Course Information Sheets/ Teaching Plans

Department of Computer Science and Engineering

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCES AND HUMANITIES
(MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech: Computer Science and Engineering	
COURSE:**LINEAR ALGEBRA AND CALCULUS**	Semester : I CREDITS: **3**
COURSE CODE: **R20CC1102** REGULATION: **Autonomous**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **S&H**
COURSE AREA/DOMAIN: Applications of linear algebra for Engineering branches.	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Solve the system of linear equations. [K3]
CO2	Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors [K4]
CO3	Relate the results of mean value theorems in calculus to Engineering problems. [K4]
CO4	Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [K3]
CO5	Identify the area and volume by interlinking them to appropriate double and triple integrals. [K5]

SYLLABUS:

UNIT	DETAILS
I	**LINEAR SYSTEMS OF EQUATIONS: (10 hours)** Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition. **Application:** Finding the current in a electrical circuit, traffic flow problems.
II	**EIGENVALUES AND EIGENVECTORS (12 hours)** Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature. **Application:** Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.
III	**MEAN VALUE THEOREMS (6 hours)** Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.
IV	**PARTIAL DIFFERENTION: (8 hours)** Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of

	functions of two variables, Lagrange's method of undetermined multipliers.
V	**MULTIPLE INTEGRALS:** **(12 hours)** Double and triple integrals, Change of Variables, Change of order of Integration. Volume integration.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Dr. B.S. Grewal , "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
T2	B.V. Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education,2018.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
R2	Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
R3	Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
R4.	Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011
R5.	Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Applications of Mathematics	PO1, PO2, PO3,PO4, PO5 & PSO1
2	Basics of Calculus	PO1, PO2, PO3,PO4, PO5 & PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/122107036/32
2	https://nptel.ac.in/courses/122107036/27
3	https://nptel.ac.in/courses/122101003/downloads/Lecture-4.pdf
4	https://nptel.ac.in/courses/122101003/downloads/Lecture-6.pdf
5	https://nptel.ac.in/courses/122104017/28

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ Chalk & Talk	✓ ☐ PPT	☐Active Learning
✓ Web Resources	✓ ☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	✓ ☐Tutorials
☐Project based learning	✓ ☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C102.1	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.2	3	3	3	2	1	-	-	-	-	-	-	-	2	-	-
C102.3	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.4	3	2	2	1	1	-	-	-	-	-	-	-	3	-	-
C102.5	3	3	2	1	1	--		-	-	-	-	-	3	-	-
Average	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C215	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: A+>= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.To design and develop algorithms for business and engineering applications.

PSO2.To apply security mechanisms for online applications.

PSO3.To apply standard practices and techniques in software project development using open-ended programming environments.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	KEY WORDS
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selects, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs,

		relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Upon successful completion of the course, the students should be able to

1. Solve the system of linear equations.
2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.
3. Relate the results of mean value theorems in calculus to Engineering problems.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Find** the Rank of the following matrices by using Echelon form $\begin{pmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{pmatrix}$	**K1**	**CO1**
2	**Interview** for what values of λ and μ, 2x+3y+5z=9,7x+3y-2z=8,2x+3y+λ z=μ have (i)no solution (ii)a unique solution (iii)an infinite number of solutions.	**K3**	**CO1**
3	**Solve** the following system of linear equations by using Gaussian Elimination Method x+y=z=6,3x+3y+4z=20,2x+y+3z=13 .	**K3**	**CO1**
4	**Solve** the following system of linear equations by using LU Decomposition Method *2x+3y+z=9, x+2y+3z=6, 3x+y=2z=8.*	**K4**	**CO1**
	UNIT 2		
1	**Find** the Eigen values and corresponding Eigen vectors of the following matrices $\begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$	**K2**	**CO2**
2	Diagonalise the following matrices A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$ and also **find** A^4 and A^{-1}.	**K2**	**CO2**
3	**Using** Cayley-Hamilton theorem find the inverse and $A^4$of the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$.	**K3**	**CO2**
4	Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form by orthogonal reduction and **evaluate** the rank	**K5**	**CO2**

	UNIT 3		
1	**Inspect** Rolle's theorem for $(x-a)^m(x-b)^n$ where m, n are positive integers in [a, b].	**K5**	**CO3**
2	In the mean value theorem $f(b)-f(a)=(b-a)f'(c)$, **determine** c lying between a and b, if $f(x)=x(x-1)(x-2)$, a = 0 and $b=\frac{1}{2}$.	**K5**	**CO3**
3	**Conclude** that $\log(1+x)=\frac{x}{1+\theta x}$, where 0 < θ < 1 and hence deduce that $\frac{x}{1+x}<\log(1+x)<x, x>a$.	**K4**	**CO3**
4	**Discuss** the applicability of Cauchy's Mean value Theorem for $f(x)=\frac{1}{x^2}, g(x)=\frac{1}{x}$ in [a, b].	**K6**	**CO3**
5	A rectangular sheet of metal of length 6 meters and width 2 meters is given. Four equal squares are removed from the corners. The sides of this sheet are now turned up to form an open rectangular box. Find approximately, the height of the box, such that the volume of the box is maximum.	**K5**	**CO3**
	UNIT 4		
1	If $z(x+y)=x^2+y^2$ **show** that $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2=4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)$	**K3**	**CO4**
2	If u = f(r) and x = r Cosθ and y = r Sinθ, **conclude** that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=f''(r)+\frac{1}{r}f'(r)$.	**K5**	**CO4**
3	In spherical coordinates, $x=r\sin\theta\cos\phi, y=r\sin\theta\sin\phi, z=r\cos\theta$ **show** that $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}=r^2\sin\theta$.	**K3**	**CO4**
4	**Discuss** the maxima and minima of $f(x,y)=x^3y^2(1-x-y)$	**K6**	**CO4**
	UNIT 5		
1	**Find** the perimeter of the loop of the curve $3ay^2=x(x-a)^2$.	**K2**	**CO5**
2	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	**K5**	**CO5**
3	**Evaluate** $\int_0^1\int_0^{1-x}\int_0^{1-x-y} dxdydz$.	**K5**	**CO5**
4	**Evaluate** $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates.	**K5**	**CO5**

Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I B.Tech I Semester Regular Examinations, Month/Year

Sub Code: R20CC1102 **LINEAR ALGEBRA & CALCULUS**

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X14=70M)

Q.No		Questions	KNOWLEDGE	CO	Marks
1		**Unit - I**			MARKS
	a	i) **Identify** two non-singular matrices P and Q such that PAQ is in the normal form. Where the matrix is $\begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 1 \end{pmatrix}$.	K3	CO1	[7M]
		ii) **Explain** for what values λ and μ the system of equations $2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+\lambda z=\mu$ will have (i) no solution (ii)a unique solution (iii)an infinite number of solutions.	K2	CO1	[7M]
		OR			
	b	**Apply** LU decomposition method to solve the following system of linear equations. $2x+3y+z=9$, $x+2y+3z=6$, $3x+y=2z=8$.	K3	CO1	[14M]
2		**Unit - II**			
	a	**Find** A^4 and A^{-1} by diagonal zing the matrix A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$.	K2	CO2	[14M]
		OR			
	b	**Examine** the Cayley-Hamilton theorem for the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$. Find A^{-1} and A^4.	K4	CO2	[14M]
3		**Unit - III**			

	a	i) **Test** Rolle's theorem for $\frac{\sin x}{e^x}$ in $(0.\pi)$	K4	CO3	[7M]
		ii) **Show** that (if $0 < a < b < 1$), $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$. Make use of the above result show that $\frac{\pi}{4}+\frac{3}{25} < \tan^{-1}\left(\frac{4}{3}\right) < \frac{\pi}{4}+\frac{1}{6}$.	K2	CO3	[7M]
		OR			
	b	i) **Verify** Cauchy's Mean value Theorem for the functions e^x and e^{-x} in (a, b).	K4	CO3	[7M]
		ii) **Find** the maximum and minimum values of $3x^4 - 2x^3 - 6x^2 + 6x + 1$ in the interval (0, 2).	K2	CO3	[7M]
4		**Unit - IV**			
	a	i) If $u = f(2x-3y, 3y-4z, 4z-2x)$, **Show** that $\frac{1}{2}\frac{\partial u}{\partial x}+\frac{1}{3}\frac{\partial u}{\partial y}+\frac{1}{4}\frac{\partial u}{\partial z}=0$	K3	CO4	[7M]
		ii) If $u = \frac{x+y}{1-xy} and v = \tan^{-1} x + \tan^{-1} y$, find $\frac{\partial(u,v)}{\partial(x,y)}$. Are u and v functionally related? If so, **find** this relationship.	K2	CO4	[7M]
		OR			
	b	i) **list** $x^2y+3y-2$ in powers of (x-1) and (y+2) using Taylor's theorem.	K4	CO4	[7M]
		ii) A rectangular box open at the top is to have volume of 32 cubic ft. **Determine** the dimensions of the box requiring least material for its construction.	K5	CO4	[7M]
5		**Unit - V**			
	a	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	K5	CO5	[14M]
		OR			
	b	change the order if integration and **evaluate** $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.	K5	CO5	[14M]

NEC	**Narasaraopeta Engineering College** (Autonomous) Yallamanda(Post), Narasaraopet- 522601 **Department of Computer Science & Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Computer Science and Engineering	
COURSE: **DATA STRUCTURES**	Year/Sem : **II/I** CREDITS: **3**
COURSE CODE: **19BCI3TH05** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **core**
COURSE AREA/DOMAIN:**CSE**	PERIODS: **6**Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
19BCITH05	PYTHON PROGRAMMING		I/II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Apply Searching, Sorting and Hashing techniques to solve problems.[K3]
CO2	Analyze basic data structures such as Stacks, Queues and Linked List. [K4]
CO3	Solve problems involving Advanced concepts of Trees. [K3]
CO4	Analyze variety of Graph data structures that are used in various applications. [K4]

SYLLABUS:

UNIT	DETAILS
I	Introduction to Data Structures and Algorithms: Basic Terminology – Preliminaries of algorithms. Data Structures, Abstract Data Types (ADTs) Algorithms, Time and Space Complexity (worst-case, averagecase, best-case).
II	Searching and Sorting : Introduction to Searching, Linear Search, Binary Search, Fibonacci Search. Introduction to Sorting, Bubble sort, Selection sort, Insertion sort , Merge sort Algorithm, Heap sort, Quick sort Algorithm.
III	Hashing: Introduction, Hash Tables, Hash Functions, Different Hash Functions, Collisions. (pg.no.:356-361). Linked Lists: Introduction, Singly linked list, Doubly linked list, Circular linked list (p.g.no. 52-65).
IV	Stacks: Definition, Stack ADT, Applications, Implementation (p.g.no 100-105).Queues: Definition, Queue ADT, Exceptions, Applications, Implementation. (p.g.no 123-124). Trees: Introduction, Binary Trees, Traversing a Binary Tree. (pg.no.:139-143). Binary Search Trees, operations on Binary Search Trees (insertions and deletions), AVL Trees (pg.no.:178-193).
V	Priority Queues and Heaps: Introduction ,ADT, Applications ,Implementations, Binary HeapsInserting a new element in a Binary Heap, Deleting an element from a Binary Heap.(pg.no.:216- 223) Graphs: Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Adjacency Matrix Representation, (Adjacency List Representation), Graph Traversal algorithms.(pg.no:247-255)

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	"Data Structures and Algorithmic Thinking with Python", Narasimha Karumanchi, IIT Bombay, CareerMonk Publications, First Edition, 2018
T2	Data Structures and Algorithms in Python, Michael T. Goodrich, Second Edition,2013
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Python Data Structures and Algorithms, Benjamin Baka, Kindle Edition
R2	Hands-On Data Structures and Algorithms with Python, Dr. Basant Agarwal and Benjamin Baa, 2nd Edition.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	HASHING TECHNIQUES	
2	COLLISION RESOLUTION TECHNIQUES	

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=YWnBbNj_G-U
2	https://www.youtube.com/watch?v=RBxS6niE6q4

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☑Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☑Flipped Learning	☐Industrial Visit	☑Collaborative Learnng
☐Brain storming	☐Role Play	☑Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2	PS03
C2104.1	3	2	2	1	-	-	-	-	-	-	-	2	2	1	
C2104.2	3	3	2	1	-	-	-	-	-	-	-	2	2	1	
C2104.3	3	2	2	2	-	-	-	-	-	-	-	2	2	1	
C2104.4	2	2	2	2	-	-	-	-	-	-	-	2	2	1	
Average	2.75	2.25	2	1.5	-	-	-	-	-	-	-	2	2	1	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2104	2.75	2.25	2	1.5								2	2	1	

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
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End Semester Examination (60%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective

presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Ability to apply learned mathematical and scientific skills in numerous areas of computer science to design and develop software based systems.

2. Ability to employ standard practices and modern programming languages to provide innovative solutions to the existing problems in all engineering and entrepreneurship applications.

3. Ability to design and develop novel applications that meets the needs of environmental and social issues.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Choose , Define ,Find,How , Label, List , Match ,Name ,Omit ,Recall ,Relate , Select , Show, Spell , Tell , What , When , Where ,Which , Who ,Why.
Understand	K2	Classify , Compare , Contrast , Demonstrate , Explain , Extend , Illustrate , Infer , Interpret , Outline , Relate , Rephrase , Show , Summarize , Translate.
Apply	K3	Apply , Build ,Choose , Construct , Develop , Experiment with , Identify ,Interview , Make use of , Model ,Organize , Plan , Select , Solve ,Utilize.
Analyse	K4	Analyze ,Assume , Categorize , Classify , Compare , Conclusion, Contrast , Discover , Dissect , Distinguish ,Divide, Examine ,Function • Inference , Inspect , List , Motive ,Relationships ,Simplify ,Survey , Take part in , Test for , Theme.
Evaluate	K5	Agree , Appraise , Assess , Award , Choose , Compare, Conclude ,Criteria ,Criticize , Decide , Deduct , Defend ,Determine, Disprove, Estimate , Evaluate , Explain , Importance , Influence, Interpret ,Judge , Justify , Mark ,Measure , Opinion , Perceive ,Prioritize ,Prove , Rate , Recommend , Rule on ,Select , Support , Value.
Create	K6	Adapt , Build , Change, Choose , Combine, Compile ,Compose , Construct ,Create , Delete , Design , Develop, Discuss ,Elaborate ,Estimate , Formulate , Happen , Imagine , Improve ,Invent , Make up , Maximize , Minimize ,Modify , Original ,Originate , Plan , Predict ,Propose , Solution , Solve ,Suppose,Test, Theory

COURSE OUTCOMES: Students will be able to

CO1 : Apply Searching, Sorting and Hashing techniques to solve problems.[K3]

CO2 : Analyze basic data structures such as Stacks, Queues and Linked List. [K4]

CO3 : Solve problems involving Advanced concepts of Trees. [K3]

CO4 : Analyze variety of Graph data structures that are used in various applications. [K4]

Unit wise Sample assessment questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT 1		
1	Define design and analysis of algorithm.	K4	CO2
2	Explain components of space Complexity.	K4	CO2
3	Explain Asymptotic notations	K4	CO2
	UNIT 2		
1	Explain Linear Search with example	K3	CO1
2	Give an example for Bubble Sort	K3	CO1
3	Sort the sequence 8, 1, 4, 1, 5, 9, 2, 6, 5 by using selection sort. And also explain the program	K3	CO1
	UNIT 3		
1	Discuss chaining.	K4	CO2
2	Construct an algorithm for deletion of an element at end in Doubly Linked list.	K4	CO2
3	Explain insertion of element at specific position in single linked list	K4	CO2
	UNIT 4		
1	Explain Circular queues with examples.	K4	CO2
2	Write an algorithm for factorial of no	K4	CO2
3	Illustrate infix to postfix conversion with example	K4	CO2
	UNIT 5		
1	Explain priority heaps.	K3	CO3
2	Explain the procedure deletion operation in Binary Search Tree	K3	CO3
3	Explain about different types of graphs	K4	CO3

Subject Code: 19BCI3TH05

II B.Tech. - I Semester [illegible] Examinations, [illegible]

DATA STRUCTURES
(CSE,AI,IT)

Time: 3 hours **Max. Marks: 60**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	Define design and analysis of algorithm.	K4	CO2	6M
		Explain components of space Complexity.	K4	CO2	6M
		OR			
	b	Explain Abstract Data Type	K4	CO2	6M
		Explain Asymptotic notations	K4	CO2	6M
2		**Unit-II**			
	a	Explain Linear Search with example	K3	CO1	6M
		Give an example for Bubble Sort	K3	CO1	6M
		OR			
	b	Illustrate the difference between Linear and Fibonacci Search.	K3	CO1	6M
		Sort the sequence 8, 1, 4, 1, 5, 9, 2, 6, 5 by using selection sort. And also explain the program	K3	CO1	6M
3		**Unit-III**			
	a	Explain collision resolution techniques	K4	CO2	12M
		OR			
	b	Construct an algorithm for deletion of an element at end in Doubly Linked list.	K4	CO2	6M
		Explain insertion of element at specific position in single linked list	K4	CO2	6M
4		**Unit-IV**			
	a	Give an example for factorial of a no with recursion with neat diagram.	K4	CO2	6M
		Explain Circular queues with examples.	K4	CO2	6M
		OR			
	b	Write an algorithm for push and pop.	K4	CO2	6M
		Explain queues with example.	K4	CO2	6M
5		**Unit-V**			
	a	Explain the procedure deleting an element in Binary Search Tree	K3	CO3	6M
		Illustrate Dijkstra algorithm with example.	K4	CO4	6M
		OR			

	b	Explain priority heaps.	K3	CO3	6M
		Explain about different types of graphs	K4	CO3	6M

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Basic Science & Humanities**

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech (common to All Branches)	
COURSE: **ENGINEERING CHEMISTRY**	Semester : **I/II** CREDITS: **3**
COURSE CODE: **R20CC1103/ R20CC1204** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ BS&H): **BS&H**
COURSE AREA/DOMAIN: **CHEMISTRY**	PERIODS: **6 Per Week.**

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

S.NO	Course Outcome Statement
CO1	Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**
CO2	Compare different types of polymers and fuels and their importance. **Analyzing [K4]**
CO3	Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**
CO4	Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**
CO5	Identify different types of engineering materials and applications in engineering. **Applying [K3]**

SYLLABUS:

UNIT	DETAILS
I	**WATER CHEMISTRY :Characteristics of water:** Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis). **Water analysis techniques:** Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.
II	**POLYMERS AND FUEL CHEMISTRY: Polymers:** Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples– Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization. **Fuels:** Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.
III	**CHEMISTRY OF ADVANCED MATERIALS: Nano materials**: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications. **Liquid crystals:** Introduction–Types–Applications. **Composite materials:** Introduction–Definition–Types–Applications–Cermets.

IV	**ELECTROCHEMICAL CELLS AND CORROSION:** Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)- Applications of secondary batteries in E-vehicles. **Corrosion:** Causes and effects of corrosion–Theories of corrosion (dry, chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions- Pigment Volume Concentration.
V	**CHEMISTRY OF ENGINEERING MATERIALS: Lubricants:** Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils. **Cement & Refractories:** Manufacture–Setting and hardening of cement–Failures of cement– Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Shikha Agarwal, "Engineering Chemistry", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
T2	O.G. Palana, "Engineering Chemistry", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
T3	B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, "Text Book of Engineering Chemistry", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	P.C. Jain and M. Jain "Engineering Chemistry", ISBN 8187433175, 15/e, Dhanpat Rai & Sons, Delhi, (2015).
R2	B.S Murthy and P. Shankar, "A Text Book of NanoScience and NanoTechnology", University Press (2013).
R3	K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn services, (2016).
R4	S.S. Dara, "A Textbook of Engineering Chemistry", ISBN 8121932645, S.Chand Publisher, (2010).

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO	UNIT	DESCRIPTION
1	Unit-I	Electro dialysis, Reverse Osmosis.
2	Unit-II	Bio degradable polymers, Moulding Techniques Knocking and Anti Knocking Agents.
3	Unit-III	Nanomaterials, Liquid crystals, Fullerenes, Composites,FRP
4	Unit-IV	Applications of secondary batteries in E-vehicles, Corrosion Controlling methods.
5	Unit-V	Application of slag cement in Fal-G Bricks, Significance of lubricants.

WEB SOURCE REFERENCES:

1	**Unit- I**	https://www.youtube.com/watch?v=cAWu0eDiSuk https://www.youtube.com/watch?v=BmpknJNDXfE https://www.youtube.com/watch?v=wNCcpx9leG4 https://www.youtube.com/watch?v=GIKISUijQCM https://www.youtube.com/watch?v=h4fCkhb4Y5I https://www.youtube.com/watch?v=zelRO_lmDdc https://www.youtube.com/watch?v=V16USbjKZXw https://www.youtube.com/watch?v=ajYJvUray9w
2	**Unit- II**	https://www.youtube.com/watch?v=5iTz9yN4v4k https://www.youtube.com/watch?v=TPtc_bAhGeg https://www.youtube.com/watch?v=-d14DmSBuAQ https://www.youtube.com/watch?v=QglJLrwDPxE

		https://www.youtube.com/watch?v=pOGpXZ-UMfo https://www.youtube.com/watch?v=J2-tDV8KYEA&t=56s https://www.youtube.com/watch?v=hOAt9UOkOq4 https://www.youtube.com/watch?v=lseA9FBUNF0 https://www.youtube.com/watch?v=Jq1WHCu-i9A https://www.youtube.com/watch?v=4ZysyokEU60 https://www.youtube.com/watch?v=Q5v_YhW_IG0
3	**Unit- III**	https://www.youtube.com/watch?v=14DqBIG96W0 https://www.youtube.com/watch?v=7WGZq1EY6no https://www.youtube.com/watch?v=9u3-3v-i1P4 https://www.youtube.com/watch?v=9XKGVHPXXho https://www.youtube.com/watch?v=MuWDwVHVLio https://www.youtube.com/watch?v=b0fbM0a86qc
4	**Unit- IV**	https://www.youtube.com/watch?v=lSq_WVC6Hiw https://www.youtube.com/watch?v=pU5Q4sopoII https://www.youtube.com/watch?v=imV_ufIzxPY https://www.youtube.com/watch?v=RAlC75xG4qU https://www.youtube.com/watch?v=QYd9ENn1nP0 https://www.youtube.com/watch?v=-K8Xb2tUWbY https://www.youtube.com/watch?v=lfT9L3ADkZw https://www.youtube.com/watch?v=MhbjQFhZ1bE
5	**Unit- V**	https://www.youtube.com/watch?v=-l7dM-a239A https://www.youtube.com/watch?v=WeH3CUvdt_s https://www.youtube.com/watch?v=et0NWu1Hurk https://www.youtube.com/watch?v=hk7NvgmvwnM https://www.youtube.com/watch?v=dyxL_BvkhJg https://www.youtube.com/watch?v=V-HIriZvTvQ https://www.youtube.com/watch?v=xb_xndPe4n0

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☑ Quiz	☑Tutorials
☐Project based learning	☑NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C112.1	-	1	3	3	-	-	-	-	1	-	-	-	1	-	2
C112.2	2	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.3	3	3	3	3	3	-	-	-	1	3	-	-	1	-	1
C112.4	3	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Average	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2103	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: O: >= 90%; E: 80%-89%; A: 70%-79%; B: 60%-69%; C: 50%-59%; D: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1: Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**

CO2: Compare different types of polymers and fuels and their importance. **Analyzing [K4]**

CO3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**

CO4: Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**

CO5: Identify different types of engineering materials and applications in engineering. **Applying [K3]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain EDTA method for the determination of total hardness present in water	K2	CO1
2	How would you estimate the amount of dissolved oxygen present in water?	K1	CO1
3	Demonstrate the zeolite process used for softening of water	K2	CO1
	UNIT 2		
1	Explain the characteristics of addition polymerization. Explain it with free radical chain Polymerization.	K2	CO2
2	Illustrate proximate analysis of coal with significance and explain determination of C and H in coal sample by ultimate analysis.	K2	CO2
3	Define cracking. Write its types. Explain catalytic cracking in terms of moving bed catalytic cracking.	K1	CO2
	UNIT 3		
1	How is CNTs prepared by Laser ablation method?	K1	CO3
2	How to characterise Nano materials by BET and TEM methods.	K1	CO3
3	Discuss the types and applications of liquid crystals	K6	CO3
	UNIT 4		
1	What are reference electrodes? Explain the working, advantages of Hydrogen and calomel electrodes.	K1	CO4
2	Demonstrate secondary batteries with Lead-Acid battery and write its applications, advantages and disadvantages.	K2	CO4
3	What are fuel cells? Explain working, uses, advantages and limitations of H 2 -O 2 fuel cell with neat sketch.	K1	CO4
	UNIT 5		
1	Explain the manufacturing of Portland cement with neat diagram.	K2	CO5
2	What are refectories? Explain porosity and chemical inertness of refractories.	K1	CO5
3	Explain theories for the mechanism of lubricants.	K2	CO5

Code: R20CC1103/R20CC1204 **Model Question Paper-I** R20

Narasaraopeta Engineering College

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B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33 Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.
All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**Explain** (i) zeolite process with a neat diagram (ii) Estimation of hardness by EDTA method.	K2	1	7
		OR			
	b	**Explain** the different methods used for the desalination of brackish water.	K2	1	7
2	a	**What** is meant by moulding of plastics? Mention the moulding techniques of Compression and injection moulding with neat diagram.	K1	2	7
		OR			
	b	**What** is cracking? How gasoline is obtained from moving and fixed catalytic cracking?	K1	2	7
3	a	**How** to characterize Nano materials by BET and TEM methods.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** how nature of metal and nature of environment influences the rate of corrosion?	K5	4	7
		OR			
	b	i) **Explain** working of Lead –acid storage battery. With reactions ii) **Illustrate** the mechanism of Electrochemical corrosion.	K2	4	7
5	a	**(i)List** the Classification and properties of refractories **(ii)Discuss** the Setting and hardening of cement.	K4	5	7
		OR			
	b	**(i).Distinguish** between extreme pressure lubrication & boundary lubrication (ii)**List** out acidic and neutral refractories and its uses.	K4	5	7

Code: R20CC1103/R20CC1204 Model Question Paper-II R20

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks:70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.

All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**What** are zeolites? How is water purified by zeolite process?	K1	1	7
		OR			
	b	**Explain** the determination BOD & COD and its significance.	K2	1	7
2	a	**(i)Explain** free radical mechanism of addition polymerization. **(ii)What** are the drawbacks of raw rubber? How to overcome the drawbacks of natural rubber by vulcanization process?	K2	1	7
		OR			
	b	**(i)Define** calorific value, HCV and LCV. Calculate the gross and net calorific value of coal having the following compositions C = 83%; H = 10%; S = 1%, N = 3%, Ash = 3%. Latent heat of steam = 587 cal/g. **(ii)Explain** moving bed catalytic cracking method with a neat labeled diagram.	K1	2	7
3	a	**What** are Nano materials? Explain the preparation of nanomaterials by Sol-Gel and Chemical reduction method.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** with neat diagrams the working of (i) Hydrogen Electrode(ii) Calomel Electrode (iii) Lechlanche cell	K2	4	7
		OR			
	b	i) **Discuss** the mechanism of dry corrosion. Explain the role of oxide film in dry corrosion. ii) **Illustrate** galvanizing and tinning.	K5	4	7
5	a	**Explain** the following properties and discuss their significance. (i) Viscosity and Viscosity index (ii) Flash & fire point (iii) Aniline point (iv) Neutralization number.	K2	5	7
		OR			
	b	**Explain** the significance of the following properties in the evaluation of refractory material. (i)Refractoriness (ii) Strength or RUL test	K2	5	7

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COURSE INFORMATION SHEET

PROGRAMME: B.Tech (CSE, IT)	
COURSE: **MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE**	Semester : I CREDITS: **3**
COURSE CODE: **19BCI3TH04** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/BS&H): **BS&H**
COURSE AREA/DOMAIN: Applications of Mathematics in Computers Engineering Fields	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCI3TH04	**MFCS**	Engineering Mathematics is the art of applying mathematics to complex real-world problems. It combines mathematical theory, practical engineering and scientific computing to address today's technological challenges. It requires basic knowledge of sets, functions, logic and algebra.	**II-I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Apply the logical statements, connectivity among the statements and forms different types of normal forms.
CO2	Analyze the theory of Inference for statement calculus.
CO3	Classify the types of graphs and trees to formulate computational problems.
CO4	Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits.
CO5	Solve mathematical problems with recurrence relations using different methods.

SYLLABUS:

UNIT	DETAILS
I	**Mathematical Logic:** **(10 hours)** Statements and Notations, Connectives - Negation, Conjunction, Disjunction, Statement Formulas and Truth tables, Conditional Statements, Bi Conditional Statements, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Functionally Complete Sets of Connectives, Other Connectives; Normal Forms - Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Ordering and Uniqueness of Normal Forms.
II	**THE THEORY OF INFERENCE FOR THE STATEMENT CALCULUS:** **(10 hours)** Validity Using Truth Tables, Consistency of Premises and Indirect method of proof. **Predicate calculus:** Predicates, Statement Function, Variables and Quantifiers, Free and Bound Variables, Inference Theory of Predicate Calculus, Exercises. **Mathematical Induction**: Principle of Mathematical Induction, Exercises.
III	**GRAPH THEORY:** **(12 hours)** Definitions, finite and infinite graphs, incidence and degree, isolated pendant vertices, isomorphism, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Euler graphs, Euler graph theorem, operations on graphs, decomposition of Euler graphs into circuits, arbitrarily traceable Euler graphs, Hamiltonian paths and circuits, number of

	edge disjoint Hamiltonian circuits in complete graph with odd number of vertices, travelling salesman problem. **Trees:** Some properties of trees, pendant vertices, distance and centers, rooted and binary trees, spanning trees, fundamental circuit, shortest spanning trees, Kruskal's algorithm.
IV	**RECURRENCE RELATION: (8 hours)** Recurrence Relations, Formation of Recurrence Relations, Solving linear homogeneous recurrence Relations by substitution method, generating functions and The Method of Characteristic Roots. Solving Inhomogeneous Recurrence Relations.
V	**BOOLEAN ALGEBRAS & COMBINATORICS: (8 hours)** **Boolean Algebras**: Boolean Algebras, Boolean Polynomials, Disjunctive and Conjunctive Normal forms, Switching Circuits and Applications. **Combinatorics:** Basic Counting Principles, Permutations and Combinations: Permutations, Combinations, Restricted Combinations, Pigeonhole Principle and its Application.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Discrete Mathematical Structures with applications to coputer science, Tremblay,Manohar,THM(UNITS-I,II,III&IV).
T2	Discrete Mathematics Bhavanari Satyanarayana and Kuncham Syam Prasad PHI,India,(UNITS-II,IV&V) .
T3	Mathematical foundation for computer science,Bhavanari Satyanarayana,T.V.Pradeep, Sk. Mohiddin Shaw, BS Publications (UNIT 6)
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Discrete Mathematics and its Application with combinatorics and Graph theory, 7th ed, Rosen TMH
R2	Discrete Mathematics and Graph theory , 3rd Ed, Purnachandra Biswal, PHI
R3	Discrete Mathematics for Computer Scientists and Mathematicians", 2nd Edition, Joe L. Mott, Abraham Kandel, Theodore P. Baker, PHI.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Applications of Mathematics	PO1, PO2, PO3 ,PO12& PSO1,PSO3
2	Basics of Set Theory and Graph Theory	PO1,PO2, PO3 ,PO12& PSO1,PSO3

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/downloads/106106094/
2	https://nptel.ac.in/courses/106108054 (Graph theory)
3	https://onlinecourses.nptel.ac.in/noc18_ma16/unit?unit=18&lesson=19
4	https://onlinecourses.nptel.ac.in/noc18_ma16/student/home
5	https://onlinecourses.nptel.ac.in/noc18_cs53/student/home

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ ☐Chalk & Talk	✓ ☐ PPT	☐Active Learning
✓ ☐Web Resources	✓ ☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	✓ ☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C211.1	3	2	2	1	-	-	-	-	-	-	-		3	1	1
C211.2	3	3	2	1	-	-	-	-	-	-	-		3	1	1
C211.3	3	3	2	1	-	-	-	-	-	-	-		3	-	-
C211.4	3	3	2	-	-	-	-	-	-	-	-		3	-	-
C211.5	3	3	2	1	-	--		-	-	-	-		3	1	1
Average	3.00	3.00	2.00	1.00	-	-	-	-	-	-	-		3.00	1.00	1.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C211	3.00	3.00	2.00	1.00	-	-	-	-	-	-	-		3.00	1.00	1.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured < 60% and ≥ 50% marks of allocated marks for that CO	Student secured ≥ 40%and < 50% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and < 80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

Cognitive levels as per Revised Blooms Taxonomy:

PSO1: Ability to apply learned mathematical and scientific skills in numerous areas of computer science to design and develp software based systems.

PSO2: Ability to employ standard practices and modern programming languages to provide innovative solutions to the existing problems in all engineering and entrepreneurship applications.

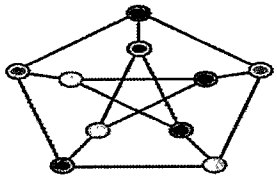
PSO3: Ability to design and develop novel applications that meets the needs of environmental and social issues.

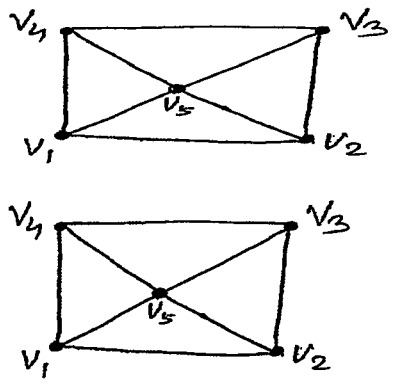
Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selects, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: After completion of this course, the students would be able to

1. Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3]
2. Develop the theory of Inference for statement calculus. [K3]
3. Classify the types of graphs and trees to formulate computational problems. [K3]
4. Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K4]
5. Solve mathematical problems with recurrence relations using different methods. [K6]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Construct** the truth table for (¬ p∧ (¬ q∧r)) V ((q∧r) V (p∧r)).	K3	CO1
2	**Write** an equivalent formula for $P \wedge (Q \underset{\leftarrow}{\overset{\rightarrow}{}} R) \vee (R \underset{\leftarrow}{\overset{\rightarrow}{}} P)$ which does not contain the conditional and bi-conditional.	K6	CO1
3	**Show** that $(P \rightarrow Q) \rightarrow Q \Rightarrow P \vee Q$.	K3	CO1
4	**Prove** that $p \rightarrow (q \rightarrow r) \Rightarrow (p \rightarrow q) \rightarrow (q \rightarrow r)$.	K2	CO1
	UNIT 2		
1	**Show** that the following: R→¬Q, RVS, S→¬Q, P→Q⇒¬P	K3	CO2
2	**Show** that R→S can be derived from the premises P→(Q→S), ¬RVP and Q.	K3	CO2
4	**Show** that $1.4+2.5+3.6+.....+n(n+3)=\frac{n(n+1)(n+5)}{3}\ \forall n \in N$, by using Principle of Mathematical Induction.	K3	CO2
5	**Show** that $2.7^n + 3.5^n$ is divisible by 24 by using Principle of Mathematical Induction.	K3	CO2
	UNIT 3		
1	**Define** the necessary and sufficient conditions to specify that two graphs are isomorphic? **Explain** with an example.	K1&K2	CO3
2	**Show** that the following graph is Hamiltonian Graph. 	K3	CO3

3	**Show** that the following graphs are isomorphic 	**K3**	**CO3**
4	How many vertices are necessary to **construct** a graph with exactly 6 edges in which each vertex is of degree 2.	**K3**	**CO3**
	UNIT 4		
1	Solve $\mathbf{a_n + 3a_{n-1} - 10a_{n-2} = 0, n >= 2}$, given $\mathbf{a_0 = 1, a_1 = 4}$ using generating functions.	**K3**	**CO4**
3	Solve the recurrence relation $\mathbf{a_r = a_{r-1} + 2, r \geq 1}$ with $\mathbf{a_0 = 1}$, using generating function.	**K3**	**CO4**
4	Solve the Recurrence Relation $\mathbf{u_n + 5u_{n-1} + 6u_{n-2} = 3n^2 - 2n + 1}$?	**K3**	**CO4**
	UNIT 6		
1	**Compute** the number of permutations of the word "NARENDRA MODI"?	**K3**	**CO5**
2	How many ways can a committee of people be chosen from 10 people if k can be 1,2,3.....or 10	**K3**	**CO5**
3	How many 3 digit no's are there which are even and have no repeated digits?	**K4**	**CO5**
	In how many ways can the letters of the word CORRESPONDENTS can be arranged so that (i) There are exactly two pairs of consecutive identical letters?	**K4**	**CO5**

Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Regular Examinations, Month/Year

Sub Code: 19BCI3TH04 **MFCS**

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X14 = 70M)

Q.NO		Questions	Cognitive Level	CO	Marks
1		**Unit - I**			
	a	(i) **Interview** $(p\rightarrow q)\rightarrow r$ and $p\rightarrow(q\rightarrow r)$ logically equivalent? **Justify** your answer by using truth table.	**K3**	**CO1**	[7M]
		(ii) **Show that** $(P\rightarrow(Q\rightarrow R))\leftrightarrow(P\rightarrow Q)\rightarrow(P\rightarrow R)$.	**K2**	**CO1**	[7M]
		OR			
	b	(i) Show that $[(P\rightarrow Q)\rightarrow R]\rightarrow[(P\rightarrow Q)\rightarrow(P\rightarrow R)]$ is a tautology.	**K2**	**CO1**	[7M]
		(ii) Show that PDNF of $P\vee[\sim P\rightarrow(Q\vee(\sim Q\rightarrow R))]$ is $\Sigma(7,6,5,4,3,2,1)$.	**K2**	**CO1**	[7M]
2		**Unit - II**			
	a	(i) **Interview** $(\exists x)\,P(x)\wedge(\exists x)\,Q(x)$ and $(\exists x)\,(P(x)\wedge Q(x))$ are not logically equivalent.	**K3**	**CO2**	[7M]
		(ii) Make use of mathematical induction prove that $1.2+2.3+3.4+\ldots\ldots\ldots\ldots+n(n+1)=\frac{n(n+1)(n+2)}{3}$. Where n is a positive integer.	**K3**	**CO2**	[7M]
		OR			
	b	(i) **Inspect** that the following $R\rightarrow\sim Q$, $R\vee S$, $S\rightarrow\sim Q$, $P\rightarrow Q\Rightarrow\sim P$.	**K4**	**CO2**	[7M]
		(ii) **Test** the validity of following arguments. "All men are mortal", "Socrates is a man", "Therefore Socrates is mortal ".	**K4**	**CO2**	[7M]
3		**Unit - III**			
	a	**(i) Construct** six regular bipartite graphs along with description of vertex and edge sets respectively.	**K3**	**CO3**	[7M]
		(ii) **Conclude** that any 2 simple connected graphs with n vertices all of degree 2 are isomorphic.	**K5**	**CO3**	[7M]
		OR			

	b	(i) Is there a Simple Graph with degrees 1,1,3,3,3,3,5,6,8,9? If so **justify** your answer.	**K5**	**CO3**	[7M]
		(ii) Discuss cover the number of vertices are needed to construct a graph with 7 edges in which each vertex is of degree 2.	**K5**	**CO3**	[7M]
4		**Unit - IV**			
	a	**(i) Solve** the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ *with* $a_0 = 2, a_1 = 7$.	**K3**	**CO4**	[7M]
		(ii) Solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$.	**K3**	**CO4**	[7M]
		OR			
	b	(i) Using generating function method solve the recurrence relation $a_n - 3a_{n-1} = n$, $n \geq 1$, given that $a_0 = 1$.	**K3**	**CO4**	[7M]
		(ii) Solve the recurrence relation $2a_{n+3} = a_{n+2} + 2a_{n+1} - a_n$ for $n \geq 0$, with $a_0 = 0$, $a_1 = 1$, $a_2 = 2$.	**K3**	**CO4**	[7M]
5		**Unit - V**			
	a	**(i) Show that** for all x, y in a Boolean algebra B, (i) $(x \wedge y)' = x' \vee y'$. (ii) $(x \vee y)' = x' \wedge y'$.	**K3**	**CO5**	[7M]
		(ii) Simplify Boolean expression to one of the following ten expressions: *0, 1, A, B, AB, A+B,* $\overline{A}\,\overline{B}$, $\overline{A} + \overline{B}$, $A\overline{B}$, $\overline{A}B$. Each answer may be used as many times as necessary. The Boolean expression is $(A+B)(\overline{A}+B)\overline{B}$	**K2**	**CO5**	[7M]
		OR			
	b	**(i) How** many arrangements are there of {8.a, 6.b, 7.c} in which each 'a' is on at least one side of another 'a'?	**K2**	**CO5**	[7M]
		(ii) **Predict** in how many ways can the letters of the word CORRESPONDENTS can be arranged so that There are exactly two pairs of consecutive identical letters?	**K6**	**CO5**	[7M]

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Computer Science and Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B. Tech. CSE	
COURSE: Software Engineering	Semester : **II/II** CREDITS: **3**
COURSE CODE: 19BCS4TH04 REGULATION: R19	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Software Engineering	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCS4TH04	Software Engineering	Theory	**II/II**

COURSE OUTCOMES:

CO	Course Outcome Statement
CO1	Compare and contrast basic software engineering methods and practices[k2]
CO2	Analyze the project management essentials[k4]
CO3	Analyze the software process models[4]
CO4	Outline the importance of software testing and quality control approaches[k2]
CO5	Understand the knowledge of software project planning.[k2]

SYLLABUS:

UNIT	DETAILS
I	Introduction to Software Engineering: Software-Software classification, Engineering Discipline; Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies - exploratory, structured, data structure, object oriented, component based development; Software Engineering Challenges- problem understanding, quality and product, cycle time and cost, reliability, change and maintenance, usability and reusability, repeatability and process maturity, estimation and planning. Software Processes: Software Process- software process model, elements of software process, characteristics of software process; Phased development life cycle- phased life cycle activity; Software Development Process Models- classical waterfall model, iterative waterfall, prototyping, incremental, spiral, agile process, RUP process model.
II	Requirements Engineering: Software Requirements- business, user, system, functional and nonfunctional; Requirements engineering Process, Requirements elicitation-fact finding techniques; Requirements Analysis, Structured Analysis - data flow diagram, data dictionary, Structured analysis, pros and cons of structured analysis; Prototyping Analysis- throwaway, evolutionary;

	Requirements Specification- characteristics, components, structure, requirement specification methods; Requirements Validation- review, inspection, test case generation, reading, prototyping; Requirements Management.
III	Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles- abstraction, information hiding, functional decomposition, design strategies, modularity; Modular Design- coupling, cohesion; Design Methodologies- function oriented design, object oriented design; Structured Design- structure chart, structure vs flow chart; Structured Design Methodology- review and refine data flow diagram, identify boundaries between input process and output segments, apply design principles modularization criteria.
IV	Implementation: Coding Principles- information hiding, structure programming, max cohesion and min coupling, code reusability, kiss, simplicity extensibility , code verification, code documentation; Coding Process- traditional coding process, test driven development. Software Testing: Testing Fundamentals- errors, faults, failures, cost of defects, testing process, role of software testers; Test Planning- create a test plan, design test cases, test stubs and test drivers, test case execution, test summary report, defect tracking and statistics; Black Box Testing- equivalence class partitioning, boundary value analysis, cause effect graphing, error guessing; White Box Testing- control flow based, path, data flow based, mutation; Levels of Testing- unit, integration, system, acceptance.
V	Project Planning and Estimation: Project Planning activities, Software Metrics and measurements, Project Size Estimation - lines of code, functional point analysis; Effort Estimation Techniques- COCOMO cost models, analytical estimation. Software Quality: software quality concept, Software Quality Factors, Verification & Validation, Software Quality Assurance- SQA activities, SQA plan; Capability Maturity Model (CMM) - SEICMM vs ISO standard.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Ugrasen Suman, "Software Engineering, concepts and practices", Cengage learning, 1/e, 2015
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	W S Jawadekar, "Software Engineering principles and practice", TMH, 2006
R2	Sommerville, "Software Engineering", 8/e, , Pearson.
R3	Roger S. Pressman, "Software Engineering", 7/e, TMH

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Scrum	PO3,PO12
2	XP	PO3
3	Software maintance	PO3,PO12
4		PO3,PO12

WEB SOURCE REFERENCES:

1	nptel.ac.in/courses/106101061

2	https://onlinecourses.nptel.ac.in/noc20_cs68/preview
3	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-cs68/
4	https://onlinecourses-archive.nptel.ac.in/noc18_cs43/preview

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☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322.1														3	
C322.2		2											3		
C322.3			2										3	3	
C322.4													1	1	
C322.5								2							
Average															

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322	2	2	3	2	-	-	-	-	-	-	-	2	3	-	2

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
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Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

T.V.S. Kiran
Course Coordinator

T.V.S. Kiran
Module Coordinator

Head of the Department

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2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: To design and develop algorithms for business and engineering applications.

PSO2: To apply security mechanisms for online applications.

PSO3: To apply standard practices and techniques in software project development using open-ended programming environments.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Compare and contrast basic software engineering methods and practices. [K2].

CO2. Analyze the project management essentials [K4].

CO3. Analyze the software process models. [K4].

CO4. Outline the importance of software testing and quality control approaches [K2].

CO5. Understand the knowledge of software project planning.[k2]

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain about Software engineering.	Understanding(K2)	1
2	Explain about waterfall model with suitable diagram.	Understanding(K2)	1
3	What are the challenges of SE	Understanding(K2)	1
4	What is software process? Explain process classification	Understanding(K2)	1
5	Explain SDLC?	Understanding(K2)	1
	UNIT 2		
1	What are software requirements	Understanding(K2)	2
2	How to analyze the requirements	Understanding(K2)	2
3	Explain prototyping analysis	Understanding(K2)	2
4	Explain about requirements elicitation	Applying (K3)	2
5	Explain about Requirements validation	Understanding(K2)	3
	UNIT 3		
1	What are the design principles? Explain in detail	Understanding(K2) & Applying (K3)	3
2	Explain about structured design methodologies	Understanding(K2)	3
3	Explain about functional decomposition	Understanding(K2)	3
4	Explain characteristics of good software design	Applying (K3)	3
5	Explain about function oriented design	Applying (K3)	3
	UNIT 4		
1	Explain about Black-Box testing	Understanding(K2)	4
2	Explain about codeing documnetaion	Understanding(K2)	4
3	Wahat are the levels of testing? Explain in detail	Understanding(K2)	4
4	Write differences between Black-box and White-box Testing	Understanding(K2)	4
	UNIT 5		
1	Write about software metrics and measurements	Understanding(K2)	5
2	What is project management? Explain in detail	Understanding(K2)	5
3	What are effort estimation techniques	Understanding(K2)	5
4	Explain about CMM.	Applying (K3)	5
5	Explain about Verification and validation	Applying (K3)	5

Model Question Paper

Narasaraopeta Engineering College (Autonomous)

NEC Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code:

II B.Tech II Semester Examinations Model Question Paper.
Software Engineering
(CSE & IT)

Time: 3 hours **Max Marks: 60**

All questions carry equal marks of 12.
K1 – Remember, k2 – Understand, k3- Apply, K4 – Analyze, K5-Evaluate, K6- Create

SNO	Questions	CO No.	Marks
1.a	Explain the structure of a Software.	(CO1 - K2)	6
1.b	Explain the about Software reusability?	(CO1 - K2)	6
	OR		
2.a	Explain about element of software process	(CO1-K3)	6
2.b	Explain about Agile process model	(CO1-K4)	6
3.a	Write about SRS.in detail	(CO2 - K4)	6
3.b	Write about Requirement engineering process	(CO3 – K4)	6
	OR		
4.a	Explain about data oriented analysis	(CO2 – K4)	6
4.b	Explain about requirement management	(CO3 - K4)	6
5	Explain about structured design methodologies	(CO3 – K4)	12
	OR		
6	Explain about function oriented design	(CO3-K4)	6
7	Write in detail about levels of testing	(CO4 - K3)	6
	OR		
8.a	Explain about Structured testing	(CO4 - K3)	6
9.a	Explain about COCOMO model	(CO5 - K3)	6
9.b	Explain about SQA	(CO5 - K3)	6
	OR		
10	Write about CMM vs ISO.	(CO5-K4)	12

NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 Department of Computer Science and Engineering

COURSE INFORMATION SHEET

PROGRAMME: B-Tech	
COURSE: **WDMS**	Semester : IV CREDITS: **3**
COURSE CODE: **19BCC4OE10** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **Elective**
COURSE AREA/DOMAIN: **Web Technologies**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCC4OE10	**WDMS**	Basic Knowledge on HTML, CSS, JAVASCRIPT	**IV**

COURSE OUTCOMES:

S.No.	Course Outcome Statement
CO1	Apply Angular8 to develop web applications. [K3]
CO2	Make use of Forms and Services. [K3]
CO3	Utilize Node.js to create Server Side Applications. [K3]
CO4	Make use of Express to deploy web applications. [K3]
CO5	Experiment with NoSQL using MongoDB. [K3]

SYLLABUS:

UNIT	DETAILS
I	**Angular8:** Introduction, Installation, Creating First Angular8 Application, Architecture, Angular Components and Templates, Data Binding, Directives, Pipes, Services and Dependency Injection.
II	**Angular8** (Reactive Programming): Http Client Programming, Angular Material, Routing and Navigation, Forms, Form Validation, CLI Commands.
III	**Node.js:** Introduction, Node.js Process Model, Node.js Console, Node.js Basics, Node.js Modules, Local Modules, Export Module, Node Package Manager, Node.js Web Server.
IV	**Node.js contd. & Express.js:** Node.js File System, Node.js EventEmitter, **Express.js:** Express.js Web App, Serving Static Resources.
V	**MongoDB:** Access MongoDB in Node.js, Connecting and Creating Database in MongoDB, Insert Documents, Update Documents, Delete Documents, Query Database.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Node.js, MongoDB and Angular Web Development by Brad Dayley, Brendan Dayley- 2nd Edition – Addison –Wesley
T2	Getting MEAN with Mango, Express, Angular and Node by Simon Holmes, Clive Harber-2nd

	Edition - Manning Publications.
T3	MEAN Cookbook by Nicholas McClay - Packt

REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Node.js: Web Development for Beginners by Joseph Conner
R2	Mean Stack Developer by Camila Cooper

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Mongoose	PO3,PSO2

WEB SOURCE REFERENCES:

1	https://www.edx.org/course/introduction-to-mongodb-using-the-mean-stack
2	https://www.simplilearn.com/full-stack-web-developer-mean-stack-certification-training
3	https://www.tutorialsteacher.com/nodejs/expressjs-web-application

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ Chalk & Talk	☑ PPT	☐ Active Learning
☑ Web Resources	☐ Students Seminars	☐ Case Study
☐ Blended Learning	☐ Quiz	☐ Tutorials
☑ Project based learning	☐ NPTEL/MOOCS	☐ Simulation
☑ ☐ Flipped Learning	☐ Industrial Visit	☐ Model Demonstration
☐ Brain storming	☐ Role Play	☐ Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C225.1	3	2	2	2	-	-	-	-	-	-	-	-	3	2	-
C225.2	3	2	2	3	-	-	-	-	-	-	-	-	3	2	-
C225.3	3	2	2	2	-	-	-	-	-	-	-	-	3	2	2
C225.4	3	2	2	2	-	-	-	-	-	-	-	-	3	3	2
C225.5	3	3	3	3	-	-	-	-	-	-	-	-	3	3	2
Average	3	2.2	2.2	2.4	-	-	-	-	-	-	-	-	3	2.4	2

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C225	3	2.2	2.2	2.4	-	-	-	-	-	-	-	-	3	2.4	2

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management

principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Apply mathematical and scientific skills in numerous areas of Computer Science and Engineering to design and develop software based systems.
2. Acquaint module knowledge on emerging trends of modern era in Computer Science and Engineering.
3. Promote novel applications that meet the needs of entrepreneur, environmental and social issues.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

COURSE OUTCOMES: Students are able to

S.No.	Course Outcome Statement
CO1	Apply Angular8 to develop web applications. [K3]
CO2	Make use of Forms and Services. [K3]
CO3	Utilize Node.js to create Server Side Applications. [K3]
CO4	Make use of Express to deploy web applications. [K3]
CO5	Experiment with NoSQL using MongoDB. [K3]

Unit wise Sample assessment questions

S. No.	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain what is the purpose of Angular and different versions of Angular.	K3	CO1
2	Summarize Angular installation process.	K3	CO1
3	Explain Angular architecture.	K3	CO1
4	Illustrate Data Binding. (Interpolation, Event Binding, Property Binding)	K3	CO1
5	Illustrate Data Binding. (Class Binding, Style Binding, two-way data binding)	K3	CO1
6	Explain all the Structural Directives with examples.	K3	CO1
7	Explain all the Attribute Directives with examples.	K3	CO1
8	Explain Component Directives with examples.	K3	CO1
9	Illustrate pipes with examples.	K3	CO1
10	Explain Services and Dependency Injection with example program.	K3	CO1
	UNIT 2		
1	Write about Http Client Programming to communicate with the server.	K3	CO2
2	Apply Http Client Programming in an angular app to communicate with the server.	K3	CO2
3	Write the process of installation of angular material module and explain the use of it.	K3	CO2
4	Apply angular material module to create a toolbar in an angular app.	K3	CO2
5	Write about Routing and Navigation.	K3	CO2
6	Illustrate how to use Routing and Navigation with an angular app.	K3	CO2
7	Illustrate how to use template driven forms with an angular app.	K3	CO2
8	Illustrate how to use reactive forms in an angular app.	K3	CO2
9	Illustrate reactive forms validation with an angular app.	K3	CO2
10	Write all the basic CLI commands.	K3	CO2
	UNIT 3		
1	Distinguish between Traditional Web Server model and Node.js process model.	K3	CO3
2	Write about Node.js Console and explain how to make use of it.	K3	CO3
3	Write about Node.js data types in detail.	K3	CO3
4	Write about all the Node.js module types.	K3	CO3

5	Explain how to write Local Module and how to export it.	K3	CO3
6	What is NPM? Explain what is the use of it?	K3	CO3
7	Write about the creation of Node.js webserver with code.	K3	CO3
	UNIT 4		
1	Write about Node.js File System.	K3	CO3
2	Write about reading a file and writing into a file using Node.js file system.	K3	CO3
3	Write about appending the content on to the file and explain how to delete the file.	K3	CO3
4	Explain how to use fs.open()	K3	CO3
5	Write about Node.js EventEmitter.	K3	CO3
6	What is Express.js? Explain the advantages of Express.js.	K3	CO4
7	Write how to create an Express.js Server with code.	K3	CO4
8	Write how express server serves static resources.	K3	CO4
	UNIT 5		
1	Write about accessing MongoDB in Node.js and connecting to MongoDB with code.	K3	CO5
2	Write about inserting documents into MangoDB database with code.	K3	CO5
3	Write about updating documents in MangoDB database with code.	K3	CO5
4	Write about deleting documents from MangoDB database with code.	K3	CO5
5	Write about querying MangoDB database with code.	K3	CO5

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

II B.Tech II Semester Model Paper-I

Web Development using MEAN Stack

(Department of CSE)

Sub Code: 19BCC4OE10 **Time: 3 hours**

Note: Answer **All FIVE** Questions. **Max. Marks: 60M**

All Questions Carry Equal Marks (5X12=60M)

1.	a.	Explain all the Structural Directives with examples.	6M
	b.	Explain Angular architecture.	6M
		OR	
	c.	Explain Services and Dependency Injection with example program.	12M
2.	a.	Write the process of installation of angular material module and explain the use of it.	6M
	b.	Apply angular material module to create a toolbar in an angular app.	6M
		OR	
	c.	Illustrate reactive forms validation with an angular app.	12M
3.	a.	Write about Node.js Console and explain how to make use of it.	6M
	b.	Write about Node.js data types in detail.	6M
		OR	
	c.	Write about the creation of Node.js webserver with code.	12M
4.	a.	Write about Node.js File System.	6M
	b.	Explain how to use fs.open().	6M
		OR	
	c.	Write how to create an Express.js Server with code.	12M
5.	a.	Write about accessing MongoDB in Node.js and connecting to MongoDB with code.	6M
	b.	Write about inserting documents into MangoDB database with code.	6M
		OR	
	c.	Write about deleting documents from MangoDB database with code.	6M
	d.	Write about updating documents in MangoDB database with code.	6M

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

II B.Tech II Semester Model Paper-II

Web Development using MEAN Stack

(Department of CSE)

Sub Code: 19BCC4OE10 **Time: 3 hours**

Note: Answer **All FIVE** Questions. **Max. Marks: 60M**

All Questions Carry Equal Marks (5X12=60M)

1.	a.	Explain all the Attribute Directives with examples.	6M
	b.	Illustrate Data Binding. (Interpolation, Event Binding, Property Binding)	6M
		OR	
	c.	Explain Component Directives with examples.	6M
	d.	Illustrate pipes with examples.	
2.	a.	Write about Http Client Programming to communicate with the server with an example program.	12M
		OR	
	b.	Write about Routing and Navigation with an example program.	12M
3.	a.	Distinguish between Traditional Web Server model and Node.js process model.	12M
		OR	
	c.	Write about all the Node.js module types.	6M
	d.	What is NPM? Explain what is the use of it?	6M
4.	a.	Write about reading a file and writing into a file using Node.js file system.	6M
	b.	What is Express.js? Explain the advantages of Express.js.	6M
		OR	
	c.	Write how express server serves static resources.	12M
5.	a.	Write about accessing MongoDB in Node.js and connecting to MongoDB with code.	6M
	b.	Write about updating documents in MangoDB database with code.	6M
		OR	
	c.	Write about querying MangoDB database with code.	6M
	d.	Write about inserting documents into MangoDB database with code.	6M

NARASARAOPETA ENGINEERING COLLEGE
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Computer Science and Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Computer Science and Engineering	
COURSE: **COMPILER DESIGN**	Semester : **I** CREDITS: **4**
COURSE CODE: **R16CS3103** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Computer Science-Design & Engineering**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
R16CS1214	**C Programming**	Knowledge of Basic Programming Language Concepts are required	**I/II**
R16CS2104	**Data Structures**	Understanding of data structures concepts are required	**II/I**
R16CS2102	**Formal Languages and Automata Theory**	Knowledge of automata theory, context free languages , basic regular expressions and state transition diagrams are required	**II/I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Summarize different phases and passes of a compiler.(K2)
CO2	Apply various Top-Down and Bottom-Up Parsing techniques.(K3)
CO3	Interpret different types of semantic rules and Intermediate Code representations.(K2)
CO4	Illustrate the effective usage of register allocation and various Code-generation techniques. (K2)
CO5	Summarize different code-optimization techniques. (K2)

SYLLABUS:

UNIT	DETAILS
I	**Overview of Language Processing**: Pre-processor, compiler, assembler, interpreter, linker & loader and phases of a compiler. **Lexical Analysis**: Role of the lexical analysis, lexical analysis vs. parsing, token, patterns and lexemes, lexical errors. Regular expressions: Regular definitions for the language constructs, strings, sequences, transition diagram for recognition of tokens, reserved words and identifiers with examples.
II	**Syntax Analysis**: Discussion on CFG, LMD, RMD, ambiguity, parse tree, role of the parser, Classification of Parsing Techniques: Brute Force approach, left recursion, left factoring. Top-down parsing: FIRST and FOLLOW, LL(1) grammars, non-recursive predictive parsing and error recovery in predictive parsing.
III	**Types of Bottom-Up Approaches**: Introduction to bottom-up parser, Why LR Parsers?, model of

	an LR parsers, operator precedence parser, shift- reduce parser, difference between LR and LL Parsers, Construction of SLR Table. More Powerful LR parsers: Construction of CLR (1), LALR parsing table, dangling ELSE ambiguity, and error recovery in LR parsing and comparison of all bottom-up approaches with all top-down approaches.
IV	**Semantic analysis**: SDT schemes, evaluation of semantic rules, intermediate codes, three address codes - quadruples, triples, abstract syntax trees, types and declarations, type checking.
V	**Symbol Table**: Use and need of symbol tables, runtime environment storage organization, stack allocation, access to non-local data, heap management. Code Generation: Issues, target machine, basic blocks and flow graphs, simple code generator, peep-hole optimization.
VI	**Machine Independent Code Optimization**: Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization, instruction scheduling and inter procedural optimization.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Compilers – Principles, Techniques, & Tools by Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Second edition, Pearson, 2007.
T2	Compiler Design by K. Muneeswaran, Oxford University Press, 2013.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Engineering a Compiler by Keith D. Cooper, & Linda Torczon, Second edition, Morgan Kaufman publications, 2011.
R2	Principles of Compiler Design by V. Raghavan, Second edition, TMH, 2011.
R3	Compiler Construction - Principles and Practice by Kenneth C. Louden, First edition, Cengage Learning publications, 1997.
R4	Implementations of Compiler - A new approach to Compilers including the Algebraic Methods by Yunlin Su, Song Y. Yan, Springer publications, 2011.
R5	Engineering a Compiler by Keith D. Cooper, & Linda Torczon, Second edition, Morgan Kaufman publications, 2011.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Study about compiler construction tools-Lex and YACC.	PO5, PSO2
2	Garbage collection, machine dependent optimization.	PO1,PO3, PSO3

WEB SOURCE REFERENCES:

1	http://www.diku.dk/hjemmesider/ansatte/torbenm/Basics/
2	http://nptel.ac.in/courses/106108052/1
3	https://www.geeksforgeeks.org/compiler-design-tutorials/
4	https://link.springer.com/article/10.1007/s10766-005-3590-6
5	http://www.diku.dk/hjemmesider/ansatte/torbenm/Basics/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑PPT	☐Active Learning
☑Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C313.1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	1
C313.2	3	2	-	-	-	-	-	-	-	-	-	-	1	-	1
C313.3	2	1	-	-	-	-	-	-	-	-	-	-	1	-	1
C313.4	2	1	-	-	-	-	-	-	-	-	-	-	1	-	1
C313.5	2	2	-	-	-	-	-	-	-	-	-	-	1	-	1
Average	2.2	1.6	-	-	-	-	-	-	-	-	-	-	1.00	-	1.00

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C314	2.2	1.6	-	-	-	-	-	-	-	-	-	-	1.00	-	1.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured < 60% and ≥50% marks of allocated marks for that CO	Student secured < 50% and ≥40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades O*&E* in External Exam	Student secured grades A*& B* in External Exam	Student secured grades C*& P* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: O : 91-100; E : 81-90; A : 71-80; B : 61-70; C : 51-60; P: 41-50; F: < 40					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

- **PSO1:** To design and develop algorithms for business and engineering applications.
- **PSO2:** To apply security mechanisms for online applications.
- **PSO3:** To apply standard practices and techniques in software project development using open-ended programming environments.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO 1. Summarize different phases and passes of a compiler.(K2)
CO 2. Apply various Top-Down and Bottom-Up Parsing techniques.(K3)
CO 3. Interpret different types of semantic rules and Intermediate Code representations.(K2)
CO 4. Illustrate the effective usage of register allocation and various Code-generation techniques. (K2)
CO 5. Summarize different code-optimization techniques. (K2)

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain the different phases of the compiler, showing the output of each phase using the example for the statement z = (a*20) + b – c	K2	CO1
2	Discuss in brief about the Role of Lexical analyser in a compiler and also Explain in brief about Lexical errors.	K2	CO1
3	Write a regular expression for identifiers and reserved words. Design the transition diagrams for them.	K2	CO1
	UNIT 2		
1	Verify whether the following grammar is LL(1) or not? E ->E + T | T T -> T* F / F F -> (F) |a|b.	K3	CO2
2	Construct the predictive parser for the following grammar S -> (L) | a L ->L,S | S	K3	CO2
3	What is left recursion and left factoring? Eliminate left recursion for the following grammar E -> E + E / num	K3	CO2
4	Show that the grammar S -> 0S1| SS |e is ambiguous.	K2	CO2
	UNIT 3		
1	Parse the input string **int id,id;** using shift-reduce parser for the grammar S -> TL; T -> int | float L -> L,id | id	K3	CO2
2	Construct the CLR parsing table for the following grammar: S→L=R | R L→*R | id R→L	K3	CO2

3	Write about SR conflicts and RR conflicts of shift reduce parsers.	K2	CO2
	UNIT 4		
1	Write the quadruple, triple, indirect triple for the expression -(a*b) + (c+d)-(a+b+c+d)	K2	CO3
2	Explain syntax tree and draw the DAG for the expression (a*b) + (c-d) * (a*b) + b.	K2	CO3
3	Write Syntax directed definition for constructing syntax tree of an expression derived from the grammar E -> E + T | E – T | T T -> (E) | id | num	K2	CO3
	UNIT 5		
1	How symbol table can be managed? Explain.	K2	CO4
2	Discuss storage allocation for block structured languages.	K2	CO4
3	Define Symbol table. Explain about the data structures for Symbol table.	K2	CO4
	UNIT 6		
1	Explain in detail about Loop Optimization.	K2	CO5
2	Discuss in detail the role of dead code elimination and strength reduction during code optimization of a compiler.	K2	CO5
3	Explain in detail about inter procedural optimization with an example	K2	CO5

Model Question Paper

Code: R16CS3103 **R16**

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
III B. Tech I Semester Regular Examinations
COMPILER DESIGN
COMPUTER SCIENCE AND ENGINEERING
[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any four Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 45 Minutes x 3 Questions	135
4	Quick revision & Winding up	10
Total		180

PART–A (12 Marks)
Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Write difference between compiler and Interpreter.	K1	1	2
	b	What is top down parsing? Explain with example.	K1	1	2
	c	List out advantages of top down parsing technique.	K1	2	2
	d	What is the use of Syntax Directed Translation?	K1	3	2
	e	Write about code generation phase.	K1	4	2
	f	Explain Loop unrolling with example	K2	5	2

PART–B (48 Marks)
Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	**Explain functions of different phases of compiler with a suitable example.**	K2	CO1	12
3	a	What do you mean by Ambiguous grammar? Explain with an example.	K2	CO2	6
	b	Explain Left recursion and left factoring techniques with examples.	K2	CO2	6

4	**a**	Construct SLR parsing table for the following grammar E -> E + T | E – T | T T -> (E) | id | num	**K3**	**CO2**	**12**
5	**a**	Show the evaluation scheme for the following grammar. S -> TL; T -> int | float L -> L,id | id	**K2**	**CO3**	**8**
	b	Explain Inherited and synthesized attributes with examples.	**K2**	**CO3**	**4**
6	**a**	Explain Peephole Optimization Techniques with examples.	**K2**	**CO4**	**6**
	b	Show the Procedure to construct Flow graph for quick sort algorithm.	**K2**	**CO4**	**6**
7	**a**	Explain Loop optimization techniques.	**K2**	**CO5**	**6**
	b	Show the use of Local and global optimization with an example.	**K2**	**CO5**	**6**

❖

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Computer Science and Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B. Tech. Computer Science and Engineering	
COURSE: **Data warehousing & Data Mining**	Semester : **VI** CREDITS: **4**
COURSE CODE: **R16CS3202 (C322)** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Data Mining**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16CS2204	**DBMS**	About Data bases	**II-II**
R16CS2201	**S P R**	About Statistics	**II-II**

COURSE OUTCOMES:

CO	Course Outcome Statement
CO1	Interpret the data mining terminology and types of data to be mined.[K2]
CO2	Outline the need and importance of preprocessing techniques. [K2]
CO3	Interpret data warehousing concepts and operations. [K2]
CO4	Compare and contrast different dominant Data Mining Algorithms. [K2]
CO5	Analyze the performance Association Rules. [K4]

SYLLABUS:

UNIT	DETAILS
I	**Introduction to data mining:** -What Is Data Mining, -Motivating Challenges, -The Origins of Data Mining, -Data Mining Tasks, -Types of Data: Attributes and Measurement, Types of Data Sets, -Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.
II	**Data:**- Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, -Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures. **Exploring data:** -The Iris Data set, -Summary Statistics: Frequencies and the Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Multivariate Summary Statistics, Other Ways to Summarize the Data.
III	**Data Warehouse and OLAP Technology for Data Mining:** -What is a Data Warehouse, -A Multidimensional Data Model: From tables to data cubes, Stars, snowflake, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation), Introducing concept

	hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, -Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, -Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and utilities, -Further development of data cube technology: Discovery-driven exploration of data cubes, Complex aggregation at multiple granularities (Multifeature cubes), -From data warehousing to data mining: Data warehouse usage, From online analytical processing to online analytical mining.
IV	**Classification: Basic Concepts, Decision Trees, and Model Evaluation:** -Preliminaries, - General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, -Model Overfitting: Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, -Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross-Validation, Bootstrap. **Classification: alternative techniques:** -Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.
V	**Association Analysis: Basic Concepts and Algorithms**: -Problem Definition, -Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, -Rule Generation: Confidence-Based Pruning, -Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, -FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm. **Association Analysis: Advanced Concepts:** -Handling Categorical Attributes, -Handling Continuous Attributes: Discretization-Based Methods, Statistics-Based Methods, Non-discretization Methods.
VI	**Cluster Analysis: Basic Concepts and Algorithms:** -Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, -K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, -Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, -DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipin kumar, Addision-Wesley.
T2	Data Mining, Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008.
R2	Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.
R3	Fundamentals of data warehouses, 2/e , Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
R4	Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Integration of data mining with a data base or data warehouse system	PO1, PSO1
2	Data mining applications and trends	PO1, PSO1

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc18_cs14
2	www.oracle.com/Data/Warehousing
3	www.databaseanswers.org/data_warehousing.htm
4	https://www.wileyindia.com/data-warehousing-data-mining.html

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☑Active Learning
☑Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☑ Quiz	☑Tutorials
☐Project based learning	☑NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO-PO Mapping

COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C322.1	2	2	2	1	-	-	-	-	-	-	-	-
C322.2	3	2	3	2	-	-	-	-	-	-	-	-
C322.3	2	2	2	2	-	-	-	-	-	-	-	-
C322.4	3	3	3	2	-	-	-	-	-	-	-	-
C322.5	3	3	3	2	-	-	-	-	-	-	-	-
C322	2.6	2.4	2.6	1.8	-	-	-	-	-	-	-	-

MAPPING COURSE WITH POs & PSOs

CO-PSO Mapping

COs	PSOs		
	PSO1	PSO2	PSO3
C322.1	-	-	-
C322.2	2	1	-

C322.3	1	1	-
C322.4	2	2	1
C322.5	2	2	1
C322	1.75	1.5	1

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322	2.6	2.4	2.6	1.8	-	-	-	-	-	-	-	-	1.75	1.5	1

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured < 60% and ≥50% marks of allocated marks for that CO	Student secured < 50% and ≥40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
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Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
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Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: To design and develop algorithms for business and engineering applications.
PSO2: To apply security mechanisms for online applications.
PSO3: To apply standard practices and techniques in software project development using open-ended programming environments.

COURSE OUTCOMES: Students are able to

CO 1: Interpret the data mining terminology and types of data to be mined.
CO 2: Outline the need and importance of preprocessing techniques.
CO 3: Interpret data warehousing concepts and operations.
CO 4: Compare and contrast different dominant Data Mining Algorithms.
CO 5: Analyze the performance Association Rules.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
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Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assignment questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	What is Data Mining? Explain in detail of KDD process?	**K2**	**CO1**
2	What is an attribute? Explain about types of attributes?	**K2**	**CO1**
3	Explain about data mining tasks?	**K2**	**CO1**
	UNIT 2		
1	What is preprocessing? Explain Briefly about Sampling, Feature Subset Selection.	**K3**	**CO2**
2	Explain about summary statistics.	**K3**	**CO2**
3	Explain about measurements of Similarity and Dissimilarity between Simple Attributes.	**K3**	**CO2**
4	Explain about measurements of Dissimilarities between Data Objects.	**K4**	**CO2**
	UNIT 3		
1	What is data warehouse? Explain data warehouse architecture with neat diagram.	**K2**	**CO3**
2	Explain about OLAP operations in the multidimensional data model with diagram.	**K3**	**CO3**
3	Describe Stars, snowflake, and fact constellations in multidimensional data model	**K2**	**CO3**
	UNIT 4		
1	Explain about Decision Tree Induction with algorithm.	**K2**	**CO3**
2	What is Classification? Explain about Bayes Theorem.	**K2**	**CO3**
3	Explain about Model Overfitting with example.	**K3**	**CO3**
	UNIT 5		
1	Explain about Apriori Algorithm with suitable example.	**K4**	**CO3**
2	Explain about FP-Growth algorithm with example.	**K4**	**CO3**
3	What is Discretization ? describe about Discretization-Based Method with example.	**K4**	**CO3**
	UNIT 6		

1	What is Cluster Analysis? Explain Different Types of Clustering techniques with example	**K4**	**CO4**
2	Explain about K-means Algorithm with example.	**K3**	**CO4**
3	Explain about Agglomerative Clustering and analyze clusters with example	**K4**	**CO4**
4	Explain DBSCAN algorithm and discover clusters with example	**K4**	**CO4**

Model Mid Question Paper – 1

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
III B.TECH II-SEMESTER I-MID EXAMINATIONS JAN-2020
Sub: DATA WAREHOUSING AND DATA MINING
Duration: 90 min. Max. Marks: 30

Answer **ALL** Questions

S. NO.	Question	Marks	CO	Cognitive Level
1	Classify the types of attributes and explain them with an example	10	CO1	K2
2	What is data pre-processing? Explain about any four data pre-processing techniques.	10	CO2	K2
3	What is multidimensional data model. Explain the schemas of multidimensional data model with example.	10	CO3	K2

Model Mid Question Paper - 2

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
III B.TECH II-SEMESTER II-MID EXAMINATIONS NOV-2020
Sub: DATA WAREHOUSING AND DATA MINING
Duration: 90 min. Max. Marks: 30

Answer **ALL** Questions

S. NO.	Question	Marks	CO	Cognitive Level

<table>
<tr><td>1</td><td>Define Apriori Principle. Discover frequent item sets for given items by using apriori principle
<table>
<tr><th>TID</th><th>ITEMS</th></tr>
<tr><td>T1</td><td>Chocolate, Milk</td></tr>
<tr><td>T2</td><td>Chocolate, Apple, Biscuit, Banana</td></tr>
<tr><td>T3</td><td>Milk, Apple, Biscuit, Cake</td></tr>
<tr><td>T4</td><td>Chocolate, Milk, Apple, Biscuit</td></tr>
<tr><td>T5</td><td>Chocolate, Milk, Apple, Cake</td></tr>
</table></td><td>10</td><td>CO5</td><td>K4</td></tr>
<tr><td>2</td><td>What is Classification? Explain general approach to solve classification problem with any example</td><td>10</td><td>CO4</td><td>K3</td></tr>
<tr><td>3</td><td>Explain K-means algorithm and apply K-means to generate two clusters (K=2) for the given data.
(2,3),(5,6),(8,7),(1,4),(2,2),(6,7),(3,4),(8,6)</td><td>10</td><td>CO4</td><td>K3</td></tr>
</table>

Model Question Paper - 1

Code: R16CS3202 **R16**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech VI Semester Regular Examinations

DATA WAREHOUSING AND DATA MINING

COMPUTER SCIENCE AND ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)

2. Answering the question in Part-A is compulsory

3. Answer any THREE Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 45 Minutes x 3 Questions	135
4	Quick revision & Winding up	10

Total	180

PART–A (12 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	List different data mining tasks.	K2	1	2
	b	Define mean, median and mode.	K2	2	2
	c	Define Concept Hierarchy.	K3	3	2
	d	Define model overfitting and model under fitting.	K2	3	2
	e	Give Apriori principle with an example.	K2	3	2
	f	List different types of clusters.	K4	4	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	Explain the types of attributes with an example.	K2	1	6
	b	What are the types of data? Explain each with an example.	K2	1	6
3	a	Briefly explain preprocessing techniques with an example.	K3	3	12
4	a	Describe the indexing OLAP data.	K2	3	6
	b	Write short notes on efficient computation of data cubes.	K3	3	6
5	a	List and explain the measures for selecting the best split.	K3	3	6
	b	Mention the characteristics of Bayesian Belief Networks. Explain	K3	3	6
6	a	Explain the FP-growth algorithm with an example	K3	4	12
7	a	List and describe the specific techniques used in the agglomerative hierarchical clustering with example.	K4	4	6
	b	Write short note on DBSCAN and explain with example.	K4	4	6

Model Question Paper - 2

Code: R16CS3202 **R16**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech VI Semester Regular Examinations

DATA WAREHOUSING AND DATA MINING
COMPUTER SCIENCE AND ENGINEERING
[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any THREE Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 45 Minutes x 3 Questions	135
4	Quick revision & Winding up	10
Total		180

PART–A (12 Marks)
Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Define Data Mining.	K2	1	2
	b	List different types of attributes with an example.	K2	2	2
	c	Differentiate operational database systems and data warehouses.	K3	3	2
	d	Write the Hunt's algorithm for decision tree construction.	K2	3	2
	e	Define Maximal Frequent Itemset and Closed Frequent Itemset.	K2	3	2
	f	List different types of clusterings.	K4	4	2

PART–B (48 Marks)
Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	Explain data mining tasks with one example for each.	K2	1	6
	b	What are the types of data? Explain each with an example.	K2	1	6
3	a	What are the similarities and dissimilarities between simple attributes? Explain.	K3	3	12

4	a	Draw and explain the three tier data warehouse architecture.	K2	3	6
	b	How efficient processing of OLAP queries is done? Give example.	K3	3	6
5	a	What are the characteristics of decision tree induction? Explain.	K3	3	6
	b	Write an algorithm for decision tree induction with an example.	K3	3	6
6	a	Explain the principles of Apriori algorithm.	K3	4	6
	b	With an example, explain the frequent item set generation in the Apriori algorithm.	K3	4	6
7	a	Make a comparison of complete and partial clusters.	K4	4	6
	b	Write K-Means clustering algorithm and explain with an example.	K4	4	6

❖

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Computer Science and Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B-Tech	
COURSE: **IOT**	Semester : VII CREDITS: 4
COURSE CODE: REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: SE	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	IOT	Basic Knowledge on internet of things	**VII**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Outline the concepts of Internet of Things. [K4]
CO2	Analyze the requirements, specifications to design IoT applications[K4]
CO3	Analyze domain specific applications using Arduino and Raspberry pi.[K4]
CO4	Interpret cloud storage models and communication APIs for IoT.[K5]

SYLLABUS:

UNIT	DETAILS
I	FUNDAMENTALS OF IoT INTRODUCTION: Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoT vs M2M.
II	IoT DESIGN METHODOLOGY: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.
III	PROTOTYPING EMBEDDED DEVICE WITH ARDUINO: Sensors, Actuators, Embedded Computing Basics-Micro Controllers, System on Chips, Choosing your Platform, Arduino – Developing on the Arduino.
IV	PROTOTYPING EMBEDDED DEVICE WITH RASPBERRY PI: Raspberry PI – Introduction, cases and Extension Boards, Developing on the Raspberry PI.
V	IOT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.
VI	DOMAIN SPECIFIC APPLICATIONS OF IoT: Home Automation, Agriculture Applications, Smart City applications.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
T2	Adrian McEwen & Hakim Cassimally, "Designing the Internet of Things", Wiley Publications – 2014
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

R2	Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and
R3	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
R4	Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		PO5, PSO2
2		PO1,PO3, PSO3

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=WUYAjxnwjU4
2	Madmaker.space
3	https://www.youtube.com/watch?v=OfGxbxUCa2k&t=256s

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1 K3	PO2 K2	PO3 K3,K6	PO4 K6,K3	PO5 K6,K1,K3	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C407.1 K1,K2	1	3	1	1	3	-	-	-	-	-	-	2	-	3	
C407.2 K1	1	1	1	1	3	-	-	-	-	-	-	2	-	3	
C407.3 K3	3	2	3	3	3	-	-	-	-	-	-	2	-	3	
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)

Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
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End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Design, model, simulate and analyze various mechanical systems or processes.
2. Obtain additional skills and knowledge to develop and implement thermal engineering systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

COURSE OUTCOMES: Students are able to

CO1	Outline the concepts of Internet of Things.
CO2	Analyze the requirements, specifications to design IoT applications.
CO3	Analyze domain specific applications using Arduino and Raspberry pi
CO4	Interpret cloud storage models and communication APIs for IoT.

Unit wise Sample assessment questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Define IOT? Explain advantages of IOT	K1	CO1
2	Explain IOT Technologies	K2	CO1
3	Explain M2M communication	K2	CO1
4	Explain about IOT physical design	K2	CO1
	UNIT 2		
1	Explain Purpose & Requirements Specification	K2	CO1

2	**Defines** Domain Model Specification	**K2**	**CO2**
3	List out the different model specifications in IOT	**K4**	**CO2**
4	Applies Device & Component Integration and Application Development.	**K3**	**CO3**
	UNIT 3		
1	Explain different types of Sensors, Actuators,	**K2**	**CO2**
2	Design application development on the Arduino	**K6**	**CO3**
	UNIT 4		
1	Explain in detaile about Raspberry –pi header	**K2**	**CO2**
2	Develop IOT applications interfacing with Raspberry-pi	**K3**	**CO3**
	UNIT 5		
1	Explain different Cloud Storage Models & Communication APIs	**K2**	**CO4**
2	Explain about Xively Cloud for IoT	**K2**	**CO4**
3	Explain about IBM Cloud for IoT	**K2**	**CO4**
	UNIT 6		
1	Design and develop Home Automation applications in IOT	**K6**	**CO3**
2.	Design and develop Agriculture Applications applications in IOT	**K6**	**CO3**
3	Design and develop Smart City applications. applications in IOT	**K6**	**CO3**

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16CS3104

IV B.Tech I Semester Examinations Model Question Paper.

INTERNET OF THINGS

(CSE)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

K1 – Remember, K2 – Understand, K3- Apply, K4 – Analyze, K5-Evaluate, K6- Create

PART A [K1 and/or K2 Level]

S. No.	Questions	CO. No.	Marks
1. a	Define is IOT?	(CO1 – K1)	2
b	Compare and contrast IOT vs M2M?	(CO1 – K2)	2
c	Define Purpose & Requirements Specification	(CO2 – K1)	2
d	Explain about types sensors	(CO2 – K2)	2
e	Explain about Raspberry PI GPIO Header	(CO1 – K2)	2
f	Explain about Xively Cloud for IOT	(CO3 – K2)	2

PART – B [K2 and above Levels]

S. No.	Questions	CO. No.	Marks
2. a	Explain characteristics and applications of IOT	(CO3 – K2)	6
2. b	Define different IOT levels and deployment Templates	(CO1 – K1)	6
3. a	Explain in detail about process specification and Domain specification	(CO2 – K2)	6

3. b	Explain device component integration and application development	(CO3 – K2)	6
4. a	Explain about different types of sensors and Actuators	(CO1 – K2)	6
4. b	Draw a neat sketch about Raspberry Pi GPIO header	(CO3 – K3)	6
5. a	Illustrate Cloud Storage models and communication API's	(CO4 – K6)	6
5. b	Explain in detail about IBM cloud	(CO4 – K2)	6
6.	Explain in detail about home automation	(CO3 – K2)	12
7.	Explain in detail about Smart city application in IOT	(CO3 – K2)	12

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Computer Science and Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B-Tech	
COURSE: **SQAT**	Semester: VIII CREDITS: **4**
COURSE CODE: **R16CS4203** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: SE	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	SE	Basic Knowledge on SOFTWARE ENGINEERING	**IV**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Outline different aspects of software quality assurance and standards. [K4]
CO2	Apply various software testing strategies. [K3]
CO3	Develop test plans, schedules and testing techniques for software project. [K4]
CO4	Apply features of software testing automation tools. [K3]
CO5	Summarize different steps in software testing process. [K2]
CO6	Identify the status of testing results and testing methodologies. [K2]

SYLLABUS:

UNIT	DETAILS
I	**Software Quality Assurance and Standards** The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance, SQA unit and other actors in SQA system. **Quality Standards:** ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma and other latest quality standards
II	**Software Testing Strategy and Environment:** Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy
III	**Building Software Testing Process:** Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist **Software Testing Techniques:** Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing
IV	**Software Testing Tools:** Selecting and Installing Software Testing Automation and Testing Tools. Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.
V	**Testing Process** **Seven Step Testing Process – I:** Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing.
VI	**Seven Step Testing Process – II:** Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis **Specialized Testing Responsibilities**: Software Development Methodologies, Testing Client/Server Systems

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Effective Methods for Software Testing, Third edition, William E. Perry, Wiley India, 2009
T2	Software Testing – Principles and Practices, Naresh Chauhan, Oxford University Press, 2010.
T3	Software Quality Assurance – From Theory to Implementation, Daniel Galin, Pearson Education, 2009.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Testing Computer Software, Cem Kaner, Jack Falk, Hung Quoc Nguyen, Wiley India, rp2012.
R2	Software Testing – Principles, Techniques and Tools, M.G.Limaye, Tata McGraw-Hill, 2009.
R3	Software Testing - A Craftsman's approach, Paul C. Jorgensen, Third edition, Auerbach Publications, 2010.
R4	Foundations of Software Testing, Aditya P. Mathur, Pearson Education, 2008
R5	Software Testing and Quality Assurance – Theory and Practice, Kshirasagar Naik, Priyadashi Tripathy, Wiley India, 2010.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		PO5, PSO2
2		PO1, PO3, PSO3

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=kpT95Jb3t3U
2	https://www.youtube.com/watch?v=T_CkZ1Ej0oY
3	https://www.youtube.com/watch?v=qNg7nzhfYhc
4	https://www.guru99.com/software-testing.html
5	https://freevideolectures.com/course/3655/software-testing

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1 K3	PO2 K2	PO3 K3,K6	PO4 K6,K3	PO5 K6,K1,K3	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C421.1 K4	2	2	2	2	-	-	-	-	-	-	-	2	-	2	-
C421.2 K3	3	3	2	2	-	-	-	-	-	-	-	2	1	2	-
C421.3 K4	2	2	2	2	-	-	-	-	-	-	-	2	-	2	-
C421.4 K3	2	2	1	2	-	-	-	-	-	-	-	2	-	-	2
C421.5 K2	2	2	2	1	-	-	-	-	-	-	-	2	1	-	2
C421.6 K2	3	3	2	2	-	-	-	-	-	-	-	2	-	2	-
Average	2.33	2.33	1.83	1.66	-	-	-	-	-	-	-	2.00	1	2.00	2

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C405	2.33	2.33	1.83	1.66	-	-	-	-	-	-	-	2.00	1.00	2.00	2.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
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Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
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Course Coordinator **Module Coordinator** **Head of the Department**

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1. Design, model, simulate and analyze various mechanical systems or processes.
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Cognitive Domain	LEVEL	Key words
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COURSE OUTCOMES: Students are able to

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CO1	Outline different aspects of software quality assurance and standards.
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CO5	Summarize different steps in software testing process.
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Department of Information Technology

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCES AND HUMANITIES
(MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech: Information Technology	
COURSE:**LINEAR ALGEBRA AND CALCULUS**	Semester : I CREDITS: **3**
COURSE CODE: **R20CC1102** REGULATION: **Autonomous**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **S&H**
COURSE AREA/DOMAIN: Applications of linear algebra for Engineering branches.	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Solve the system of linear equations. [K3]
CO2	Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors [K4]
CO3	Relate the results of mean value theorems in calculus to Engineering problems. [K4]
CO4	Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [K3]
CO5	Identify the area and volume by interlinking them to appropriate double and triple integrals. [K5]

SYLLABUS:

UNIT	DETAILS
I	**LINEAR SYSTEMS OF EQUATIONS: (10 hours)** Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition. **Application:** Finding the current in a electrical circuit, traffic flow problems.
II	**EIGENVALUES AND EIGENVECTORS (12 hours)** Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature. **Application:** Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.
III	**MEAN VALUE THEOREMS (6 hours)** Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.
IV	**PARTIAL DIFFERENTION: (8 hours)** Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of

	functions of two variables, Lagrange's method of undetermined multipliers.
V	**MULTIPLE INTEGRALS:** **(12 hours)** Double and triple integrals, Change of Variables, Change of order of Integration. Volume integration.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Dr. B.S. Grewal , "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
T2	B.V. Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education,2018.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
R2	Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
R3	Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
R4.	Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011
R5.	Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Applications of Mathematics	PO1, PO2, PO3,PO4, PO5 & PSO1
2	Basics of Calculus	PO1, PO2, PO3,PO4, PO5 & PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/122107036/32
2	https://nptel.ac.in/courses/122107036/27
3	https://nptel.ac.in/courses/122101003/downloads/Lecture-4.pdf
4	https://nptel.ac.in/courses/122101003/downloads/Lecture-6.pdf
5	https://nptel.ac.in/courses/122104017/28

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ Chalk & Talk	✓ ☐ PPT	☐Active Learning
✓ Web Resources	✓ ☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	✓ ☐Tutorials
☐Project based learning	✓ ☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C102.1	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.2	3	3	3	2	1	-	-	-	-	-	-	-	2	-	-
C102.3	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.4	3	2	2	1	1	-	-	-	-	-	-	-	3	-	-
C102.5	3	3	2	1	1	--		-	-	-	-	-	3	-	-
Average	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C215	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: A^{+}>= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator

Module Coordinator

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.To design and develop algorithms for business and engineering applications.

PSO2.To apply security mechanisms for online applications.

PSO3.To apply standard practices and techniques in software project development using open-ended programming environments.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	KEY WORDS
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selects, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs,

		relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Upon successful completion of the course, the students should be able to

1. Solve the system of linear equations.
2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.
3. Relate the results of mean value theorems in calculus to Engineering problems.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Find** the Rank of the following matrices by using Echelon form $\begin{pmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{pmatrix}$	K1	CO1
2	**Interview** for what values of λ and μ, 2x+3y+5z=9,7x+3y-2z=8,2x+3y+λ z=μ have (i)no solution (ii)a unique solution (iii)an infinite number of solutions.	K3	CO1
3	**Solve** the following system of linear equations by using Gaussian Elimination Method x+y=z=6,3x+3y+4z=20,2x+y+3z=13 .	K3	CO1
4	**Solve** the following system of linear equations by using LU Decomposition Method *2x+3y+z=9, x+2y+3z=6, 3x+y=2z=8.*	K4	CO1
	UNIT 2		
1	**Find** the Eigen values and corresponding Eigen vectors of the following matrices $\begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$	K2	CO2
2	Diagonalise the following matrices A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$ and also **find** A^4 and A^{-1}.	K2	CO2
3	**Using** Cayley-Hamilton theorem find the inverse and A^4 of the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$.	K3	CO2
4	Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form by orthogonal reduction and **evaluate** the rank	K5	CO2

	UNIT 3		
1	**Inspect** Rolle's theorem for $(x-a)'''(x-b)''$ where m, n are positive integers in [a, b].	**K5**	**CO3**
2	In the mean value theorem $f(b)-f(a)=(b-a)f'(c)$, **determine** c lying between a and b, if $f(x)=x(x-1)(x-2)$, a = 0 and $b=\frac{1}{2}$.	**K5**	**CO3**
3	**Conclude** that $\log(1+x)=\frac{x}{1+\theta x}$, where 0 < θ < 1 and hence deduce that $\frac{x}{1+x}<\log(1+x)<x, x>a$.	**K4**	**CO3**
4	**Discuss** the applicability of Cauchy's Mean value Theorem for $f(x)=\frac{1}{x^2}, g(x)=\frac{1}{x}$ in [a, b].	**K6**	**CO3**
5	A rectangular sheet of metal of length 6 meters and width 2 meters is given. Four equal squares are removed from the corners. The sides of this sheet are now turned up to form an open rectangular box. Find approximately, the height of the box, such that the volume of the box is maximum.	**K5**	**CO3**
	UNIT 4		
1	If $z(x+y)=x^2+y^2$ **show** that $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2=4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)$	**K3**	**CO4**
2	If u = f(r) and x = r Cosθ and y = r Sinθ, **conclude** that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=f''(r)+\frac{1}{r}f'(r)$.	**K5**	**CO4**
3	In spherical coordinates, $x=r\sin\theta\cos\phi, y=r\sin\theta\sin\phi, z=r\cos\theta$ **show** that $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}=r^2\sin\theta$.	**K3**	**CO4**
4	**Discuss** the maxima and minima of $f(x,y)=x^3y^2(1-x-y)$	**K6**	**CO4**
	UNIT 5		
1	**Find** the perimeter of the loop of the curve $3ay^2=x(x-a)^2$.	**K2**	**CO5**
2	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	**K5**	**CO5**
3	**Evaluate** $\int_0^1\int_0^{1-x}\int_0^{1-x-y} dxdydz$.	**K5**	**CO5**
4	**Evaluate** $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates.	**K5**	**CO5**

Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I B.Tech I Semester Regular Examinations, Month/Year

Sub Code: R20CC1102 **LINEAR ALGEBRA & CALCULUS**

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X14=70M)

Q.No		Questions	KNOWLEDGE	CO	Marks
		Unit - I			MARKS
1	a	i) **Identify** two non-singular matrices P and Q such that PAQ is in the normal form. Where the matrix is $\begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 1 \end{pmatrix}$.	K3	CO1	[7M]
		ii) **Explain** for what values λ and μ the system of equations $2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+\lambda z=\mu$ will have (i) no solution (ii)a unique solution (iii)an infinite number of solutions.	K2	CO1	[7M]
		OR			
	b	**Apply** LU decomposition method to solve the following system of linear equations. $2x+3y+z=9$, $x+2y+3z=6$, $3x+y=2z=8$.	K3	CO1	[14M]
2		**Unit - II**			
	a	**Find** A^4 and A^{-1} by diagonal zing the matrix A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$.	K2	CO2	[14M]
		OR			
	b	**Examine** the Cayley-Hamilton theorem for the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$. Find A^{-1} and A^4.	K4	CO2	[14M]
3		**Unit - III**			

	a	i) **Test** Rolle's theorem for $\frac{\sin x}{e^x}$ in $(0.\pi)$	K4	CO3	[7M]
		ii) **Show** that (if 0 < a < b < 1), $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$. Make use of the above result show that $\frac{\pi}{4}+\frac{3}{25} < \tan^{-1}\left(\frac{4}{3}\right) < \frac{\pi}{4}+\frac{1}{6}$.	K2	CO3	[7M]
		OR			
	b	i) **Verify** Cauchy's Mean value Theorem for the functions e^x and e^{-x} in (a, b).	K4	CO3	[7M]
		ii) **Find** the maximum and minimum values of $3x^4 - 2x^3 - 6x^2 + 6x + 1$ in the interval (0, 2).	K2	CO3	[7M]
4		**Unit - IV**			
	a	i) If $u = f(2x-3y, 3y-4z, 4z-2x)$, **Show** that $\frac{1}{2}\frac{\partial u}{\partial x}+\frac{1}{3}\frac{\partial u}{\partial y}+\frac{1}{4}\frac{\partial u}{\partial z}=0$	K3	CO4	[7M]
		ii) If $u = \frac{x+y}{1-xy} and v = \tan^{-1} x + \tan^{-1} y$, find $\frac{\partial(u,v)}{\partial(x,y)}$. Are u and v functionally related? If so, **find** this relationship.	K2	CO4	[7M]
		OR			
	b	i) **list** $x^2y+3y-2$ in powers of (x-1) and (y+2) using Taylor's theorem.	K4	CO4	[7M]
		ii) A rectangular box open at the top is to have volume of 32 cubic ft. **Determine** the dimensions of the box requiring least material for its construction.	K5	CO4	[7M]
5		**Unit - V**			
	a	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	K5	CO5	[14M]
		OR			
	b	change the order if integration and **evaluate** $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.	K5	CO5	[14M]

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Basic Science & Humanities**

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech (common to All Branches)	
COURSE: **ENGINEERING CHEMISTRY**	Semester : **I/II** CREDITS: **3**
COURSE CODE: **R20CC1103/ R20CC1204** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ BS&H): **BS&H**
COURSE AREA/DOMAIN: **CHEMISTRY**	PERIODS: **6 Per Week.**

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

S.NO	Course Outcome Statement
CO1	Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**
CO2	Compare different types of polymers and fuels and their importance. **Analyzing [K4]**
CO3	Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**
CO4	Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**
CO5	Identify different types of engineering materials and applications in engineering. **Applying [K3]**

SYLLABUS:

UNIT	DETAILS
I	**WATER CHEMISTRY :Characteristics of water:** Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis). **Water analysis techniques:** Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.
II	**POLYMERS AND FUEL CHEMISTRY: Polymers:** Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples– Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization. **Fuels:** Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.
III	**CHEMISTRY OF ADVANCED MATERIALS: Nano materials**: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications. **Liquid crystals:** Introduction–Types–Applications. **Composite materials:** Introduction–Definition–Types–Applications–Cermets.

IV	**ELECTROCHEMICAL CELLS AND CORROSION:** Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)- Applications of secondary batteries in E-vehicles. **Corrosion:** Causes and effects of corrosion–Theories of corrosion (dry, chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions- Pigment Volume Concentration.
V	**CHEMISTRY OF ENGINEERING MATERIALS: Lubricants:** Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils. **Cement & Refractories:** Manufacture–Setting and hardening of cement–Failures of cement– Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Shikha Agarwal, "Engineering Chemistry", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
T2	O.G. Palana, "Engineering Chemistry", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
T3	B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, "Text Book of Engineering Chemistry", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	P.C. Jain and M. Jain "Engineering Chemistry", ISBN 8187433175, 15/e, Dhanpat Rai & Sons, Delhi, (2015).
R2	B.S Murthy and P. Shankar, "A Text Book of NanoScience and NanoTechnology", University Press (2013).
R3	K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn services, (2016).
R4	S.S. Dara, "A Textbook of Engineering Chemistry", ISBN 8121932645, S.Chand Publisher, (2010).

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO	UNIT	DESCRIPTION
1	Unit-I	Electro dialysis, Reverse Osmosis.
2	Unit-II	Bio degradable polymers, Moulding Techniques Knocking and Anti Knocking Agents.
3	Unit-III	Nanomaterials, Liquid crystals, Fullerenes, Composites,FRP
4	Unit-IV	Applications of secondary batteries in E-vehicles, Corrosion Controlling methods.
5	Unit-V	Application of slag cement in Fal-G Bricks, Significance of lubricants.

WEB SOURCE REFERENCES:

1	**Unit- I**	https://www.youtube.com/watch?v=cAWu0eDiSuk https://www.youtube.com/watch?v=BmpknJNDXfE https://www.youtube.com/watch?v=wNCcpx9leG4 https://www.youtube.com/watch?v=GIKISUijQCM https://www.youtube.com/watch?v=h4fCkhb4Y5I https://www.youtube.com/watch?v=zelRO_lmDdc https://www.youtube.com/watch?v=V16USbjKZXw https://www.youtube.com/watch?v=ajYJvUray9w
2	**Unit- II**	https://www.youtube.com/watch?v=5iTz9yN4v4k https://www.youtube.com/watch?v=TPtc_bAhGeg https://www.youtube.com/watch?v=-d14DmSBuAQ https://www.youtube.com/watch?v=QglJLrwDPxE

		https://www.youtube.com/watch?v=pOGpXZ-UMfo https://www.youtube.com/watch?v=J2-tDV8KYEA&t=56s https://www.youtube.com/watch?v=hOAt9UOkOq4 https://www.youtube.com/watch?v=lseA9FBUNF0 https://www.youtube.com/watch?v=Jq1WHCu-i9A https://www.youtube.com/watch?v=4ZysyokEU60 https://www.youtube.com/watch?v=Q5v_YhW_IG0
3	**Unit- III**	https://www.youtube.com/watch?v=14DqBIG96W0 https://www.youtube.com/watch?v=7WGZq1EY6no https://www.youtube.com/watch?v=9u3-3v-i1P4 https://www.youtube.com/watch?v=9XKGVHPXXho https://www.youtube.com/watch?v=MuWDwVHVLio https://www.youtube.com/watch?v=b0fbM0a86qc
4	**Unit- IV**	https://www.youtube.com/watch?v=lSq_WVC6Hiw https://www.youtube.com/watch?v=pU5Q4sopoII https://www.youtube.com/watch?v=imV_ufIzxPY https://www.youtube.com/watch?v=RAlC75xG4qU https://www.youtube.com/watch?v=QYd9ENn1nP0 https://www.youtube.com/watch?v=-K8Xb2tUWbY https://www.youtube.com/watch?v=lfT9L3ADkZw https://www.youtube.com/watch?v=MhbjQFhZ1bE
5	**Unit- V**	https://www.youtube.com/watch?v=-l7dM-a239A https://www.youtube.com/watch?v=WeH3CUvdt_s https://www.youtube.com/watch?v=et0NWu1Hurk https://www.youtube.com/watch?v=hk7NvgmvwnM https://www.youtube.com/watch?v=dyxL_BvkhJg https://www.youtube.com/watch?v=V-HIriZvTvQ https://www.youtube.com/watch?v=xb_xndPe4n0

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☑ Quiz	☑Tutorials
☐Project based learning	☑NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C112.1	-	1	3	3	-	-	-	-	1	-	-	-	1	-	2
C112.2	2	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.3	3	3	3	3	3	-	-	-	1	3	-	-	1	-	1
C112.4	3	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Average	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2103	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: O: >= 90%; E: 80%-89%; A: 70%-79%; B: 60%-69%; C: 50%-59%; D: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1: Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**

CO2: Compare different types of polymers and fuels and their importance. **Analyzing [K4]**

CO3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**

CO4: Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**

CO5: Identify different types of engineering materials and applications in engineering. **Applying [K3]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain EDTA method for the determination of total hardness present in water	K2	CO1
2	How would you estimate the amount of dissolved oxygen present in water?	K1	CO1
3	Demonstrate the zeolite process used for softening of water	K2	CO1
	UNIT 2		
1	Explain the characteristics of addition polymerization. Explain it with free radical chain Polymerization.	K2	CO2
2	Illustrate proximate analysis of coal with significance and explain determination of C and H in coal sample by ultimate analysis.	K2	CO2
3	Define cracking. Write its types. Explain catalytic cracking in terms of moving bed catalytic cracking.	K1	CO2
	UNIT 3		
1	How is CNTs prepared by Laser ablation method?	K1	CO3
2	How to characterise Nano materials by BET and TEM methods.	K1	CO3
3	Discuss the types and applications of liquid crystals	K6	CO3
	UNIT 4		
1	What are reference electrodes? Explain the working, advantages of Hydrogen and calomel electrodes.	K1	CO4
2	Demonstrate secondary batteries with Lead-Acid battery and write its applications, advantages and disadvantages.	K2	CO4
3	What are fuel cells? Explain working, uses, advantages and limitations of H 2 -O 2 fuel cell with neat sketch.	K1	CO4
	UNIT 5		
1	Explain the manufacturing of Portland cement with neat diagram.	K2	CO5
2	What are refectories? Explain porosity and chemical inertness of refractories.	K1	CO5
3	Explain theories for the mechanism of lubricants.	K2	CO5

Code: R20CC1103/R20CC1204 **Model Question Paper-I** R20

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33 Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.
All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**Explain** (i) zeolite process with a neat diagram (ii) Estimation of hardness by EDTA method.	K2	1	7
		OR			
	b	**Explain** the different methods used for the desalination of brackish water.	K2	1	7
2	a	**What** is meant by moulding of plastics? Mention the moulding techniques of Compression and injection moulding with neat diagram.	K1	2	7
		OR			
	b	**What** is cracking? How gasoline is obtained from moving and fixed catalytic cracking?	K1	2	7
3	a	**How** to characterize Nano materials by BET and TEM methods.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** how nature of metal and nature of environment influences the rate of corrosion?	K5	4	7
		OR			
	b	i) **Explain** working of Lead –acid storage battery. With reactions ii) **Illustrate** the mechanism of Electrochemical corrosion.	K2	4	7
5	a	**(i)List** the Classification and properties of refractories **(ii)Discuss** the Setting and hardening of cement.	K4	5	7
		OR			
	b	**(i).Distinguish** between extreme pressure lubrication & boundary lubrication (ii)**List** out acidic and neutral refractories and its uses.	K4	5	7

Code: R20CC1103/R20CC1204 Model Question Paper-II R20

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks:70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.

All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**What** are zeolites? How is water purified by zeolite process?	K1	1	7
		OR			
	b	**Explain** the determination BOD & COD and its significance.	K2	1	7
2	a	**(i)Explain** free radical mechanism of addition polymerization. **(ii)What** are the drawbacks of raw rubber? How to overcome the drawbacks of natural rubber by vulcanization process?	K2	1	7
		OR			
	b	**(i)Define** calorific value, HCV and LCV. Calculate the gross and net calorific value of coal having the following compositions C = 83%; H = 10%; S = 1%, N = 3%, Ash = 3%. Latent heat of steam = 587 cal/g. **(ii)Explain** moving bed catalytic cracking method with a neat labeled diagram.	K1	2	7
3	a	**What** are Nano materials? Explain the preparation of nanomaterials by Sol-Gel and Chemical reduction method.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** with neat diagrams the working of (i) Hydrogen Electrode(ii) Calomel Electrode (iii) Lechlanche cell	K2	4	7
		OR			
	b	i) **Discuss** the mechanism of dry corrosion. Explain the role of oxide film in dry corrosion. ii) **Illustrate** galvanizing and tinning.	K5	4	7
5	a	**Explain** the following properties and discuss their significance. (i) Viscosity and Viscosity index (ii) Flash & fire point (iii) Aniline point (iv) Neutralization number.	K2	5	7
		OR			
	b	**Explain** the significance of the following properties in the evaluation of refractory material. (i)Refractoriness (ii) Strength or RUL test	K2	5	7

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Information Technology**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Information Technology	
COURSE: **OOPS Through JAVA**	Year/Sem : **II /I** CREDITS: **3**
COURSE CODE: **19BCI3TH03** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **Core**
COURSE AREA/DOMAIN:IT	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Interpret the syntax and semantics of java programming language and OOPs concepts. [K2]
CO2	Make use of different predefined classes and packages to develop programmes using OOPs concepts. [K3]
CO3	Apply exception handling and multithreading on java programs. [K3]
CO4	Develop Java Programmes using collection frame work & I/O. [K3]
CO5	Make use of Applets, AWT and event-handling to develop GUI. [K3]

SYLLABUS:

UNIT	DETAILS
I	Oriented Languages (Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP. The History and Evolution of Java, Java Buzzwords, java program structure. **Data Types, Variables, and Arrays:** The primitive types, variables, type conversion and casting, Automatic Type Promotion in Expressions, Arrays, Operators, Control statements. **Introducing Classes :** Class fundamentals, Declaring the objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this keyword, Garbage Collection, the finalize() Method.
II	**A Closer Look at Methods and Classes:** Overloading Methods, Using objects as Parameters, Returning Objects, Understanding static , Nested and Inner Classes. **Inheritance:** Inheritance Basics and types of inheritance, Using super, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, The Object class. **Packages and Interfaces:** Packages, Access Protection, Importing Packages, Interfaces, Default Interface Methods, Use static Methods in an Interface.
III	**String Handling**: String class, StringBuffer class, StringBuilder Class, **Exception Handling**: Fundamentals, Exception types, Uncaught Exceptions, Using try

	and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally. Java's Built-in Exceptions, Creating Your Own Exception Subclasses. **Multithreaded Programming** : The Java Threaded Model, The Main Thread , Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming, Stopping Threads.
IV	**Collections Framework in Java-** Introduction to Java collections, Overview of Java collection frame work, Commonly used Collection classes- ArrayList,LinkedList, HashSet, Hash table, HashMap, TreeSet,TreeMap , StringTokenizer. **Input/Output:** reading and writing data - Byte Stream, Console, Character Stream, Buffered Byte Stream, Buffered Character Stream; java.io package.
V	**The Applet Class:** Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, The HTML APPLET Tag, Passing Parameters to Applets. **Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events, Event Listener Interfaces, Using The Delegation Event Model, Adapter Classes , Inner Classes. **Introducing the AWT:** java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Herbert Schildt, "The Complete Reference Java", 8/e, , TMH, 2011 (UNITS : I, IV, V)
T2	Sachin Malhotra, Saurabh Choudhary, "Programming in JAVA", 2/e, , Oxford, 2014, (UNITS: I, II & III)
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	JAVA Programming, K. Rajkumar,1/e, Pearson,2013.
R2	Core JAVA, Black Book, Nageswara Rao, Wiley, 1/e, Dream Tech, 2012.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Swing Components	CO5
2	Sort(), ArrayAdapter(), Array()	CO4

WEB SOURCE REFERENCES:

1	https://www.geeksforgeeks.org
2	https://www.w3schools.com
3	https://beginnersbook.com
4	https://www.javatpoint.com

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☑Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☑Flipped Learning	☐Industrial Visit	☑Collaborative Learning
☐Brain storming	☐Role Play	☑Virtual Labs

MAPPING CO'S WITH PO'S

COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C212.1	-	-	2	3	2	-	-	-	-	-	-	-
C212.2	-	-	2	2	2	-	-	-	-	-	-	-
C212.3	-	-	1	2	2	-	-	-	-	-	-	-
C212.4	-	1	1	3	3	-	-	-	-	-	-	-
C212.5	-	-	-	2	-	-	-	-	-	-	-	-
C212	-	1	1.5	2.4	2.25	-	-	-	-	-	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C212	-	0.933	1.4	2.24	2.1	-	-	-	-	-	-	-	1.866	1.866	2.05

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (20%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO

Assignments (10%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (60%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering

and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Ability to apply learned mathematical and scientific skills in numerous areas of computer science to design and develop software based systems.

2. Ability to employ standard practices and modern programming languages to provide innovative solutions to the existing problems in all engineering and entrepreneurship applications.

3. Ability to design and develop novel applications that meets the needs of environmental and social issues.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Choose , Define ,Find,How , Label, List , Match ,Name ,Omit ,Recall ,Relate , Select , Show, Spell , Tell , What , When , Where ,Which , Who ,Why.
Understand	K2	Classify , Compare , Contrast , Demonstrate , Explain , Extend , Illustrate , Infer , Interpret , Outline , Relate , Rephrase , Show , Summarize , Translate.
Apply	K3	Apply , Build ,Choose , Construct , Develop , Experiment with , Identify ,Interview , Make use of , Model ,Organize , Plan , Select , Solve ,Utilize.
Analyse	K4	Analyze ,Assume , Categorize , Classify , Compare , Conclusion, Contrast , Discover , Dissect , Distinguish ,Divide, Examine ,Function • Inference , Inspect , List , Motive ,Relationships ,Simplify ,Survey , Take part in , Test for , Theme.
Evaluate	K5	Agree , Appraise , Assess , Award , Choose , Compare, Conclude ,Criteria ,Criticize , Decide , Deduct , Defend ,Determine, Disprove, Estimate , Evaluate , Explain , Importance , Influence, Interpret ,Judge , Justify , Mark ,Measure , Opinion , Perceive ,Prioritize ,Prove , Rate , Recommend , Rule on ,Select , Support , Value.
Create	K6	Adapt , Build , Change, Choose , Combine, Compile ,Compose , Construct ,Create , Delete , Design , Develop, Discuss ,Elaborate ,Estimate , Formulate , Happen , Imagine , Improve ,Invent , Make up , Maximize , Minimize ,Modify , Original ,Originate , Plan , Predict ,Propose , Solution , Solve ,Suppose,Test, Theory

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2]

CO2: Make use of different predefined classes and packages to develop programmes using OOPs concepts. [K3]

CO3: Apply exception handling and multithreading on java programs. [K3]

CO4: Develop Java Programmes using collection frame work & I/O. [K3]

CO5: Make use of Applets, AWT and event-handling to develop GUI. [K3]

Unit wise Sample Assessment Questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT 1		
1	What is Object Oriented Programming? How it is different from Procedural concepts?	**K2**	**CO1**
2	Explain briefly object oriented concepts or features.	**K2**	**CO1**
3	Discuss the lexical issues of Java.	**K2**	**CO1**
4	List the applications of object oriented program	**K2**	**CO1**
5	What is the role and responsibility of JVM in program execution?	**K2**	**CO1**
6	Differentiate between abstraction and information hiding.	**K2**	**CO1**
7	List and explain Java buzzwords. Which factors are making Java famous language?	**K2**	**CO1**
8	Give the program structure of Java.	**K2**	**CO1**
	UNIT 2		
1	Discuss about primitive data types and type conversion with example program.	**K3**	**CO2**
2	Explain bit wise operators with example program? Discuss precedence rules and associativity concept.	**K3**	**CO2**
3	Discuss various control structures available in Java with example program.	**K3**	**CO2**
4	What is a constructor? What is its requirement in programming? Explain with program.	**K3**	**CO2**
5	Discuss about classes and objects? Differentiate class with objects.	**K3**	**CO2**
6	Explain about the static keyword with example program.	**K3**	**CO2**

7	Illustrate the usage of 'this' keyword.(write programs also).	K3	CO2
8	Write a Java program to sort a given set of strings in the alphabetical order where the strings are supplied through the command line.	K3	CO2
9	Explain arrays concept with example programs(1D,2D arrays).	K3	CO2
	UNIT 3		
1	What is inheritance? What are the benefits of inheritance? Explain types of inheritance with example programs.	K2	CO3
2	Differentiate method overloading and method overriding with example program.	K2	CO3
3	Explain super keyword usage with example program.	K2	CO3
4	What is an abstract class and abstract method.? Can we create an instance for an abstract class explain.	K2	CO3
5	Illustrate final keyword with example program.	K2	CO3
6	What is an interface? Explain its relationships with classes with example program.	K2	CO3
7	Differentiate class, abstract class and interface.	K2	CO3
8	What is a package ? How to create and use a package.	K2	CO3
9	What is an exception? How to handle an exception explain with program.	K2	CO3
10	Discuss about Syncronization,and give examples for synchronized block and synchronized method.	K2	CO3
11	Explain the usage of suspending and Resuming threads.	K2	CO3
	UNIT 4		
1	List down the primary interfaces provided by Java Collections Framework?	K2	CO4
2	What do you understand by Iterator in the Java Collection Framework?	K2	CO4
3	What is the use of the List interface?	K2	CO4
4	How would you convert an ArrayList to Array and an Array to ArrayList?	K2	CO4
5	What is the HashSet class in Java and how does it store elements?	K2	CO4
6	List down the different Collection views provided by the Map interface in the Java Collection framework?	K2	CO4
7	Briefly explain reading and writing data using java.io package.		
	UNIT 5		
1	What is an applet. Explain the structure of Applet.	K3	CO5

2	Briefly explain Applet Life Cycle.	K3	CO5
3	Explain the usage of paint(),update() and repaint() methods.	K3	CO5
4	Briefly explain Event Delegation Model.	K3	CO5
5	What are different Sources of Events. Explain the purpose of Event Listeners with example.	K3	CO5
6	Briefly explain Adapter classes and Inner classes	K3	CO5

II B.Tech I Semester Model Paper-1
OOPs through JAVA

Sub Code: 19BCI3TH03 **Time: 3 hrs**
Note: Answer All Five Questions. **Max.Marks:60**
All Questions Carry Equal Marks (5X12=60M)
(Common to CSE, IT)

---

1. A. Summarize all the object oriented principles and also explain the structure of Java Program with an example program. (6M)
   B. Classify variables in java and write an example program for each and every type of variable. (6M)
   (OR)
   A. Define class and object. Explain them with the help of a program.(6M)
   B. Write about use of this keyword with example program. (6M)

2. A. Explain the concept of method overloading with example program. (6M)
   B. Explain the concept of constructor overloading with example program. (6M)
   (OR)
   A. Explain what Dynamic Method Dispatch is with example program. (6M)
   B. Explain the use of static keyword with example program. (6M)

3. A. Distinguish between checked and unchecked exceptions. Explain how to make use of throws and throw keywords with example program. (6M)
   B.Explain the concept of inter-thread communication with an example program. (6M)
   (OR)
   A. Write a java program by making use of try, catch and finally keywords and explain.(6M)
   B. Explain the use of isAlive() and join() with example program.(6M)

4. A. Illustrate TreeSet and TreeMap with example programs. (6M)
   B. Explain FileReader and FileWriter classes with example programs. (6M)
   (OR)
   A. Illustrate HashSet and HashMap with example programs. (6M)
   B. Write about Byte Streams. (6M)

5. A. Explain the concept of passing parameters to applets with example program. (6M)
   B. Explain different Layout managers. (6M)
   (OR)
   A. Explain Applet life cycle methods. (6M)
   B. Write a JAVA program that displays the x and y position of the cursor movement using Mouse. (6M)

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Information Technology**

COURSE INFORMATION SHEET

PROGRAMME: B-Tech	
COURSE: **IOT**	Semester : IV CREDITS: **4**
COURSE CODE: **19BIT4TH06** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: SE	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	IOT	Basic Knowledge on internet of things	**VII**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Outline the concepts of Internet of Things. [K4]
CO2	Analyze the requirements, specifications to design IoT applications[K4]
CO3	Analyze domain specific applications using Arduino and Raspberry pi.[K4]
CO4	Interpret cloud storage models and communication APIs for IoT.[K5]

SYLLABUS:

UNIT	DETAILS
I	FUNDAMENTALS OF IoT INTRODUCTION: Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoT vs M2M.
II	IoT DESIGN METHODOLOGY: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.
III	IOT Physical Devices & Endpoints: Basic Building Blocks of IOT Devices, Sensors, Actuators, Exemplary Device: Raspberry Pi, Raspberry Pi Interfaces, Other IOT Devices: Arduino, PcDuino, BeagleBone, Cubieboard
IV	**IOT Physical Servers & Cloud Offerings:** Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.
V	DOMAIN SPECIFIC APPLICATIONS OF IoT: Home Automation, Agriculture Applications, Smart City applications.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
T2	Adrian McEwen & Hakim Cassimally, "Designing the Internet of Things", Wiley Publications – 2014
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**

R1	Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
R2	Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and
R3	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
R4	Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		PO5, PSO2
2		PO1,PO3, PSO3

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=G4-CtKkrOmc
2	http://www.cse.wustl.edu/~jain/cse570-13/m_18iot.htm
3	https://www.youtube.com/watch?v=9ZUFYyXhQm8
4	https://www.udemy.com/introduction-to-iot-using-raspberry-pi-2/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1 K3	PO2 K2	PO3 K3,K6	PO4 K6,K3	PO5 K6,K1,K3	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C406.1 K1,K2	1	3	1	1	3	-	-	-	-	-	-	2	-	3	
C406.2 K1	1	1	1	1	3	-	-	-	-	-	-	2	-	3	
C406.3 K3	3	2	3	3	3	-	-	-	-	-	-	2	-	3	
C406.3 K3	3	2	3	3	3	-	-	-	-	-	-	2	-	3	
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary

environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Design, model, simulate and analyze various mechanical systems or processes.
2. Obtain additional skills and knowledge to develop and implement thermal engineering systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

COURSE OUTCOMES: Students are able to

CO1	Outline the concepts of Internet of Things.
CO2	Analyze the requirements, specifications to design IoT applications.
CO3	Analyze domain specific applications using Arduino and Raspberry pi
CO4	Interpret cloud storage models and communication APIs for IoT.

Unit wise Sample assessment questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Define IOT? Explain advantages of IOT	K1	CO1
2	Explain IOT Technologies	K2	CO1
3	Explain M2M communication	K2	CO1
4	Explain about IOT physical design	K2	CO1

UNIT 2			
1	Explain Purpose & Requirements Specification	**K2**	**CO1**
2	**Defines** Domain Model Specification	**K2**	**CO2**
3	List out the different model specifications in IOT	**K4**	**CO2**
4	Applies Device & Component Integration and Application Development.	**K3**	**CO3**
UNIT 3			
1	Explain different types of Sensors, Actuators,	**K2**	**CO2**
2	Design application development on the Arduino	**K6**	**CO3**
UNIT 4			
1	Explain in detaile about Raspberry –pi header	**K2**	**CO2**
2	Develop IOT applications interfacing with Raspberry-pi	**K3**	**CO3**
UNIT 5			
1	Design and develop Home Automation applications in IOT	**K6**	**CO3**
2	Design and develop Agriculture Applications applications in IOT	**K6**	**CO3**
3	Design and develop Smart City applications. applications in IOT	**K6**	**CO3**

Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: 19BIT4TH06

II B.Tech II Semester Examinations Model Question Paper.

INTERNET OF THINGS

(IT)

Time: 3 hours **Max Marks: 60**

Question Paper Consists of **Part-A** and **Part-B.**

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

K1 – Remember, K2 – Understand, K3- Apply, K4 – Analyze, K5-Evaluate, K6- Create

PART A [K1 and/or K2 Level]

S. No.	Questions	CO. No.	Marks
1. a	Define is IOT?	(CO1 – K1)	2
b	Compare and contrast IOT vs M2M?	(CO1 – K2)	2
c	Define Purpose & Requirements Specification	(CO2 – K1)	2
d	Explain about types sensors	(CO2 – K2)	2
e	Explain about Raspberry PI GPIO Header	(CO1 – K2)	2
f	Explain about Xively Cloud for IOT	(CO3 – K2)	2

PART – B [K2 and above Levels]

S. No.	Questions	CO. No.	Marks
2. a	Explain characteristics and applications of IOT	(CO3 – K2)	6
2. b	Define different IOT levels and deployment Templates	(CO1 – K1)	6
3. a	Explain in detail about process specification and Domain specification	(CO2 – K2)	6

3. b	Explain device component integration and application development	(CO3 – K2)	6
4. a	Explain about different types of sensors and Actuators	(CO1 – K2)	6
4. b	Draw a neat sketch about Raspberry Pi GPIO header	(CO3 – K3)	6
5. a	Illustrate Cloud Storage models and communication API's	(CO4 – K6)	6
5. b	Explain in detail about IBM cloud	(CO4 – K2)	6
6.	Explain in detail about home automation	(CO3 – K2)	12
7.	Explain in detail about Smart city application in IOT	(CO3 – K2)	12

Department of CSE(Artificial Intelligence)

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCES AND HUMANITIES
(MATHEMATICS)

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech: Computer Science and Engineering(Artificial Intelligence)	
COURSE:**LINEAR ALGEBRA AND CALCULUS**	Semester : I CREDITS: **3**
COURSE CODE: **R20CC1102** REGULATION: **Autonomous**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **S&H**
COURSE AREA/DOMAIN: Applications of linear algebra for Engineering branches.	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Solve the system of linear equations. [K3]
CO2	Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors [K4]
CO3	Relate the results of mean value theorems in calculus to Engineering problems. [K4]
CO4	Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [K3]
CO5	Identify the area and volume by interlinking them to appropriate double and triple integrals. [K5]

SYLLABUS:

UNIT	DETAILS
I	**LINEAR SYSTEMS OF EQUATIONS: (10 hours)** Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition. **Application:** Finding the current in a electrical circuit, traffic flow problems.
II	**EIGENVALUES AND EIGENVECTORS (12 hours)** Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature. **Application:** Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.
III	**MEAN VALUE THEOREMS (6 hours)** Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.
IV	**PARTIAL DIFFERENTION: (8 hours)** Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of

	functions of two variables, Lagrange's method of undetermined multipliers.
V	**MULTIPLE INTEGRALS:** **(12 hours)** Double and triple integrals, Change of Variables, Change of order of Integration. Volume integration.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Dr. B.S. Grewal , "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
T2	B.V. Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education,2018.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
R2	Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
R3	Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
R4.	Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011
R5.	Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Applications of Mathematics	PO1, PO2, PO3,PO4, PO5 & PSO1
2	Basics of Calculus	PO1, PO2, PO3,PO4, PO5 & PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/122107036/32
2	https://nptel.ac.in/courses/122107036/27
3	https://nptel.ac.in/courses/122101003/downloads/Lecture-4.pdf
4	https://nptel.ac.in/courses/122101003/downloads/Lecture-6.pdf
5	https://nptel.ac.in/courses/122104017/28

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ Chalk & Talk	✓ ☐ PPT	☐Active Learning
✓ Web Resources	✓ ☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	✓ ☐Tutorials
☐Project based learning	✓ ☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C102.1	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.2	3	3	3	2	1	-	-	-	-	-	-	-	2	-	-
C102.3	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C102.4	3	2	2	1	1	-	-	-	-	-	-	-	3	-	-
C102.5	3	3	2	1	1	--		-	-	-	-	-	3	-	-
Average	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C215	3.00	2.80	2.2	1.6	1	-	-	-	-	-	-	-	2.065	-	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secur d < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: A+>= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.To design and develop algorithms for business and engineering applications.

PSO2.To apply security mechanisms for online applications.

PSO3.To apply standard practices and techniques in software project development using open-ended programming environments.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	KEY WORDS
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
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Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs,

		relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Upon successful completion of the course, the students should be able to

1. Solve the system of linear equations.
2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.
3. Relate the results of mean value theorems in calculus to Engineering problems.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Find** the Rank of the following matrices by using Echelon form $\begin{pmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & -8 \end{pmatrix}$	K1	CO1
2	**Interview** for what values of λ and μ, 2x+3y+5z=9,7x+3y-2z=8,2x+3y+λ z=μ have (i)no solution (ii)a unique solution (iii)an infinite number of solutions.	K3	CO1
3	**Solve** the following system of linear equations by using Gaussian Elimination Method x+y=z=6,3x+3y+4z=20,2x+y+3z=13 .	K3	CO1
4	**Solve** the following system of linear equations by using LU Decomposition Method *2x+3y+z=9, x+2y+3z=6, 3x+y=2z=8.*	K4	CO1
	UNIT 2		
1	**Find** the Eigen values and corresponding Eigen vectors of the following matrices $\begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$	K2	CO2
2	Diagonalise the following matrices A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$ and also **find** A^4 and A^{-1}.	K2	CO2
3	**Using** Cayley-Hamilton theorem find the inverse and $A^4$of the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$.	K3	CO2
4	Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form by orthogonal reduction and **evaluate** the rank	K5	CO2

	UNIT 3		
1	**Inspect** Rolle's theorem for $(x-a)^m(x-b)^n$ where m, n are positive integers in [a, b].	**K5**	**CO3**
2	In the mean value theorem $f(b)-f(a)=(b-a)f'(c)$, **determine** c lying between a and b, if $f(x)=x(x-1)(x-2)$, a = 0 and $b=\frac{1}{2}$.	**K5**	**CO3**
3	**Conclude** that $\log(1+x)=\frac{x}{1+\theta x}$, where $0 < \theta < 1$ and hence deduce that $\frac{x}{1+x} < \log(1+x) < x, x > a$.	**K4**	**CO3**
4	**Discuss** the applicability of Cauchy's Mean value Theorem for $f(x)=\frac{1}{x^2}, g(x)=\frac{1}{x}$ in [a, b].	**K6**	**CO3**
5	A rectangular sheet of metal of length 6 meters and width 2 meters is given. Four equal squares are removed from the corners. The sides of this sheet are now turned up to form an open rectangular box. Find approximately, the height of the box, such that the volume of the box is maximum.	**K5**	**CO3**
	UNIT 4		
1	If $z(x+y)=x^2+y^2$ **show** that $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2=4\left(1-\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)$	**K3**	**CO4**
2	If u = f(r) and x = r Cosθ and y = r Sinθ, **conclude** that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=f''(r)+\frac{1}{r}f'(r)$.	**K5**	**CO4**
3	In spherical coordinates, $x=r\sin\theta\cos\phi, y=r\sin\theta\sin\phi, z=r\cos\theta$ **show** that $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}=r^2\sin\theta$.	**K3**	**CO4**
4	**Discuss** the maxima and minima of $f(x,y)=x^3y^2(1-x-y)$	**K6**	**CO4**
	UNIT 5		
1	**Find** the perimeter of the loop of the curve $3ay^2=x(x-a)^2$.	**K2**	**CO5**
2	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	**K5**	**CO5**
3	**Evaluate** $\int_0^1\int_0^{1-x}\int_0^{1-x-y} dxdydz$.	**K5**	**CO5**
4	**Evaluate** $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ by changing to polar coordinates.	**K5**	**CO5**

Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

I B.Tech I Semester Regular Examinations, Month/Year

Sub Code: R20CC1102 **LINEAR ALGEBRA & CALCULUS**

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X14=70M)

Q.No		Questions	KNOWLEDGE	CO	Marks
1		**Unit - I**			MARKS
	a	i) **Identify** two non-singular matrices P and Q such that PAQ is in the normal form. Where the matrix is $\begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 1 \end{pmatrix}$.	K3	CO1	[7M]
		ii) **Explain** for what values λ and μ the system of equations $2x+3y+5z=9, 7x+3y-2z=8, 2x+3y+\lambda z=\mu$ will have (i) no solution (ii)a unique solution (iii)an infinite number of solutions.	K2	CO1	[7M]
		OR			
	b	**Apply** LU decomposition method to solve the following system of linear equations. $2x+3y+z=9$, $x+2y+3z=6$, $3x+y=2z=8$.	K3	CO1	[14M]
2		**Unit - II**			
	a	**Find** A^4 and A^{-1} by diagonal zing the matrix A= $\begin{pmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{pmatrix}$.	K2	CO2	[14M]
		OR			
	b	**Examine** the Cayley-Hamilton theorem for the matrix A= $\begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$. Find A^{-1} and A^4.	K4	CO2	[14M]
3		**Unit - III**			

	a	i) **Test** Rolle's theorem for $\frac{\sin x}{e^x}$ in $(0.\pi)$	K4	CO3	[7M]
		ii) **Show** that (if $0 < a < b < 1$), $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$. Make use of the above result show that $\frac{\pi}{4}+\frac{3}{25} < \tan^{-1}\left(\frac{4}{3}\right) < \frac{\pi}{4}+\frac{1}{6}$.	K2	CO3	[7M]
		OR			
	b	i) **Verify** Cauchy's Mean value Theorem for the functions e^x and e^{-x} in (a, b).	K4	CO3	[7M]
		ii) **Find** the maximum and minimum values of $3x^4 - 2x^3 - 6x^2 + 6x + 1$ in the interval (0, 2).	K2	CO3	[7M]
4		**Unit - IV**			
	a	i) If $u = f(2x-3y, 3y-4z, 4z-2x)$, **Show** that $\frac{1}{2}\frac{\partial u}{\partial x}+\frac{1}{3}\frac{\partial u}{\partial y}+\frac{1}{4}\frac{\partial u}{\partial z}=0$	K3	CO4	[7M]
		ii) If $u = \frac{x+y}{1-xy} and v = \tan^{-1} x + \tan^{-1} y$, find $\frac{\partial(u,v)}{\partial(x,y)}$. Are u and v functionally related? If so, **find** this relationship.	K2	CO4	[7M]
		OR			
	b	i) **list** $x^2y+3y-2$ in powers of (x-1) and (y+2) using Taylor's theorem.	K4	CO4	[7M]
		ii) A rectangular box open at the top is to have volume of 32 cubic ft. **Determine** the dimensions of the box requiring least material for its construction.	K5	CO4	[7M]
5		**Unit - V**			
	a	The segment of the parabola $y^2=4ax$ which is cut off by the latus rectum revolves about the directrix . **Determine** the volume of rotation of the annular region.	K5	CO5	[14M]
		OR			
	b	change the order if integration and **evaluate** $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$.	K5	CO5	[14M]

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Basic Science & Humanities**

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech (common to All Branches)	
COURSE: **ENGINEERING CHEMISTRY**	Semester : **I/II** CREDITS: **3**
COURSE CODE: **R20CC1103/ R20CC1204** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ BS&H): **BS&H**
COURSE AREA/DOMAIN: **CHEMISTRY**	PERIODS: **6 Per Week.**

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES:

S.NO	Course Outcome Statement
CO1	Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**
CO2	Compare different types of polymers and fuels and their importance. **Analyzing [K4]**
CO3	Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**
CO4	Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**
CO5	Identify different types of engineering materials and applications in engineering. **Applying [K3]**

SYLLABUS:

UNIT	DETAILS
I	**WATER CHEMISTRY :Characteristics of water:** Sources, Impurities–Hardness & its units– Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis). **Water analysis techniques:** Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.
II	**POLYMERS AND FUEL CHEMISTRY: Polymers:** Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples– Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization. **Fuels:** Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.
III	**CHEMISTRY OF ADVANCED MATERIALS: Nano materials**: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods– Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications. **Liquid crystals:** Introduction–Types–Applications. **Composite materials:** Introduction–Definition–Types–Applications–Cermets.

IV	**ELECTROCHEMICAL CELLS AND CORROSION:** Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)- Applications of secondary batteries in E-vehicles. **Corrosion:** Causes and effects of corrosion–Theories of corrosion (dry, chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions- Pigment Volume Concentration.
V	**CHEMISTRY OF ENGINEERING MATERIALS**: **Lubricants:** Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils. **Cement & Refractories:** Manufacture–Setting and hardening of cement–Failures of cement– Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Shikha Agarwal, "Engineering Chemistry", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
T2	O.G. Palana, "Engineering Chemistry", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
T3	B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, "Text Book of Engineering Chemistry", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	P.C. Jain and M. Jain "Engineering Chemistry", ISBN 8187433175, 15/e, Dhanpat Rai & Sons, Delhi, (2015).
R2	B.S Murthy and P. Shankar, "A Text Book of NanoScience and NanoTechnology", University Press (2013).
R3	K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn services, (2016).
R4	S.S. Dara, "A Textbook of Engineering Chemistry", ISBN 8121932645, S.Chand Publisher, (2010).

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO	UNIT	DESCRIPTION
1	Unit-I	Electro dialysis, Reverse Osmosis.
2	Unit-II	Bio degradable polymers, Moulding Techniques Knocking and Anti Knocking Agents.
3	Unit-III	Nanomaterials, Liquid crystals, Fullerenes, Composites,FRP
4	Unit-IV	Applications of secondary batteries in E-vehicles, Corrosion Controlling methods.
5	Unit-V	Application of slag cement in Fal-G Bricks, Significance of lubricants.

WEB SOURCE REFERENCES:

1	**Unit- I**	https://www.youtube.com/watch?v=cAWu0eDiSuk https://www.youtube.com/watch?v=BmpknJNDXfE https://www.youtube.com/watch?v=wNCcpx9leG4 https://www.youtube.com/watch?v=GIKISUijQCM https://www.youtube.com/watch?v=h4fCkhb4Y5I https://www.youtube.com/watch?v=zelRO_lmDdc https://www.youtube.com/watch?v=V16USbjKZXw https://www.youtube.com/watch?v=ajYJvUray9w
2	**Unit- II**	https://www.youtube.com/watch?v=5iTz9yN4v4k https://www.youtube.com/watch?v=TPtc_bAhGeg https://www.youtube.com/watch?v=-d14DmSBuAQ https://www.youtube.com/watch?v=QglJLrwDPxE

		https://www.youtube.com/watch?v=pOGpXZ-UMfo https://www.youtube.com/watch?v=J2-tDV8KYEA&t=56s https://www.youtube.com/watch?v=hOAt9UOkOq4 https://www.youtube.com/watch?v=lseA9FBUNF0 https://www.youtube.com/watch?v=Jq1WHCu-i9A https://www.youtube.com/watch?v=4ZysyokEU60 https://www.youtube.com/watch?v=Q5v_YhW_IG0
3	**Unit- III**	https://www.youtube.com/watch?v=14DqBIG96W0 https://www.youtube.com/watch?v=7WGZq1EY6no https://www.youtube.com/watch?v=9u3-3v-i1P4 https://www.youtube.com/watch?v=9XKGVHPXXho https://www.youtube.com/watch?v=MuWDwVHVLio https://www.youtube.com/watch?v=b0fbM0a86qc
4	**Unit- IV**	https://www.youtube.com/watch?v=lSq_WVC6Hiw https://www.youtube.com/watch?v=pU5Q4sopoII https://www.youtube.com/watch?v=imV_ufIzxPY https://www.youtube.com/watch?v=RAlC75xG4qU https://www.youtube.com/watch?v=QYd9ENn1nP0 https://www.youtube.com/watch?v=-K8Xb2tUWbY https://www.youtube.com/watch?v=lfT9L3ADkZw https://www.youtube.com/watch?v=MhbjQFhZ1bE
5	**Unit- V**	https://www.youtube.com/watch?v=-l7dM-a239A https://www.youtube.com/watch?v=WeH3CUvdt_s https://www.youtube.com/watch?v=et0NWu1Hurk https://www.youtube.com/watch?v=hk7NvgmvwnM https://www.youtube.com/watch?v=dyxL_BvkhJg https://www.youtube.com/watch?v=V-HIriZvTvQ https://www.youtube.com/watch?v=xb_xndPe4n0

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☑ Quiz	☑Tutorials
☐Project based learning	☑NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C112.1	-	1	3	3	-	-	-	-	1	-	-	-	1	-	2
C112.2	2	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.3	3	3	3	3	3	-	-	-	1	3	-	-	1	-	1
C112.4	3	3	3	3	3	-	-	-	1	-	-	-	1	-	2
C112.5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Average	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2103	2.75	2.5	3	3	3	-	-	-	1	3	-	-	1.25	-	1.75

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: O: >= 90%; E: 80%-89%; A: 70%-79%; B: 60%-69%; C: 50%-59%; D: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1: Analyze the suitable method of water treatment depending on the quality treatment. **Analyzing [K4]**

CO2: Compare different types of polymers and fuels and their importance. **Analyzing [K4]**

CO3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. **Applying [K3]**

CO4: Distinguish electrical energy sources and importance of corrosion science. **Analyzing [K4]**

CO5: Identify different types of engineering materials and applications in engineering. **Applying [K3]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain EDTA method for the determination of total hardness present in water	K2	CO1
2	How would you estimate the amount of dissolved oxygen present in water?	K1	CO1
3	Demonstrate the zeolite process used for softening of water	K2	CO1
	UNIT 2		
1	Explain the characteristics of addition polymerization. Explain it with free radical chain Polymerization.	K2	CO2
2	Illustrate proximate analysis of coal with significance and explain determination of C and H in coal sample by ultimate analysis.	K2	CO2
3	Define cracking. Write its types. Explain catalytic cracking in terms of moving bed catalytic cracking.	K1	CO2
	UNIT 3		
1	How is CNTs prepared by Laser ablation method?	K1	CO3
2	How to characterise Nano materials by BET and TEM methods.	K1	CO3
3	Discuss the types and applications of liquid crystals	K6	CO3
	UNIT 4		
1	What are reference electrodes? Explain the working, advantages of Hydrogen and calomel electrodes.	K1	CO4
2	Demonstrate secondary batteries with Lead-Acid battery and write its applications, advantages and disadvantages.	K2	CO4
3	What are fuel cells? Explain working, uses, advantages and limitations of H 2 -O 2 fuel cell with neat sketch.	K1	CO4
	UNIT 5		
1	Explain the manufacturing of Portland cement with neat diagram.	K2	CO5
2	What are refectories? Explain porosity and chemical inertness of refractories.	K1	CO5
3	Explain theories for the mechanism of lubricants.	K2	CO5

Code: R20CC1103/R20CC1204 **Model Question Paper-I** **R20**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33 Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.
All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**Explain** (i) zeolite process with a neat diagram (ii) Estimation of hardness by EDTA method.	K2	1	7
		OR			
	b	**Explain** the different methods used for the desalination of brackish water.	K2	1	7
2	a	**What** is meant by moulding of plastics? Mention the moulding techniques of Compression and injection moulding with neat diagram.	K1	2	7
		OR			
	b	**What** is cracking? How gasoline is obtained from moving and fixed catalytic cracking?	K1	2	7
3	a	**How** to characterize Nano materials by BET and TEM methods.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** how nature of metal and nature of environment influences the rate of corrosion?	K5	4	7
		OR			
	b	i) **Explain** working of Lead –acid storage battery. With reactions ii) **Illustrate** the mechanism of Electrochemical corrosion.	K2	4	7
5	a	**(i)List** the Classification and properties of refractories **(ii)Discuss** the Setting and hardening of cement.	K4	5	7
		OR			
	b	**(i).Distinguish** between extreme pressure lubrication & boundary lubrication (ii)**List** out acidic and neutral refractories and its uses.	K4	5	7

Code: R20CC1103/R20CC1204 **Model Question Paper-II** **R20**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

B. Tech I/II Semester Regular Examinations

ENGINEERING CHEMISTRY

(COMMON TO ALL BRANCHES)

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks:70**

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-B 33Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

Answer All FIVE Questions.

All Questions Carry Equal Marks (5X14=70M)

S. No		Question	Cognitive Level	CO	Marks
1	a	**What** are zeolites? How is water purified by zeolite process?	K1	1	7
		OR			
	b	**Explain** the determination BOD & COD and its significance.	K2	1	7
2	a	**(i)Explain** free radical mechanism of addition polymerization. **(ii)What** are the drawbacks of raw rubber? How to overcome the drawbacks of natural rubber by vulcanization process?	K2	1	7
		OR			
	b	**(i)Define** calorific value, HCV and LCV. Calculate the gross and net calorific value of coal having the following compositions C = 83%; H = 10%; S = 1%, N = 3%, Ash = 3%. Latent heat of steam = 587 cal/g. **(ii)Explain** moving bed catalytic cracking method with a neat labeled diagram.	K1	2	7
3	a	**What** are Nano materials? Explain the preparation of nanomaterials by Sol-Gel and Chemical reduction method.	K2	3	7
		OR			
	b	**Distinguish** types and applications of liquid crystals.	K4	3	7
4	a	**Explain** with neat diagrams the working of (i) Hydrogen Electrode(ii) Calomel Electrode (iii) Lechlanche cell	K2	4	7
		OR			
	b	i) **Discuss** the mechanism of dry corrosion. Explain the role of oxide film in dry corrosion. ii) **Illustrate** galvanizing and tinning.	K5	4	7
5	a	**Explain** the following properties and discuss their significance. (i) Viscosity and Viscosity index (ii) Flash & fire point (iii) Aniline point (iv) Neutralization number.	K2	5	7
		OR			
	b	**Explain** the significance of the following properties in the evaluation of refractory material. (i)Refractoriness (ii) Strength or RUL test	K2	5	7

Department of Electronics and Communication Engineering

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics and Communication Engineering	
COURSE: **ELECTRONIC DEVICES AND CIRCUITS**	Semester : **I** CREDITS: **3**
COURSE CODE: R20EC2102 REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **ELECTRONIC DEVICES**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	Engineering Physics	Knowledge of Free electron theory and Semiconductor Physics.	**I**
	Engineering Mathematics	Knowledge of Differentiation, Integration and Trigonometric Functions	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Make Use of** P-N diodes in electronic circuits. **[K3]**.
CO2	**Make Use of** special diodes and rectifiers in electronic circuits. **[K3]**.
CO3	**Examine** the operation of BJT and its applications. **[K4]**.
CO4	**Analyze** the thermal stability of BJT. **[K4]**.
CO5	**Examine** the operation of FET, other transistors and their applications. **[K4]**.

SYLLABUS:

UNIT	DETAILS
I	**PN JUNCTION DIODE CHARACTERISTICS:** Insulators, Semiconductors and Metals–Classification using Energy gap, Intrinsic and Extrinsic Semiconductors. P-N Junction Diode - Formation of P-N Junction, Open Circuited P-N Junction, Biased P-N Junction - Forward Bias, Reverse Bias, Current Components in PN Junction Diode, Law of Junction, Diode Current Equation - Quantitative Analysis, V-I Characteristics of Diode - Forward Bias, Reverse Bias, Breakdown in P-N Junction Diode, Temperature Dependence on V-I Characteristics, Diode Resistance-Static Resistance, Dynamic Resistance, Reverse Resistance, Diode Capacitance - Transition Capacitance, Diffusion Capacitance, Energy Band Diagram of PN Junction Diode.
II	**SPECIAL DIODES AND RECTIFIERS:** Zener Diode - V-I Characteristics, Applications, Breakdown Mechanisms - Zener Breakdown and Avalanche Breakdown, Construction, Operation, Characteristics and applications of LED, LCD, Photodiode, Varactor Diode and Tunnel diode. **RECTIFIERS:** Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π- Section, Derive and compare rectifier parameters with and without filter.
III	**BIPOLAR JUNCTION TRANSISTOR (BJT):** Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Current Components, Transistor Equation - Relation among IC, IB, ICBO, Transistor Configurations - CB, CE and CC, Transistor as a switch, Transistor switching times, Transistor as an Amplifier. Characteristics of Transistor in Common

	Base Configuration, Common Emitter and Common Collector Configurations - Input and output characteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α, β, and γ, Comparison of CB, CE and CC Configurations, Punch Through/ Reach through, Typical transistor junction voltage values, Photo Transistor
IV	**BJT BIASING AND THERMAL STABILITY:** Need For Biasing, Operating Point, Load Line Analysis - D.C. Load Line, A.C. Load Line, Biasing - Methods, Basic Stability, Fixed Bias, Collector-to-base Bias and Self Bias, Stabilization against variations in VBE, Ic and β, Stability Factors S, S' and S'', Bias Compensation - Thermistor, Sensistor, Diode Compensation for variation in ICO, Thermal Runaway, Thermal Stability.
V	**FET & OTHER TRANSISTORS:** FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N- Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters - Drain Resistance, Amplification factor, Transconductance, Pinch-off voltage, MOSFET - Types - Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET - N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET.SCR- Symbol, Two-Transistor version, UJT - Negative Resistance Property and Applications.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Electronic Devices and Circuits – J. Millman, C. Halkias, Tata McGraw-Hill, Third Edition, 2010.
T2	Electronic Devices and Circuits – Allen Mottershed, PHI, 2011.
T3	Electronic Devices and Circuits – Salivahanan, N. Suresh Kumar, A. Vallavaraj, Tata McGraw-Hill, Second Edition, 2008.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Integrated Electronics – Jacob Millman, C. Halkies, C.D. Parikh, Satyabrata Jit, Tata McGraw-Hill, Second Edition, 2011.
R2	Electronic Devices and Circuit Theory – R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
R3	Electronic Devices and Circuits – A.P. Godse and U.A. Bakshi, Technical Publications, First Edition, 2009.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Overview of Semiconductors and Diodes	PO1,PO2,PO3, PSO1
2	Knowledge on Transistors	PO1,PO3, PO4, PSO1

WEB SOURCE REFERENCES:

1	Student Resources provided in https://www.electronics-tutorials.ws/ for basic electronic circuits
2	http://nptel.ac.in/courses/117105080/ on Electronics and Communication Engineering
3	http://www2.ece.ohio-state.edu/ee327/ Electronic Devices and Circuit laboratory
4	https://searchworks.stanford.edu/view/11352963 for fundamentals of Electronics available in Digital Library
5	https://electronicsforu.com/ for news on electronics and for Projects
6	https://archive.org/details/ElectronicDevicesCircuits
7	https://www.sanfoundry.com/1000-electronic-devices-circuits-questions-answers/ Question and Answers available on total Edc.

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C211 .1	3	3	1	2	-	-	-	-	-	-	-	2	3	2
C211.2	3	3	3	2	-	-	-	-	-	-	-	2	3	2
C211.3	3	3	2	2	-	-	-	-	-	-	-	2	3	1
C211.4	3	3	3	2	-	-	-	-	-	-	-	2	3	2
C211.5	2	3	2	2	-	-	-	-	-	-	-	2	2	2
Average	2.8	3	2.2	2	-	-	-	-	-	-	-	2	2.8	1.8

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C21	3.00	3.00	2.25	2.00	-	-	-	-	-	-	-	2.00	3.00	1.75

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO 1: **Make Use of** P-N diodes in electronic circuits. **[K3]**.

CO 2: **Make Use of** special diodes and rectifiers in electronic circuits. **[K3]**.

CO 3: **Examine** the operation of BJT and its applications. **[K4]**.

CO 4: **Analyze** the thermal stability of BJT. **[K4]**.

CO 5: **Examine** the operation of FET, other transistors and their applications. **[K4]**.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**List the PN diode** capacitances and solve capacitance for transition capacitance	K4	CO1
2	**Analyze** the Energy band Diagram of PN junction Diode.	K4	CO1
3	**Solve** the thermal voltage and barrier voltage at 250C , a Si PN junction is formed from P-material doped with 1022acceptors/m3 and n-material doped with 1.5 × 1021donors/m3 .	K3	CO1
4	**Analyze** VI characteristics of PN diode with Forward and Reverse bias.	K4	CO1
	UNIT 2		
1	**Analyze** Zener breakdown and Avalanche breakdown with briefly.	K4	CO2
2	**Analyze** the construction and working of LED.	K4	CO2
3	**Solve** the transformer secondary voltage for a capacitor input filter using a capacitance of 10p.F for a Full wave rectifier supplies a load requiring 300V at 200mA.	K3	CO2
4	**Analyze** the V-I Characteristic of Tunnel diode and explain its operation.	K4	CO2
	UNIT 3		
1	**Compare** α, β and γ of a transistor and also derive the relation among these.	K4	CO3
2	**Analyze** current components of transistor.	K4	CO3
3	**Solve** the IC ,IB ,β, and ICEO for a silicon, with α=0.995 emitter current is 10mA & leakage current IC0=0.5μA.	K3	CO3
4	**Compare** CB, CE & CC cofigurations.	K4	CO3
	UNIT 4		
1	**List** the advantage and disadvantages of fixed bias method.	K4	CO4
2	**Analyze** the working of collector – Base bias circuit using NPN transistor. Derive the equation for IB	K4	CO4
3	**Compare** the d.c and a.c load lines with suitable diagrams	K4	CO4
4	**Analyze** the working of Self Bias circuit using NPN transistor.	K4	CO4
	UNIT 5		

1	**Define** the Pinch-off voltage Vp. Sketch the depletion region before and after Pinch-off.	K1	CO5
2	**Explain** V-I characteristics of SCR with sketches?	K2	CO5
3	**Explain** briefly drain characteristics of N-channel enhancement MOSFET	K2	CO5
4	**Outline** the drain characteristics of a n-channel JFET and Explain it.	K2	CO5

❖

Model Question Paper- R20

Code: R20EC2102

Narasaraopeta Engineering College(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

II B. Tech I Semester Regular Examinations

ELECTRONIC DEVICES AND CIRCUITS

DEPARTMENT ELECTRONICS AND COMMUNICATION ENGINEERING

Time: 3 Hrs **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 12 marks.

		SECTION-I	**Cognitive Level**	**CO**	**Marks**
1	a	**Analyze** the V-I characteristics of PN junction diode in forward and reverse bias.	K4	CO1	[7M]
	b	**Analyze** the energy band diagram of PN junction diode.	K4	CO1	[7M]
		OR			
1	a	**Analyze** the Transition capacitance and diffusion capacitance of the Diode.	K4	CO1	[7M]
	b	**Solve** the silicon diode has reverse saturation current of 2.5uA at 300^0K. Find forward voltage for a forward current of 10mA.	K3	CO1	[7M]
		SECTION-II			
2	a	**Analyze** how a Zener diode works as a voltage regulator.	K4	CO2	[7M]
	b	**Analyze** the construction and working of LED.	K4	CO2	[7M]
		OR		CO2	
2	a	**Analyze** the construction and working of Varactor diode?	K4	CO2	[7M]
	b	**Analyze** ripple factor for L-Section filter connected to a full wave	K4	CO2	[7M]

		rectifier.			
		SECTION-III			
3	a	**Compare CE, CB and CC configurations.**	**K4**	**CO3**	[7M]
	b	**Analyze how transistor works as a Switch.**	**K4**	**CO3**	[7M]
		OR			
3	a	**List the different current components in a transistor and explain briefly.**	**K4**	**CO3**	[7M]
	b	**Analyze the phenomenon of early effect in transistors?**	**K4**	**CO3**	[7M]
		SECTION-IV			
4	a	**Analyze thethermal runaway? Derive necessary expressions to obtain thermal stability.**	**K4**	**CO4**	[7M]
	b	**Analyze the collector to base bias method in transistors?**	**K4**	**CO4**	[7M]
		OR			
4	a	**Analyze about Self Bias in a transistor.**	**K4**	**CO4**	[7M]
	b	**Classify the transistor load line analysis and explain it.**	**K4**	**CO4**	[7M]
		SECTION-V			
5	a	**Analyze the construction and operation of JFET.**	**K4**	**CO5**	[7M]
		Analyze about Drain and Transfer Characteristics of Enhancement type N-channel MOSFET.	**K4**	**CO5**	[7M]
		OR			
5	a	**Compare JFET and MOSFET.**	**K4**	**CO5**	[7M]
	b	**Analyze about i) Drain Resistance ii)Amplification factor iii) Transconductance iv) Pinch-off voltage**	**K4**	**CO5**	[7M]
		**********			

II-Model Question Paper- R20

Code: R20EC2102

Narasaraopeta Engineering College(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

II B. Tech I Semester Regular Examinations

ELECTRONIC DEVICES AND CIRCUITS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Time: 3 Hrs **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 12 marks.

*****

		SECTION-I	Cognitive Level	CO	Marks
	a	**Analyze** semiconductors, insulators and metals classification using energy band diagrams.	K4	CO1	[7M]
	b	**Solve** the current flowing through a Germanium Diode at room temperature is 8 x 10^{-7} amps when large reverse voltage is applied. Calculate the current flowing through the Diode when 0.1V forward bias is applied.	K3	CO1	[7M]
		OR			
1	a	**Examine** the working of an open circuited PN junction. Give necessary response curves.	K4	CO1	[7M]
	b	**Analyze** in detail about the current components in a PN junction diode.	K4	CO1	[7M]
		SECTION-II			
2	a	**Analyze** the construction and working of LCD.	K4	CO2	[7M]
	b	**Make use of** circuit and necessary waveforms explain the operation of bridge rectifier.	K3	CO2	[7M]
		OR			
2	a	**Analyze** the construction and working of Tunnel diode.	K4	CO2	[7M]
	b	**List** the rectifier and derive rectification efficiency expressions for it for the following (i) Half wave (ii) Full wave rectifier.	K4	CO2	[7M]
		SECTION-III			

3	a	**Analyze** input and output characteristics of a NPN transistor in CE configuration.	**K4**	**CO3**	**[7M]**
	b	**Compare** CE, CB and CC configurations.	**K4**	**CO3**	**[7M]**
		OR			
3	a	**Make use of** a neat diagram show different current components in a transistor.	**K3**	**CO3**	**[7M]**
	b	**Analyze** about Photo Transistor.	**K4**	**CO3**	**[7M]**
		SECTION-IV			
4	a	**Analyze** the voltage divider biasing method for BJT.	**K4**	**CO4**	**[7M]**
	b	**Solve** the silicon transistor with fixed bias, V_{CC} =9V, R_C =3 kΩ, R_B =8 kΩ, β=50, V_{BE}=0.7V.	**K3**	**CO4**	**[7M]**
		OR			
4	a	**Analyze** about Self Bias in a transistor.	**K4**	**CO4**	**[7M]**
	b	**Analyze** about basic stability of operating point in a transistor.	**K4**	**CO4**	**[7M]**
		SECTION-V			
5	a	**Analyze** the operation of N-channel enhancement type MOSFET with the help of it's ($I_D - V_{DS}$) and ($I_D - V_{GS}$) characteristics.	**K4**	**CO5**	**[6M]**
	b	**Analyze** about Construction, Operation and Characteristics of SCR.	**K4**	**CO5**	**[6M]**
		OR			
5	a	**Analyze** about Construction, Working of UJT.	**K4**	**CO5**	**[7M]**
	b	**Analyze** about Drain and Transfer characteristics of JFET with neat sketches.	**K4**	**CO5**	**[7M]**
		**********			

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics And Communication Engineering	
COURSE: **ANALOG AND DIGITAL COMMUNICATIONS**	YEAR: II SEMESTER : II SECTION:A,B,C&D CREDITS: 3
COURSE CODE: **R20EC2203** REGULATION: R20	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Electronics**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EC2201	**RVSP**	Knowledge of random variables and noise	**I-II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Elaborate the basic concepts of Analog Communication Systems. **[K3]**.
CO2	Analyze the Analog modulated and demodulated systems. **[K3]**.
CO3	Construct different digital modulation techniques. **[K3].**
CO4	Analyze the fundamental concepts of information theorems and capacity **[K3]**.
CO5	Assess the right method of error detection and error correction for data transmission **[K4]**.

SYLLABUS:

UNIT	DETAILS
I	**ANALOG COMMUNICATION:** Introduction to Communication Systems – Modulation – Types – Need for Modulation. Theory of Amplitude Modulation – Generation of AM waves-Square law Modulator, Switching modulator, Detection of AM waves-Square law detector and Envelope detector. – Theory of Frequency and Phase Modulation. Noise: Source of Noise – External Noise- Internal Noise- Noise Calculation.
II	**RADIO TRANSMITTERS & RECEIVERS:** Radio Transmitters-Function of a Transmitter, Basic Components of a Radio Transmitter, Classification of Transmitter- MW, SW, UHF and VHF, Micro Wave Transmitter, AM, FM, PM, TV, Radio broadcasting Transmitters, AM Transmitter-Low-Level Transmitter, High Level Transmitter. Radio Receivers - Receiver Types- AM, FM, Communication, Television, Radar Receivers, and Radio Receivers, Tuned radio frequency receiver-Block Diagram of TRF Receiver, Super heterodyne receiver-Block Diagram of Super heterodyne Receiver and Advantages.
III	**DATA AND PULSE COMMUNICATION:** Data Communication: History of Data Communication – Standards Organizations for Data Communication- Data Communication Circuits – Data Communication Codes – Error Detection and Correction Techniques. Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) – Comparison of various Pulse Communication System (PAM – PTM –PCM). Delta modulation
IV	**DIGITAL MODULATION TECHNIQUES:** Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)- Minimum Shift Keying (MSK) – Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – Quadrature Amplitude Modulation (QAM) – 8 QAM– Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK –PSK – QAM).
V	**SOURCE AND ERROR CONTROL CODING :**Entropy, Source encoding theorem, Shannon-fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Principles of Communication Systems - Herbert Taub, Donald L Schiling, GoutamSaha, 3rd Edition, McGraw-Hill, 2008
T2	Communication Systems by Simon Haykins John Wiley & Sons, 4th Edition.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Wayne Thomasi "Electronic communication systems fundamentals through advanced", 4th edition.
R2	Communication Systems, 2E, R. P. Singh, S. D. Sapre, McGraw-Hill Education, 2008.
R3	George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	The sampling Theorem	PO5, PSO2
2	RF section and characteristics	PO2,PO5, PSO2

WEB SOURCE REFERENCES:

1	https://www.allaboutcircuits.com/textbook/
2	https://onlinecourses.nptel.ac.in/noc18_ec03/ Communication systems - Prof Santanu Chattopadhyay – IIT Kharagpur.
3	http:// http://nptel.ac.in/courses/106103068/ Communication systems - IIT GUWAHATI
4	http:// http://nptel.ac.in/courses/106102062/ Computer Architecture - IIT Delhi

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: Design and develop IoT applications using Raspberry Pi, Arduino and other advanced processors.

PSO2: Design and synthesize various circuits using latest hardware and EDA tools.

PSO3: Design and analyse modern communication systems to meet the present and future needs of industry with cost effective solutions.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
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Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

C223.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C22.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C223.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C223.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C223	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 50% and < 60% marks of allocated marks for that CO	Student secured ≥ 40% and <50% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Elaborate the basic concepts of Analog Communication Systems. [K3]
CO2: Analyze the Analog modulated and demodulated systems. [K3]
CO3: Construct different digital modulation techniques. [K2]
CO4: Analyze the fundamental concepts of information theorems and capacity. [K3]
CO5: Assess the right method of error detection and error correction for data transmission[K4]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	What is the principle of Amplitude modulation? Derive expression for the AM wave and draw its spectrum.	K2	CO1
2	Explain the process of detection of AM using Envelope detector with neat sketches.	K1	CO1
3	Explain how FM signal can be generated using PM modulator.	K2	CO1
4	List and Explain different types of Noises.		
	UNIT 2		
1	Utilize the block diagram of AM Transmitter to explain the function of each block.	K3	CO2
2	List and explain the Characteristics of Receivers.	K2	CO2
3	Utilize the block diagram of FM Transmitter to explain the function of each block.	K3	CO2
4	Utilize the block diagram of superheterodyne receiver to explain the function of each block.	K3	CO2
	UNIT 3		
1	Explain the generation of PAM, with a neat circuit diagram and wave forms	K2	CO3
2	List the elements of Data Communication Circuits and explain	K4	CO3
3	Compare Pulse Digital Modulation techniques.	K4	CO3
4	With a neat sketch explain the principle and operation of PCM.	K2	CO3
	UNIT 4		

1	Is it possible to detect BFSK signals non-coherently? If yes, explain	K2	CO4
2	With a neat sketch, explain the modulation and detection of 8-PSK.	K2	CO4
3	Explain the process of generating ASK withy neat sketches.	K2	CO4
	UNIT 5		
1	Apply Shanon-Fano coding to the source with 8 emitting messages having probabilities1/2,3/20,3/20,2/25,2/25,1/50,1/100 and 1/100 respectively, and find t coding efficiency.	K3	CO5
2	Explain the concept of Mutual information and its properties.	K3	CO5
3	The generator polynomial of a (7, 4) cyclic code is $G(p)=p^3+p+1$.. Determine the all code vectors for the code in non-systematic form.	K3	CO5

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R20 Model Question Paper – II

Code: R20EC2203

NARASARAOPETA ENGINEERING COLLEGE, NARASARAOPET
(AUTONOMOUS)

Yallamanda (Post), Narasaraopet- 522601

II B. Tech II Semester Regular Examinations, Month-Year

ANALOG AND DIGITAL COMMUNICATIONS

Time: 3 Hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each **SECTION** and each Question carries **14 marks.** **5 X 14 = 70**

Q.NO		Questions	KL	CO	Marks
		SECTION-I			
1	A	i) Explain the square law detection of AM signals.	K2	CO1	[7M]
		ii) A modulating signal of 2 cos5000t is amplitude modulated over a carrier signal of 5cos20000t. Find the modulation index, LSB and USB frequencies, bandwidth and the ratio of Side Band Power to the Total Power of AM wave. wave?	K4	CO1	[7M]
		OR			
	B	i) Compare AM, FM and PM	K4	CO1	[7M]
		ii) List and Explain different types of Noises.	K4	CO1	[7M]
		SECTION-II			
2	A	i) Utilize the block diagram of super-heterodyne receiver for AM to explain each block.	K4	CO2	[7M]
		ii) List out the different Classification of Transmitters and explain any one type in detail.	K4	CO2	[7M]
		OR			
	B	i) Utilize the block diagram of TRF receiver to explain each block.	K4	CO2	[7M]
		ii) List out the advantages and disadvantages of TRF receiver.	K4	CO2	[7M]
		SECTION-III			
3	A	i) Explain the generation of PAM, with a neat circuit diagram and wave forms.	K2	CO3	[7M]
		ii) List and Explain in brief about Standards Organizations for Data Communication	K4	CO3	[7M]
		OR			
	B	i) With a neat sketch explain the principle and operation of PCM.	K2	CO3	[7M]
		ii) Compare PAM, PWM and PPM.	K4	CO3	[7M]
		SECTION-IV			
4	A	i) Is it possible to detect BFSK signals non-coherently? If yes, explain	K5	CO4	[7M]
		ii) What are the similarities between BPSK and BFSK signals?	K1	CO4	[7M]
		OR			

	B	**i)** With a neat sketch, explain the modulation and detection of 8-PSK.	**K2**	**CO4**	**[7M]**
		ii) Explain the process of generating ASK withy neat sketches.	**K2**	**CO4**	**[7M]**
SECTION-V					
5	**A**	**i)** Apply Shanon-Fano coding to the source with 8 emitting messages having probabilities1/2,3/20,3/20,2/25,2/25,1/50,1/100 and 1/100 respectively, and find the coding efficiency.	**K4**	**CO5**	**[7M]**
		ii) Explain the concept of Mutual information and its properties.	**K2**	**CO5**	**[7M]**
	OR				
	B	**i)** Explain the process of Huffman coding for encoding the given message with suitable example.	**K2**	**CO5**	**[7M]**
		ii) The generator polynomial of a (7, 4) cyclic code is $G(p)=p^3+p+1$.. Determine the all code vectors for the code in non-systematic form.	**K2**	**CO5**	**[7M]**

NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 **Department of ELECTRONICS AND COMMUNICATION ENGINEERING**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics And Communication Engineering	
COURSE: **COMPUTER ORGANISATION & MICROPROCESSORS**	YEAR: III SEMESTER : I SECTION:A,B,C&D CREDITS: 4
COURSE CODE: **R19BEC5TH05** REGULATION: R19	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Electronics**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EC2201	**STLD**	Knowledge of Digital circuit design system	**II-II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Apply the concepts of computer system and CPU design. **[K3]**
CO2	Demonstrate memory organization and I/O processing **[K3]**.
CO3	Make use of Instruction set in developing the assembly language programming **[K3].**
CO4	Demonstrate the hardware features of 8086 and Pentium processors. **[K3]**.
CO5	Model an 8086 based microcomputer system by interfacing memory and I/O devices **[K3]**.

SYLLABUS:

UNIT	DETAILS
I	COMPUTER SYSTEM Basic Structure of Computers : Computer Types, Functional units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi computers, CPU Organization: Processor Organization, Control Unit Design, Instruction pipelining, The RISC versus CISC.
II	MEMORY & I/O SUB SYSTEMS Memory Organization: Basic Concepts, Semi conductor memories, Cache memory organization, Virtual memory organization. Input/Output Organization: Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP).
III	8086 MICROPROCESSOR ARCHITECTURE & PROGRAMMING Introduction to 8085, Architecture of 8086, Register organization of 8086, physical memory organization, I/O addressing capability, addressing modes of 8086, instruction set off 8086, assembler directives and operators. Assembly language programming of 8086, introduction to stack, stack structure of 8086/8088,
IV	8086 INTERRUPTS Signal description of 8086, interrupts and interrupt service routines, interrupt cycle of 8086, non mask able interrupt and mask able interrupts, interrupt programming, minimum mode, maximum mode of 8086 system and timings diagrams for different bus operations. Introduction to Pentium processor architecture.
V	8086 INTERFACING Semiconductor memory interfacing, Interfacing I/O ports, PIO 8255, modes of operation of 8255, interfacing of D/A and A/D converters and stepper motor. Programmable interrupt controller 8259A, programmable communication interface 8251 USART, 8257 DMA.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Morris Mano, "Computer system architecture", 3rd Edition.

T2	A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	William Stallings, "Computer Organization and Architecture", 8th Edition, Pearson, 2010.
R2	Douglas V Hall, "Microprocessors and interfacing, Programming and Hardware", 2nd Edition, TMH, 2006

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Interfacing of microprocessor with PIC in cascade mode	PO5, PSO2
2	Interfacing of microcontrollers with alphanumeric keyboard	PO2,PO5, PSO2

WEB SOURCE REFERENCES:

1	https://www.allaboutcircuits.com/textbook/
2	https://onlinecourses.nptel.ac.in/noc18_ec03/ Microprocessors and Microcontrollers - Prof Santanu Chattopadhyay – IIT Kharagpur.
3	http:// http://nptel.ac.in/courses/106103068/ Computer Organization and Architecture - IIT GUWAHATI
4	http:// http://nptel.ac.in/courses/106102062/ Computer Architecture - IIT Delhi
5	http:// http://nptel.ac.in/courses/106108100/ Microprocessors and Microcontrollers - IISC Bangalore
6	https://www.allaboutcircuits.com/video-lectures/
7	https://www.intel.in/content/www/in/en/homepage.html

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 50% and < 60% marks of allocated marks for that CO	Student secured ≥ 40% and <50% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :
PSO1. Analyze and design analog and digital circuits for a specification and function.
PSO2. Design a variety of electronic systems for applications including signal processing, communications computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Apply the concepts of computer system and CPU design. **[K3]**

CO2: Demonstrate memory organization and I/O processing **[K3]**

CO3: Make use of Instruction set in developing the assembly language programming. **[K3]**

CO5: Demonstrate the hardware features of 8086 and Pentium processors. **[K3]**

CO6: Model an 8086 based microcomputer system by interfacing memory and I/O devices **[K3]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Discuss decimal arithmetic operations. Explain Booth multiplication algorithm with example.	K2	CO1
2	What are the functions of ALU and Explain the components of the computer system.	K1	CO1
3	Derive and explain an algorithm for adding and subtracting 2 floating point binary numbers.	K2	CO1
	UNIT 2		
1	Write about Stored Program Organization. Explain Direct Addressing and Indirect Addressing with neat diagrams	K2	CO2
2	Explain the instruction cycle with the help of flow chart.	K2	CO2
3	What is Interrupt? Explain different types of interrupts.	K2	CO2
4	What are the characteristics of RISC and CISC? Explain in detail.	K2	CO2
	UNIT 3		
1	Explain Timing and Control Unit with neat diagram. (Hardwired Control Unit).	K2	CO3
2	Explain Micro Programmed control organization with neat diagram.	K2	CO3
3	What is a Micro program sequencer for control memory, explain with neat circuit diagram? (Write about micro programmed control unit).	K2	CO3
4	Explain micro instruction format.	K2	CO3
	UNIT 4		
1	Explain the architecture of 8086 microprocessor with a neat sketch	K2	CO4
2	What is memory segmentation and its advantages? Explain the memory segmentation types and memory organization of 8086?	K2	CO4
3	Explain the addressing modes of 8086?Calculate the effective addresses for different addressing modes of 8086 for the contents of different registers as given below Offset (displacement) = 5000H; [AX]=1000H; [BX]=2000H; [SI]=3000H; [DI]=4000H; [BP]=5000H; [SP]=6000H; [CS]=0000H; [DS]=1000H; [SS]=2000H; [IP]=7000H;	K2	CO4
	UNIT 5		
1	How interrupts are handled by 8086, mention the steps of interrupt sequence?	K1	CO5
2	Write an assembly lanuage program to transfer an N array of elements located at address 1000H to address 2000H and arrange the elements in ascending order	K3	CO5

	and to address 3000H and arrange in descending order?		
3	Mention the various interrupts in 8086 with the help of interrupt vector table?	K3	CO5
	UNIT 6		
1	Draw and explain the architecture of 8255 and Explain the modes of operation of 8255?	K2	CO6
2	Explain the architecture of 8251A? Write mode instruction control word of 8251A?	K2	CO6
3	Write about the command words of 8259A? How 8259A is connected in cascade mode explain?	K3	CO6

I-Model Question Paper- R19

Code: R19BEC5TH05

Narasaraopeta Engineering College(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III B. Tech I Semester Regular Examinations

COMPUTER ORGANIZATION & MICROPROCESSORS

Electronics and Communication Engineering

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs Max. Marks: 60

Note: This question paper Consists of 5 Sections.

Answer **FIVE** Questions,

Choosing ONE Question from each SECTION and each Question carries 12 marks.

*****

	SECTION-I	
1	A) List the various functional unit of a computer. B) Distinguish the major characteristics of RISC and CISC architectures.	[6M+6M]
	OR	
2	A) Organize various types of Buses in Computer. B) Explain in detail about Instruction pipelining	[6M+6M]
	SECTION-II	
3	A) Analyze semiconductor memory in detail. B) Explain in detail about I/O interface.	[6M+6M]
	OR	
4	A) Function basic concepts of memory systems. B) Analyse Direct Memory Access (DMA) with neat Diagram.	[6M+6M]
	SECTION-III	
5	A) Draw and discuss the internal block diagram of 8086. B) List the different types of addressing modes of 8086.	[6M+6M]
	OR	
6	A) Draw the Register Organisation of 8086 explain typical application of each register. B) Analyse the physical memory organization in an 8086 system.	[6M+6M]
	SECTION-IV	
7	A) Analyse interrupts and Interrupt service routines	[6M+6M]

	B) Distinguish Non-mask able Interrupt and mask able Interrupts.	
	OR	
8	Analyse the signal description of 8086 System.	[12M]
	SECTION-V	
9	A) Build Interface two 4K*8 EPROM and two 4K*8 RAM chips with 8086. Select suitable maps. B) Explain the internal architecture of 8259A with neat block diagram.	[6M+6M]
	OR	
10	A) Draw and Discuss internal Architecture of USART 8251.B) Analyze the Interfacing digital to analog converter data converters with an example.	[6M+6M]
	**********	

II-Model Question Paper- R19

Code: R19BEC5TH05

Narasaraopeta Engineering College(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III B. Tech I Semester Regular Examinations

COMPUTER ORGANIZATION & MICROPROCESSORS

Electronics and Communication Engineering

Time: 3 Hrs | Max. Marks: 60

Note: This question paper Consists of 5 Sections.

Answer **FIVE** Questions,

Choosing ONE Question from each SECTION and each Question carries 12 marks.

*****

	SECTION-I	
1	A) Explain in detail about Instruction pipelining. B) Analyse in detail about Processor Organization in computer.	[6M+6M]
	OR	
2	A) Distinguish Multiprocessors and Multicomputer. B) Explain Control Unit Organization.	[6M+6M]
	SECTION-II	
3	A) Explain Cache memory organization B) Analyse the Priority Interrupt with an example.	[6M+6M]
	OR	
4	A) Explain Virtual memory organization. B) Analyze Direct memory Access with neat diagram	[6M+6M]
	SECTION-III	
5	A) Explain the execution of all the instructions of 8086 with suitable examples. B) Explain the Assembler directives of 8086 with suitable example.	[6M+6M]
	OR	
6	A) Draw the Register organization of 8086 Microprocessor and explain the operation of each register in detail. B) Write an ALP to find out the number of even and odd numbers from a given series of 16-bit hexadecimal numbers.	[6M+6M]
	SECTION-IV	

7	A) Explain Interrupt Structure of 8086 in detail. B) Draw and Discuss a typical Maximum mode of 8086 system.	[6M+6M]
	OR	
8	A) Explain any six signals of 8086 system. B) Draw and Discuss a typical minimum mode of 8086 system.	[6M+6M]
	SECTION-V	
9	Examine the different modes of operation of 8255.	[12M]
	OR	
10	A) Analyse Programmable interrupt controller (PIC) 8259A B) Analyze the Interfacing Analog to Digital converter data converters with an example.	[6M+6M]
	**********	

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Code: R20EC2203

NARASARAOPETA ENGINEERING COLLEGE, NARASARAOPET
(AUTONOMOUS)

Yallamanda (Post), Narasaraopet- 522601

II B. Tech II Semester Regular Examinations, Month-Year

ANALOG AND DIGITAL COMMUNICATIONS

Time: 3 Hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each **SECTION** and each Question carries **14 marks.** **5 X 14 = 70**

Q.NO		Questions	KL	CO	Marks
		SECTION-I			
1	A	i) What is the principle of Amplitude modulation? Derive expression for the AM wave and draw its spectrum.	K1	CO1	[7M]
		ii) A Modulating signal $10\ sin(2\pi x10^3 t)$ is used to modulate a carrier signal $20\ sin(2\pi x10^4 t)$. Determine Modulation index, percentage modulation, frequencies of sideband components and their amplitudes. What will be the bandwidth of Modulated signal?	K3	CO1	[7M]
		OR			
	B	i) Explain the process of detection of AM using Envelope detector with neat sketches.	K2	CO1	[7M]
		ii) Explain how FM signal can be generated using PM modulator.	K2	CO1	[7M]
		SECTION-II			
2	A	i) Discuss briefly the similarities and differences between FM and AM receivers.	K2	CO2	[7M]
		ii) Explain the Characteristics of RF section.	K2	CO2	[7M]
		OR			
	B	i) Analyze the effect of feedback on performance of AM Transmitter.	K4	CO2	[7M]
		ii) Utilize the block diagram of a superheterodyne receiver to explain its operation. What are the advantages of this receiver?	K4	CO2	[7M]
		SECTION-III			
3	A	i) Explain the generation of PAM, with a neat circuit diagram and wave forms	K2	CO3	[7M]
		ii) With a neat sketch explain the principle and operation of Delta Modulation.	K2	CO3	[7M]
		OR			
	B	i) List the elements of Data Communication Circuits and explain	K4	CO3	[7M]
		ii) Compare Pulse Digital Modulation techniques.	K4	CO3	[7M]
		SECTION-IV			
4	A	i) Explain the process of generating FSK signals.	K2	CO4	[7M]

		ii) Describe the process of detecting PSK signals.	K3	CO4	[7M]
		OR			
	B	i) With a neat sketch, explain the Non-coherent detection of BFSK.	K2	CO4	[7M]
		ii) Compare ASK, FSK and PSK.	K4	CO4	[7M]
		SECTION-V			
5	A	i) Explain the concept of entropy and its properties.	K2	CO5	[7M]
		ii) An analog signal band-limited to 10 kHz is quantized in 8 levels of a PCM system with probabilities of 1/4, 1/5, 1/5, 1/10, 1/10, 1/20, 1/20, and 1/20 respectively. Calculate the entropy and the rate of information.	K3	CO5	[7M]
		OR			
	B	i) Consider a (7,4) linear block code with the parity-check matrix H given by: $H=\begin{bmatrix}1&0&1&1&1&0&0\\1&1&0&1&0&1&0\\0&1&1&1&0&0&1\end{bmatrix}$ Construct code words for this (7, 4) code and show that this code is a Hamming code.	K4	CO5	[7M]
		ii) Develop the relation between the mutual information and the joint entropy of the channel input and channel output.	K5	CO5	[7M]

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Electronics and Communication Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics and Communication Engineering	
COURSE: **ANTENNAS AND WAVE PROPAGATION**	Semester : **VI** CREDITS: **3**
COURSE CODE: **19BEC6TH01** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **COMMUNICATIONS**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BEC4TH05	**E.M.T.L**	Knowledge of electromagnetic fields , MAXWELL's equations and relations are required	**IV**
19BCC1TH03	**ENGINEERING MATHEMATICS**	An ability to solve ordinary and partial differential equations	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Analyze** radiation mechanism and basic antenna parameters **[K4]**
CO2	Interpret wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas**[K2]**
CO3	Demonstrate antenna measurements to know antenna's performance **[K2]**
CO4	Identify the characteristics of radio wave propagation.**[K3]**
CO5	Illustrate the concept of wave propagation and its characteristics in atmospheric conditions **[K2]**

SYLLABUS:

UNIT	DETAILS
I	**UNIT – I: ANTENNA FUNDAMENTALS:** Introduction to Antennas. Radiation Mechanism – single wire, 2-wire, dipoles, Current Distribution on a thin wire antenna. Characteristics of Antenna- Radiation Pattern, Radiation intensity, Beam solid angle, Directivity, Gain, Polarization, efficiency, Equivalent areas, Radiation Resistance, Effective length, antenna temperature; Relation between Maximum Directivity and effective area, illustrated Problems.
II	**UNIT – II: LINEAR WIRE ANTENNA:** Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance. Introduction to Antenna Theorems and Loop antennas.
III	**UNIT – III: ANTENNA ARRAYS :** Introduction, 2 element arrays – different cases; N element uniform arrays- Broadside, End-fire Arrays, EFA with Increased Directivity. Principle of pattern multiplication, Binomial and Phased array.

IV	**UNIT – IV: HF, VHF, UHF ANTENNAS** Introduction, Traveling wave radiators – basic concepts, Long wire antennas, V-Antenna, Rhombic Antenna, Folded Dipole, Yagi-Uda Antenna, Helical Antenna, Reflector antenna, Parabolic antenna. **Antenna Measurements:** Radiation pattern, Gain transfer method, Absolute measurement, Directivity.
V	**UNIT – V: WAVE PROPAGATION:** Friss Free space Equation for wave Propagation, Ground wave Propagation, Space wave Propagation- Field strength calculation, Line of Sight, Duct Propagation, Tropospheric Scattering. Sky wave Propagation-Formation of Ionospheric Layers, Mechanism of Reflection and Refraction and their Characteristics, Ionospheric Abnormalities and Absorption.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Constantine A.Balanis, "Antenna Theory: Analysis and Design", 4th Edition, John Wiley & Sons, 2016.
T2	K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation" –Tech India Publications, New Delhi, 2001.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	J. D. Kraus, R. J. Marhefka, "Antennas and Wave Propagations", 4th Edition, McGraw-Hill, 2010.
R2	E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2007.
R3	F.E. Terman, "Electronic and Radio Engineering", 4th Edition, McGraw-Hill, 1955.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Smart antennas, dielectric resonate antenna	PO5, PSO2

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/108101092/1
2	https://onlinecourses.nptel.ac.in/noc18_ee13/preview
3	https://nptel.ac.in/courses/117101056/48
4	https://www.youtube.com/watch?v=md7GjQQ2YA0

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C321.1	3	3	3	3	-	-	-	-	-	-	-	3	2	3
C321.2	3	3	3	3	-	-	-	-	-	-	-	2	2	3
C321.3	3	3	3	3	-	-	-	-	-	-	-	2	2	3
C321.4	3	3	3	3	-	-	-	-	-	-	-	3	2	3
C321.5	3	3	3	2	-	-	-	-	-	-	-	3	2	3
Average	3.00	3.00	3.00	2.80	-	-	-	-	-	-	-	2.60	2.00	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C321	3.00	3.00	3.00	2.80	-	-	-	-	-	-	-	2.60	2.00	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Analyze and design analog and digital circuits for a given specifications and functions.
2. Design a variety of electronic systems for applications including signal processing communications, computer networks and control systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Explain radiation mechanism and basic antenna parameters.

CO2: Interpret wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and microstrip antennas.

CO3: Build different types of antenna arrays.

CO4: Demonstrate antenna measurements to know antenna's performance.

CO5: Identify the characteristics of radio wave propagation.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Analyze** the principle of radiation mechanism in antennas.	K4	CO1
2	**Solve** the directivity, efficiency and effective area of an antenna if its Rr=80Ω, Rl=10Ω.The power gain is 10 dB and antenna operates at a frequency 100MHz.	K4	CO1
3	**Identify** and define the terms: i) Effective length ii) Effective aperture area.	K1	CO1
	UNIT 2		
1	**Examine** the R_{rad} of a λ/2 dipole is 73Ω and derive it.	K4	CO2
2	**Identify** and derive the field equations from a small loop antenna?	K3	CO2
3	**Solve** the input power to the isotropic antenna which will radiate same field strength of the dipole for a half-wave dipole antenna is radiating 1KW and has a gain of 2.15dBi.	K4	CO2
4	**Identify** the concept of short magnetic dipole in dipole antennas and explain briefly.	K3	CO2
	UNIT 3		
1	**Analyze** the radiation pattern of a linear array of the three isotropic sources spaced λ/2 apart. The excitation of the sources is in-phase and have amplitude ratio 1:2:1.	K4	CO3
2	**Solve** an expression for the array factor for an N-element uniform linear array,.	K4	CO3
3	**Distinguish** between about Broadside and End-fire arrays.	K4	CO3
4	**Solve** the radiated power A broadside array operating at 100 cm wavelength consists of four half wave dipoles spaced 50 cm. Each element carries radio frequency current in the same phase and magnitude 0.5 Amp.	K4	CO3
	UNIT 4		
1	**Identify** the construction and operation of helical antenna under axial mode and explain briefly.	K3	CO4
2	**Analyze** the operation of Yagi - Uda array with a neat sketch and explain it.	K4	CO4

3	**Examine** the radiation mechanism in travelling wave radiator and explain.	**K4**	**CO4**
4	**Analyze** the important design parameters of parabolic reflector antenna	**K4**	**CO4**
5	**Utilize** the directivity and gain measurements in antenna.	**K3**	**CO4**
	UNIT 5		
1	**Analyze** the concept of Tropospheric wave propagation.	**K4**	**CO5**
2	**Develop** the MUF for the given path for a HF radio link has to be established between two points at a distance of 2500 Km on earth's surface considering the ionospheric height to be 200 Km and its critical frequency 5 MHz.	**K3**	**CO5**
3	**Analyze** the following terms in wave propagation: (i) Critical frequency (ii) MUF (iii) Skip Distance (iv) Virtual height	**K4**	**CO5**
4	**Solve** the range of LOS system when the receiver and transmitter antenna heights are 10m and 100m respectively. Take the effective earth's radius into consideration	**K4**	**CO5**

Model Question Paper-1

Code: 19BEC6TH01 **R19**

NARASARAOPETA ENGINEERING COLLEGE
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
B. Tech V Semester Regular Examinations
ANTENNAS AND WAVE PROPAGATION
ELECTRONICS AND COMMUNICATION ENGINEERING
[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 12 marks.

. S. No		Question	Cognitive Level	CO	Marks
1	a	**Analyze** the radiation mechanism from dipoles.	K4	1	6
	b	**Solve** the power gain of an antenna for given data .The HPBW radiation one plane are 600 and on orthogonal plane are 300. Antenna efficiency is 85%.	K3	1	6
		OR			
2	a	**Analyze** the characteristics of Antenna	K4	1	6
	b	**Identify** the relation between Maximum directivity and effective area.	K3	1	6
3	a	**Identify** the reciprocity theorem in antennas and prove it in case of antenna system.	K3	2	6
	b	**Solve** the maximum effective aperture of a microwave antenna whose operating frequency is 1GHz and directivity is 900?	K3	2	6
		OR			
4	a	**Analyze** the retarded potentials in antennas	K4	2	6
	b	**Make Use of** current distributions in Half wave Dipole Antenna.	K3	2	6
5	a	**Analyze** the Broadside and End-fire arrays.	K4	3	6
	b	**Solve** the radiated power for broadside array operating at 100 cm wavelength consists of four half wave dipoles spaced 50 cm. Each element carries radio frequency current in the same phase and magnitude 0.5 Amp.	K3	3	6
		OR			
6	a	**Analyze** the operation of End-fire array with increased directivity.	K4	3	6
	b	**Identify** the concept of pattern multiplication in Antenna arrays and	K3	3	6

		explain			
7	a	**Make use of** important parameters to design the parabolic reflector antenna	**K3**	**4**	**6**
	b	**Develop** the length of reflector element and driven element for a 6-element Yagi array for operation of 500 MHz with a folded dipole.	**K3**	**4**	**6**
		OR			
8	a	**Analyze** the directivity and gain measurements of an antenna	**K4**	**4**	**6**
	b	**Analyze** the working of Horn antenna	**K4**	**4**	**6**
9	a	**Analyze** the concept of Friss free space equation for wave propagation.	**K4**	**5**	**6**
	b	**Utilize** the concept of Ground wave and Space wave propagation in wave propagation.	**K3**	**5**	**6**
		OR			
10	a	**Utilize** the salient features of duct propagation and Tropospheric scattering in wave propagation.	**K3**	**5**	**6**
	b	**Solve** the range of LOS system when the receiver and transmitter antenna heights are 10m and 100m respectively. Take the effective earth's radius into consideration.	**K3**	**5**	**6**

Model Question Paper-2

Code: 19BEC6TH01 **R19**

NARASARAOPETA ENGINEERING COLLEGE
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
B. Tech V Semester Regular Examinations
ANTENNAS AND WAVE PROPAGATION
ELECTRONICS AND COMMUNICATION ENGINEERING
[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 12 marks.

S. No		Question	Cognitive Level	CO	Marks
1	a	**Examine** the relation between maximum directivity (D_{max}) and effective aperture A_e is $D_{max}=4\pi A_e/\lambda^2$ and derive it.	K4	1	6
	b	**Analyze** the concept of current distribution in thin wire antennas with suitable sketches.	K4	1	6
		OR			
2	a	**Make use of** Polarization in antennas.	K3	1	6
	b	**Identify** the Radiation resistance and Antenna Temperature in antennas and explain briefly.	K3	1	6
3	a	**Examine** R_{rad} of a $\lambda/2$ dipole is 73Ω and derive it.	K4	2	6
	b	**Solve** the input power to the isotropic antenna, which will radiate same field strength of the dipole for a half-wave dipole antenna is radiating 1KW and has a gain of 2.15dBi.	K3	2	6
		OR			
4	a	**Analyze** different antenna theorems.	K4	2	6
	b	**Identify** the radiation from small electric dipole and explain it.	K3	2	6
5	a	**Utilize** the principle of pattern multiplication for radiation pattern of 8 – isotropic elements fed in phase, spaced $\lambda/2$ apart.	K3	2	6
	b	**Analyze** the following concepts: i) Scanning arrays ii) Binomial arrays	K4	3	6
		OR			

6	a	**Identify** the different cases in two element arrays and explain briefly.		3	6
	b	**Distinguish** between Binomial and Phased arrays	K4	3	6
7	a	**List** the parameters and basic characteristics of Helical antenna and write the expressions for HPBW, BWFN, directivity and axial ratio.	K4	4	6
	b	**Analyze** the principle of formation of images in an active corner reflector antenna. Hence sketch the image formation for a 90^{O} corner reflector. Obtain array factor for 90^{O} corner reflector.	K4	4	6
		OR			
8	a	**Construct** and explain the working of lens antenna. List out its disadvantages.	K3	4	6
	b	**List** the different types of horn antennas and explain with suitable diagrams.	K4	4	6
9	a	**List** and explain any two types of fading normally encountered in radio wave propagation. How are the problems of fading overcome?	K4	5	6
	b	**Make use of** following concepts in wave propagation and explain them briefly: i) MUF ii) Virtual Height iii) Wave tilt	K3	5	6
		OR			
10	a	**Analyze** the concepts of Reflection and Refraction	K4	5	6
	b	**Identify** the Ionospheric abnormalities and explain them briefly.	K3	5	6

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Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electronics and Communication Engineering

COURSE INFORMATION SHEET

PROGRAMME: B. Tech Electronics and Communication Engineering	
COURSE: **GLOBAL POSITIONING SYSTEM**	Semester : **VII** CREDITS: **3**
COURSE CODE: **R16CC41OE18** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: **Communications**	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16CC1102	**Engineering Mathematics**	An ability to solve ordinary and partial differential equations.	**I**
R16EC2103	**Signals & Systems**	Basic knowledge of signals and systems are required.	**III**
R16EC2204	**Analog Communications**	Knowledge of modulation and transmission of analog signals is required	**IV**
R16EC3102	**Digital Communications**	Knowledge of modulation and transmission of digital signals are required	**V**
R16EC3103	**Digital Signal Processing**	Basic knowledge on processing of digital signals and LTI systems are required.	**VI**

COURSE OUTCOMES:

SNO	Course Outcome Statement	Knowledge Level
CO1	State the Space-segment, Control segment and User segment.	**K1**
CO2	Infer GPS observables.	**K2**
CO3	Identify how GPS is used for surveying.	**K1**
CO4	Process the GPS data using different methods.	**K3**
CO5	Identify the application areas of GPS.	**K1**
CO6	Interpret the Hardware and Software improvements for future GPS.	**K2**

SYLLABUS:

UNIT	DETAILS
I	**OVERVIEW OF GPS:** Basic concepts, Space segment- constellation, satellites, operational capabilities, denial of accuracy and access. Control segment- master control station, monitor stations, ground control stations. User segment- user categories, receiver types, information services.
II	**GPS OBSERVABLES:** Data acquisition- code pseudoranges, phase psecudoranges, Doppler data, biases and noise. Data combinations- linear phase combinations, code, psecudorange smoothing. Atmospheric effects- phase and group velocity, ionospheric refraction, toposoheric refraction, atmospheric monitoring. Reletivitistic effects- special relativity, general relativity, relevant relativistic effects of GPS. Antenna Phase center offset and variation. Multipath- general remarks, mathematical model, multipath reduction.

III	**SURVEYING WITH GPS:** Introduction- terminology definitions, observation techniques, field equipment. Planning a GPS survey- General remarks, Pre survey planning, field reconnaisence, monumentation, organizational design. Surveying Procedure- preobservation, observation, postobservation, ties to control monuments. In Situ data Processing data transfer, data processing, trouble shooting and quality control, datum transformations, computation of plane coordinates, Survey report.
IV	**METHODS OF PROCESSING GPS DATA:** Data processing- data handling, cycle slip detection and repair. Ambiguity resolutions- general aspects, basic approaches, search techniques, ambiguity validation. Adjustment, filtering and smoothening- least squares adjustments, kalmal filtering, smoothening. Network adjustment- single base line solution, multipoint solution, single base line versus multi point solution, least squares adjustment of base lines. Dilutin of precision. Accuracy measures- introduction, chi-square distribution, specifications.
V	**APPLICATIONS OF GPS**: General Uses of GPS- global uses, regional uses, local uses. Attitude determination- theoretical and practical considerations. Air borne GPS for photo control. Interoperability of GPS, GPS and inertial navigation systems, GPS and GLONASS, GPS and other sensors.
VI	**FUTURE OF GPS:** New application aspects. GPS modernization- future GPS satellites, augmented signal structure. GPS augmentation- ground based and satellite based augmentation. GNSS - GNSS development, GNSS/Loran-C integration. Hardware and software improvements.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	"GPS theory and practice"/ B. Hofmann- Wellnhoff , H. Lichtenegger and J. Collins/ Fifth edition, Springer-Verlag Wien, Newyork, 2001.
T2	"Global Positioning System: Theory and Applications"/ Bradford W. Parkinson, James Spilker / Vol. I, 1996.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	"Satellite Geodesy Foundations, Methods and Applications"/ 1. Gunter Seeber / Walter de Gruyter publications, 2003.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Mathematical models for positioning	PO1,PO2
2	Advanced applications of GPS	PSO1,PSO2

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/105107121/2
2	https://nptel.ac.in/courses/105107157/
3	https://www.youtube.com/watch?v=BqjpQZqykKA
4	https://www.youtube.com/watch?v=zlPVXEAXpMI

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ Chalk & Talk	☑ PPT	☐ Active Learning
☑ Web Resources	☑ Students Seminars	☐ Case Study
☐ Blended Learning	☑ Quiz	☐ Tutorials
☐ Project based learning	☐ NPTEL/MOOCS	☐ Simulation
☐ Flipped Learning	☐ Industrial Visit	☐ Model Demonstration
☐ Brain storming	☐ Role Play	☐ Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C416.1		3	1	1	–	–	–	–	–	–	–	2	–	3
C416.2	3	3	2	2	–	–	–	–	–	–	–	2	–	3
C416.3	3	3	2	2	–	–	–	–	–	–	–	2	–	3
C416.4	3	3	2	2	3	–	–	–	–	–	–	2	–	3
C416.5	3	3	3	2	–	–	–	–	–	–	–	2	–	3
C416.6	3	3	3	3	–	–	–	–	–	–	–	2	–	3
Average	3	3	2.5	2.33	3	–	–	–	–	–	–	2	–	3

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C416	3	3	2.5	2.33	3	–	–	–	–	–	–	2	–	3

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 50% and < 60% marks of allocated marks for that CO	Student secured ≥40% and < 50% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades S* & A* in External Exam	Student secured grades B* & C* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predict, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: State the Space segment, Control segment and User segment. **[K1]**
CO2: Infer GPS observables. **[K2]**
CO3: Know how GPS is used for surveying. **[K1]**
CO4: Process the GPS data using different methods. **[K3]**
CO5: Identify the application areas of GPS. **[K1]**
CO6: Interpret the Hardware and Software improvements for future GPS. **[K2]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**What** is JPO? **Explain** the global system segments managed by the JPO.	K1 & K2	CO1
2	**What** is the necessity Master control station in control segment.	K1	CO1
3	**Classify** GPS receivers.	K2	CO1
	UNIT 2		
1	**Explain** the relativistic effects for GPS.	K2	CO2
2	**How** the multipath effect on carrier phases is estimated?	K1	CO2
3	**Develop** the relation between Phase and group velocity under atmospheric velocity.	K3	CO2
	UNIT 3		
1	**Define** code range and carrier phase.	K1	CO3
2	**Explain** Surveying techniques in GPS	K2	CO3
3	**What** is preplanning survey? **Explain.**	K1 & K2	CO3
	UNIT 4		
1	**Explain** the terms adjustment, filtering, and smoothing.	K2	CO4
2	**Identify** and **Explain** any three ambiguity Resolution techniques.	K3 & K2	CO4
3	**Compare** single baseline versus multipoint solution in network adjustment.	K2	CO4
	UNIT 5		
1	**List** the general uses of GPS.	K1	CO5
2	**Explain** installation controlling methods.	K2	CO5
3	**Compare** GPS with GLONASS	K2	CO5
	UNIT 6		
1	**What** are the future satellite systems? **Explain** their advantages.	K1 & K2	CO6
2	**Explain** GPS augmentation system.	K2	CO6
3	**What** are the hardware and software improvements?	K1	CO6

Model Question Paper-I

Code: R16CC410318 R16

Narasaraopeta Engineering College

(Autonomous)

Yallmanda (Post), Narasaraopet- 522601

IV B. Tech., I Semester Regular Examinations

GLOBAL POSITIONING SYSTEM

ELECTRONICS & COMMUNICATIONS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions

S No		Question	Cognitive Level	CO	Marks
1	a	**Classify** GPS receivers.	K2	1	2
	b	**What** is the relation between Phase and group velocity under atmospheric velocity.	K1	3	2
	c	**Define** code range and carrier phase.	K1	3	2
	d	**Explain** the terms adjustment.	K2	4	2
	e	**List** the general uses of GPS.	K1	5	2
	f	**Explain** GPS augmentation system.	K2	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	**Explain** in detail about Control segment master control and monitor stations?	K2	1	6
	b	**Explain** Space segment constellation in detail.	K2	1	6
3	a	**Compare** code pseudoranges, phase psecudoranges in detail	K2	2	4
	b	**Explain** atmospheric effects phase and group velocity, ionospheric refraction, toposoheric refraction, atmospheric monitoring.	K2	2	8
4	a	**What** are the steps in Surveying Procedure of GPS	K1	3	6
	b	**Explain** about data processing, trouble shooting and quality control, datum transformations.	K2	3	6
5	a	**Explain** cycle slip detection and repair.	K2	5	6
	b	**What** is least squares adjustments and explain about kalmal filtering, smoothening.	K1	5	6
6	a	**Explain** Attitude determination by theoretical and practical considerations.	K2	6	6
	b	**Explain** Interoperability of GPS	K2	6	6
7	a	**What** are the future GPS satellites	K1	6	6
	b	**Explain** GNSS/Loran-C integration	K2	6	6

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Model Question Paper-II

Code: R16CC410318

R16

Narasaraopeta Engineering College

(Autonomous)

Yallmanda (Post), Narasaraopet- 522601

IV B. Tech., I Semester Regular Examinations

GLOBAL POSITIONING SYSTEM

ELECTRONICS & COMMUNICATIONS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S. No		Question	Cognitive Level	CO	Marks
1	a	**What** is JPO?	K1	1	2
	b	**Explain** the global system segments managed by the JPO.	K2	1	2
	c	**Define** code range and carrier phase.	K1	4	2
	d	**Name** three ambiguity Resolution techniques.	K1	5	2
	e	**List** any three differences between GPS with GLONASS	K1	5	2
	f	**What** are the future satellite systems?	K1	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	**Explain** monitor station in control segment	K2	1	6
	b	**What** are the operational capabilities of Space station	K1	1	6
3	a	**Explain** Antenna Phase center offset and variation.	K2	2	6
	b	**What** are datum transformations, computation of plane coordinates.	K1	2	6
4	a	**Explain** Pre survey planning.	K2	4	6
	b	**Explain** organizational design in detail	K2	3	6
5	a	**Explain** basic approaches for Ambiguity resolutions.	K2	5	6
	b	**Explain** about single base line solution, multipoint solution	K2	5	6
6	a	**What** are the uses of GPS	K1	6	6
	b	**Explain** inertial navigation systems in GPS	K2	6	6
7	a	**Explain** about augmented signal structure	K2	6	6
	b	**Explain** ground based and satellite based augmentation	K2	6	6

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Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electronics and Communication Engineering
COURSE INFORMATION SHEET

PROGRAMME: B. Tech Electronics and Communication Engineering	
COURSE: **Wireless Sensor Networks**	Semester : **VIII** CREDITS: **3**
COURSE CODE: **R16EC4202** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: **Communications**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EC2204	Analog Communications	Knowledge of modulation and transmission of analog signals are required	IV
R16EC3102	Digital Communications	Knowledge of modulation and transmission of digital signals are required	V
R16EC4103	Computer Networks	Knowledge of OSI layers and protocols	VII

COURSE OUTCOMES:

SNO	Course Outcome Statement	Knowledge Level
CO1	Define wireless sensor networks and the key components.	**K1**
CO2	Illustrate various physical and wireless MAC layers.	**K2**
CO3	Analyze different Ad hoc routing protocols.	**K3**
CO4	Recall about transport layer protocols and challenges for providing QOS.	**K4**
CO5	Demonstrate the security issues in wireless sensor networks and WSN applications.	**K2**
CO6	Model real time applications based on concepts of wireless sensor networks	**K3**

SYLLABUS:

UNIT	DETAILS
I	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Introduction to sensor networks, Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints and challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.
II	**ARCHITECTURES AND NETWORKING TECHNOLOGIES** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network, Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts. Physical Layer and Transceiver design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs and WANETs

III	**MAC PROTOCOLS FOR WIRELESS SENSOR NETWORKS** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols
IV	**ROUTING PROTOCOLS** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.
V	**TRANSPORT LAYER AND SECURITY PROTOCOLS** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks,
VI	**SECURITY IN WSNs AND APPLICATIONS OF WANs** Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Ultra wide band radio communication, Wireless fidelity systems. Futuredirections, Home automation, smart metering Applications

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	C. Siva Ram Murthy and B. S. Manoj, —Ad Hoc Wireless Networks: Architectures and Protocols‖, PHI 2004.
T2	. Holger Karl & Andreas Willig, —Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
T3	Feng Zhao & Leonidas J. Guibas, —Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
	Jagannathan Sarangapani, —Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control‖, CRC Press, 2007
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R 1	Kazem Sohraby, Daniel Minoli, & Taieb Znati, —Wireless Sensor Networks- Technology, Protocols, and Applications‖, John Wiley, 2007.
R 2	C.K. Toh, —Ad- Hoc Mobile Wireless Networks: Protocols & Systems‖, 1st Edition, Pearson Education, 2007.
R 3	C. S. Raghavendra, Krishna M. Sivalingam,‖Wireless Sensor Networks‖, 2004, Springer.
	S Anandamurugan, —Wireless Sensor Networks‖, Lakshmi Publications, 2010.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Wireless sensor networks with OFDM.	PO5, PSO2
2	Introduction to WSN in cryptography.	PO1,PO3, PSO1, PSO2

WEB SOURCE REFERENCES:

1	http://nptel.ac.in/courses/Modernwirelesssensornetworks.
2	http://nptel.ac.in/courses/Information Theory, Coding &Cryptography.

3	Mat Lab-https://in.mathworks.com/products/matlab.html

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	-	-	-	-	-	-	-	1	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	3
CO3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	1	-	2
CO5	3	3	2	2	1	-	-	-	-	-	-	1	-	2
CO6	3	3	2	2	-	-	-	-	-	-	-	-	-	2
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	1.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Wireless Sensor Networks	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	1.00	-	2.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades S* & A* in External Exam	Student secured grades B* & C* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
*** Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%**					

Course Coordinator | Module Coordinator | Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
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Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit Wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1: Define wireless sensor networks and the key components.. **[K1]**
CO2: Illustrate various physical and wireless MAC layers.. **[K2]**
CO3: Analyze different Ad hoc routing protocols. **[K3]**
CO4: Recall about transport layer protocols and challenges for providing QOS.. **[K4]**
CO5: Demonstrate the security issues in wireless sensor networks and WSN applications.. **[K2]**
CO6: Model real time applications based on concepts of wireless sensor networks. **[K2]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Explain** Key definitions of sensor networks	K1	CO1
2	**What** are the Advantages of sensor Networks	K1	CO1
3	**Explain** Unique constraints and challenges, Driving Applications	K2	CO1
	UNIT 2		
1	**Explain the** Hardware Components, Energy Consumption of Sensor Nodes.	K3	CO2
2	**Explain** Operating Systems and Execution Environments.	K2	CO2
3	**Show** Network Architecture -Sensor Network, Scenarios.	K2	CO2
	UNIT 3		
1	**Explain** the Classifications of MAC Protocols	K2	CO4
2	**How** MAC Protocols that use Directional Antennas	K1	CO4
3	**Find** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks.	K1	CO3
	UNIT 4		
1	**What are** issues in Designing a Routing Protocol for Ad Hoc Wireless Networks.	K1	CO3
2	**Define** Routing Protocols	K1	CO3
3	**Explain** hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms.	K2	CO3
	UNIT 5		
1	**Find** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks.	K1	CO3
2	**What** Classification of Transport Layer Solutions	K1	CO3

3	**Explain** Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks.	K2	CO3
	UNIT 6		
1	**Explain** Security in Ad Hoc Wireless Networks.	K2	CO4
2	**Find** Network Security Requirements.	K3	CO4
3	**Define** network Security Attacks, Key Management.	K1	CO4

Model Question Paper-I

Code: R16EC4202 **R16**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III B. Tech I Semester Regular Examinations

DIGITAL COMMUNICATIONS

ELECTRONICS & COMMUNICATIONS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs. **Max. Marks: 60**

Note: **1. Question Paper consists of two parts (Part-A and Part-B)**
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	**Explain** Key definitions of sensor networks	K1	1	2
	b	**Explain the** Hardware Components, Energy Consumption of Sensor Nodes	K3	2	2
	c	**Explain** the Classifications of MAC Protocols	K2	4	2
	d	**What are** issues in Designing a Routing Protocol for Ad Hoc Wireless Networks	K1	5	2
	e	**Find** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks	K2	5	2
	f	**Explain** Security in Ad Hoc Wireless Networks	K2	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	**What** are the Advantages of sensor Networks	K1	1	6
	b	**Explain** Unique constraints and challenges, Driving Applications	K2	1	6
3	a	**Explain** Operating Systems and Execution Environments.	K2	2	6
	b	**Show** Network Architecture -Sensor Network, Scenarios.	K2	2	6
4	a	**How** MAC Protocols that use Directional Antennas	K1	4	6
	b	**Find** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks.	K1	3	6
5	a	**Define** Routing Protocols	K1	5	6
	b	**Explain** hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms.	K2	5	6
6	a	**What** Classification of Transport Layer Solutions	K1	6	6
	b	**Explain** Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks.	K2	6	6
7	a	**Find** Network Security Requirements.	K3	6	6
	b	**Define** network Security Attacks, Key Management.	K1	6	6

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Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electronics and Communication Engineering
COURSE INFORMATION SHEET

PROGRAMME: B. Tech Electronics and Communication Engineering	
COURSE: **Wireless Sensor Networks**	Semester : **VIII** CREDITS: **3**
COURSE CODE: **R16EC4202** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: **Communications**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EC2204	Analog Communications	Knowledge of modulation and transmission of analog signals are required	IV
R16EC3102	Digital Communications	Knowledge of modulation and transmission of digital signals are required	V
R16EC4103	Computer Networks	Knowledge of OSI layers and protocols	VII

COURSE OUTCOMES:

SNO	Course Outcome Statement	Knowledge Level
CO1	Define wireless sensor networks and the key components.	K1
CO2	Illustrate various physical and wireless MAC layers.	K2
CO3	Analyze different Ad hoc routing protocols.	K3
CO4	Recall about transport layer protocols and challenges for providing QOS.	K4
CO5	Demonstrate the security issues in wireless sensor networks and WSN applications.	K2
CO6	Model real time applications based on concepts of wireless sensor networks	K3

SYLLABUS:

UNIT	DETAILS
I	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Introduction to sensor networks, Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints and challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.
II	**ARCHITECTURES AND NETWORKING TECHNOLOGIES** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network, Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts. Physical Layer and Transceiver design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs and WANETs

III	**MAC PROTOCOLS FOR WIRELESS SENSOR NETWORKS** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols
IV	**ROUTING PROTOCOLS** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.
V	**TRANSPORT LAYER AND SECURITY PROTOCOLS** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks,
VI	**SECURITY IN WSNs AND APPLICATIONS OF WANs** Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks. Ultra wide band radio communication, Wireless fidelity systems. Futuredirections, Home automation, smart metering Applications

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	C. Siva Ram Murthy and B. S. Manoj, —Ad Hoc Wireless Networks: Architectures and Protocols‖, PHI 2004.
T2	. Holger Karl & Andreas Willig, —Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
T3	Feng Zhao & Leonidas J. Guibas, —Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
	Jagannathan Sarangapani, —Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control‖, CRC Press, 2007
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R 1	Kazem Sohraby, Daniel Minoli, & Taieb Znati, —Wireless Sensor Networks- Technology, Protocols, and Applications‖, John Wiley, 2007.
R 2	C.K. Toh, —Ad- Hoc Mobile Wireless Networks: Protocols & Systems‖, 1st Edition, Pearson Education, 2007.
R 3	C. S. Raghavendra, Krishna M. Sivalingam,‖Wireless Sensor Networks‖, 2004, Springer.
	S Anandamurugan, —Wireless Sensor Networks‖, Lakshmi Publications, 2010.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Wireless sensor networks with OFDM.	PO5, PSO2
2	Introduction to WSN in cryptography.	PO1,PO3, PSO1, PSO2

WEB SOURCE REFERENCES:

1	http://nptel.ac.in/courses/Modernwirelesssensornetworks.
2	http://nptel.ac.in/courses/Information Theory, Coding &Cryptography.

3	Mat Lab-https://in.mathworks.com/products/matlab.html

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	-	-	-	-	-	-	-	1	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	3
CO3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	1	-	2
CO5	3	3	2	2	1	-	-	-	-	-	-	1	-	2
CO6	3	3	2	2	-	-	-	-	-	-	-	-	-	2
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	1.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Wireless Sensor Networks	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	1.00	-	2.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades S* & A* in External Exam	Student secured grades B* & C* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

*** Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%**

Course Coordinator | Module Coordinator | Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predict, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit Wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1: Define wireless sensor networks and the key components.. **[K1]**
CO2: Illustrate various physical and wireless MAC layers.. **[K2]**
CO3: Analyze different Ad hoc routing protocols. **[K3]**
CO4: Recall about transport layer protocols and challenges for providing QOS.. **[K4]**
CO5: Demonstrate the security issues in wireless sensor networks and WSN applications.. **[K2]**
CO6: Model real time applications based on concepts of wireless sensor networks. **[K2]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Explain** Key definitions of sensor networks	K1	CO1
2	**What** are the Advantages of sensor Networks	K1	CO1
3	**Explain** Unique constraints and challenges, Driving Applications	K2	CO1
	UNIT 2		
1	**Explain the** Hardware Components, Energy Consumption of Sensor Nodes.	K3	CO2
2	**Explain** Operating Systems and Execution Environments.	K2	CO2
3	**Show** Network Architecture -Sensor Network, Scenarios.	K2	CO2
	UNIT 3		
1	**Explain** the Classifications of MAC Protocols	K2	CO4
2	**How** MAC Protocols that use Directional Antennas	K1	CO4
3	**Find** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks.	K1	CO3
	UNIT 4		
1	**What are** issues in Designing a Routing Protocol for Ad Hoc Wireless Networks.	K1	CO3
2	**Define** Routing Protocols	K1	CO3
3	**Explain** hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms.	K2	CO3
	UNIT 5		
1	**Find** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks.	K1	CO3
2	**What** Classification of Transport Layer Solutions	K1	CO3

3	**Explain** Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks.	**K2**	**CO3**
	UNIT 6		
1	**Explain** Security in Ad Hoc Wireless Networks.	**K2**	**CO4**
2	**Find** Network Security Requirements.	**K3**	**CO4**
3	**Define** network Security Attacks, Key Management.	**K1**	**CO4**

Model Question Paper-I

Code: R16EC4202 **R16**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III B. Tech I Semester Regular Examinations

DIGITAL COMMUNICATIONS

ELECTRONICS & COMMUNICATIONS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs. **Max. Marks: 60**

Note: **1. Question Paper consists of two parts (Part-A and Part-B)**
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	**To study the Question Paper and choose to attempt**	5
2	**Part-A 5 Minutes x 6 Questions**	30
3	**Part-B 35 Minutes x 4 Questions**	140
4	**Quick revision & Winding up**	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S.No		Question	Cognitive Level	CO	Marks
1	a	**Explain** Key definitions of sensor networks	K1	1	2
	b	**Explain the** Hardware Components, Energy Consumption of Sensor Nodes	K3	2	2
	c	**Explain** the Classifications of MAC Protocols	K2	4	2
	d	**What are** issues in Designing a Routing Protocol for Ad Hoc Wireless Networks	K1	5	2
	e	**Find** Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks	K2	5	2
	f	**Explain** Security in Ad Hoc Wireless Networks	K2	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	**What** are the Advantages of sensor Networks	K1	1	6
	b	**Explain** Unique constraints and challenges, Driving Applications	K2	1	6
3	a	**Explain** Operating Systems and Execution Environments.	K2	2	6
	b	**Show** Network Architecture -Sensor Network, Scenarios.	K2	2	6
4	a	**How** MAC Protocols that use Directional Antennas	K1	4	6
	b	**Find** Issues in Designing a MAC protocol for Ad Hoc Wireless Networks.	K1	3	6
5	a	**Define** Routing Protocols	K1	5	6
	b	**Explain** hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms.	K2	5	6
6	a	**What** Classification of Transport Layer Solutions	K1	6	6
	b	**Explain** Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks.	K2	6	6
7	a	**Find** Network Security Requirements.	K3	6	6
	b	**Define** network Security Attacks, Key Management.	K1	6	6

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Department of Mechanical Engineering

NEC	**Narasaraopeta Engineering College** (Autonomous) Yallmanda (Post), Narasaraopet- 522601 **Department of Basic science and Humanities**

Course Information Sheet of ME Department

PROGRAMME: I B.Tech	
COURSE: **Engineering Physics**	Semester : I I CREDITS: **3**
COURSE CODE: **R20CC1203** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **S&H**
COURSE AREA/DOMAIN: **Physics**	PERIODS: 4 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	Engineering Physics	An ability to understand the basic concepts of Physics	**II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Utilise the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polaraisation in various fields. **(K3)**
CO2	Analyse and understand various types of lasers & optical fibers.**(K4)**
CO3	Identify the crystal structures and XRD techniques. **(K3).**
CO4	Apply the magnetic materials in engineering field. **(K3)**
CO5	Identify the various applications of semiconductors in engineering field. **(K3**

SYLLABUS:

UNIT	DETAILS
I	**Interference & Diffraction:** Introduction -Interference in thin films by reflection – Newton's rings, introduction to diffraction – difference between Fresnel's and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating. **Polarization:** Introduction – Types of Polarization – Double refraction – Nicol's prism- Quarter wave plate and Half Wave plate- Applications
II	**Lasers:** Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications. **Fiber Optics**: Introduction- Basic structure and Principle of optical fiber - Acceptance angle – cone - Numerical Aperture-Applications.
III	**Crystallography** : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC. **X-Ray Diffraction**: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.
IV	**Magnetic materials:** Magnetic dipole moment- Magnetization- Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, and Ferro – Hysteresis Loop- Soft and Hard magnetic materials – Applications of Magnetic materials **Superconductivity:** Introduction- Properties, Meissner effect - Type-I and Type-II super

	conductors- BCS theory (Qualitative) – AC and DC Josephson effects - Applications of Superconductors
V	**Acoustics**: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time – Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures. **Ultrasonics:** Introduction - Properties - Production by Magnetostriction and Piezoelectric methods – Non Destructive Testing (Qualitative) – Applications.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, Mc Millan India Ltd, First edition, 2000.
T2	M.N. Avadhanulu & P.G. Kshirasagar, "A text book of Engineering Physics", ISBN 81-219-0817-5, S. Chand publications, First Edition, 2011.
T3	P. K. Palanisamy, "Engineering Physics", ISBN: 9788183714464, Scitech Publishers, 4th Edition, 2014.
T4	M.R. Srinivasan, "Engineering Physics", ISBN978-81-224-3636-5, New Age international publishers, 2nd Edition,2014
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Charles Kittle, "Introduction to solid state physics" ISBN: 9788126578436, Willey India Pvt.Ltd, 5TH edition, 2012.
R2	M.Arumugam, "Applied Physics", ISBN: 81-89638-01-7, Anuradha Agencies, 4th edition, 2013.
R3	D.K.Bhattacharya, "Engineering Physics", ISBN: 0198065426, 9780198065425, Oxford University press, 2nd edition, 2010.
R4	Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics",. University Press ISBN: 8173716781,1st edition, 2010.
R5	B.K.Pandey & S. Chaturvedi "Engineering Physics" ISBN: 8131517616, Cengage Learning, 1st edition, 2012.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION
Unit-I	Conditions of sustained interference pattern, Newton's rings- Diameters of Dark and Bright rings, Wavelength of light. Differences between interference and Diffraction Optic axis and Principal section (Polarization)
Unit-II	Metastable state, Pumping (Laser), Structure of optical fiber, Fractional Refractive Index Change (optical fiber)
Unit-III	Primitive and non-primitive unit cell (Crystal structure) Limitation of Bragg's Law of X-Ray diffraction (X-Ray diffraction)
Unit-IV	Magnetic Dipole, magnetic field, magnetic flux, magnetic strength
Unit-V	Basic principle of NDT and Transmission method (Ultrasonics)

WEB SOURCE REFERENCES:

UNIT-I	https://www.youtube.com/watch?v=CAe3lkYNKt8, https://www.youtube.com/watch?v=xjMjWtntm9k , https://youtu.be/PU-SeNfIRcs https://youtu.be/-mNQW5OShMA https://www.youtube.com/watch?v=h9xx3pXFW-g https://www.youtube.com/watch?v=EUA8KYv-je4 https://www.youtube.com/watch?v=6_C8KyU67RU https://www.youtube.com/watch?v=Fu-aYnRkUgg https://www.youtube.com/watch?v=bSx-KcJg5cg
UNIT-II	https://www.youtube.com/watch?v=WgzynezPiyc https://www.youtube.com/watch?v=BKVMw4jpDZw https://www.youtube.com/watch?v=djIzXvwIz5U https://www.youtube.com/watch?v=RyY4PEpV2RQ https://www.youtube.com/watch?v=k1mrNrjDJwc https://www.youtube.com/watch?v=VG4t0detuWw https://www.youtube.com/watch?v=Wh9knsYSodI
UNIT-III	https://www.youtube.com/watch?v=BjVTdZ_htu8 https://www.youtube.com/watch?v=CsnNbuqxGTk https://www.youtube.com/watch?v=n84gzYlB0BQ https://www.youtube.com/watch?v=zpRBpSMqJXc
UNIT-IV	https://www.youtube.com/watch?v=UBTk1eru3Tc https://www.youtube.com/watch?v=JgSXQorBQSk https://www.youtube.com/watch?v=O2sz0VYqs-o
UNIT-V	https://www.youtube.com/watch?v=zdmEaXnB-5Q https://www.youtube.com/watch?v=qt8E3YmA-Cs https://www.youtube.com/watch?v=qt8E3YmA-Cs https://www.youtube.com/watch?v=qt8E3YmA-Cs https://www.youtube.com/watch?v=VMZKkb1TeCk https://www.youtube.com/watch?v=s6rQI7t9XM4 https://www.youtube.com/watch?v=wpAA3qeOYiI

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

■ Chalk & Talk	■ PPT	■ Active Learning
■ Web Resources	■ Students Seminars	☐ Case Study
☐ Blended Learning	☐ Quiz	■ Tutorials
☐ Project based learning	■ NPTEL/MOOCS	☐ Simulation
☐ Flipped Learning	☐ Industrial Visit	☐ Model Demonstration
☐ Brain storming	☐ Role Play	■ Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C11.1	3	3	-	2	2	-	-	-	-	-	-	2	2	-	-
C11.2	3	3	-	2	2	-	-	-	-	-	-	2	2	-	-
C11.3	3	3	-	2	2	-	-	-	-	-	-	2	2	-	-
C11.4	3	3	-	2	2	-	-	-	-	-	-	2	2	-	-
C11.5	3	3	-	2	2	-		-	-	-	-	2	2	-	-
Average	3.00	3.00	-	2.00	2.00	-	-	-	-	-	-	2.00	2.00	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C115	3.00	3.00	-	2.00	2.00	-	-	-	-	-	-	2.00	2.00	-	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator

Module Coordinator

Head of the Department

NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Mechanical Engineering & Civil Engineering	
COURSE: **ENGINEERING MECHANICS**	Year/Sem : **I/II** CREDITS: **3**
COURSE CODE: **19BCC2TH11** REGULATION: **R19**	COURSE TYPE (**CORE** /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **DESIGN**	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	Year/SEM
	Engineering Mathematics	Vectors, differential equations and integrations	**I/I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Apply** the principles of mechanics to determine the resultant of several concurrent forces acting on a particle. [K_3]
CO2	**Analyze** the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges. [K_4]
CO3	**Illustrate** the centroid and center of gravity bodies and composite sections. [K_4]
CO4	**Determine** the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and composite sections.[K_4]
CO5	**Apply** the work-energy principle to particles and connected systems for engineering applications. [K_3]

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION TO ENGINEERING MECHANICS:** Basic Concepts, Characteristics of a Force, Force system classification, Resultant of Force Systems, parallelogram law of forces, Triangle of forces. **SYSTEMS OF FORCES:** Resolution of forces, Coplanar Concurrent forces, Moment of Force and its Application – Couples, Varignon's theorem. **EQUILIBRIUM OF SYSTEMS OF FORCES:** Equations of Equilibrium of Coplanar concurrent, Lami's Theorem, support reactions, free body diagrams.
II	**ANALYSIS OF PLANE TRUSSES:** Definition, Assumptions made in the analysis of plane trusses-methods of joints and method of sections. **FRICTION:** Introduction, Classification of friction, Laws of Friction, Coefficient of Friction, Angle of Friction, Angle of Repose, Motion of a body on an Inclined Plane, Ladder friction, Wedge friction.
III	**CENTROID:** Centroids of simple figures (from basic principles)-Centroids of composite figures.

	CENTRE OF GRAVITY: Centre of Gravity of simple body (from basic principles), Centre of gravity of composite bodies, pappu's theorem.
IV	**AREA MOMENTS OF INERTIA:** Definition, Radius of gyration, Parallel axis theorem, perpendicular axis theorem, Moments of Inertia of composite figures, polar moment of Inertia. **MASS MOMENT OF INERTIA:** Moment of Inertia of Rigid body-Moment of Inertia from basic principles-Slender bar, Rectangular Plate, Circular Plate, Moment of Inertia of 3D Bodies-Cone, Solid Cylinder.
V	**KINETICS:** Analysis as a particle, Newton's laws of motion, D'Alembert's principle –simple applications- analysis as a rigid body in translation-fixed axis rotation-Simple applications. **WORK-ENERGY METHOD:** Equations for Translation, work-Energy applications to particle motion, connected system-Impulse momentum method-simple applications.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Engineering Mechanics by S.Timoshenko & D.H.Young., 4th Edn - ,Mc Graw Hill publications
T2	Engineering Mechanics by S.S. Bhavikatti-New age publications
T3	Engineering Mechanics Statics and Dynamics A.K.TAYAL Umesh publications.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Engineering Mechanics by Fedinand . L. Singer , Harper – Collins.
R2	Mechanics of Materials (In Si Units) by Beer and Johnson, Tata McGraw-Hil.
R3	Strength of Materials (Mechanics of Materials) by James M.Gere and Barry J.Goodno, PWS-KENT Publishing Company, 1990
R4	Strength of Materials (Mechanics of Solids) by R.K. Rajput , S.Chand Publications.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	vibrations	PO3, PO4,PSO3
2	Balancing	PO3,PO4, PSO3

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/112103109/14.
2	https://nptel.ac.in/courses/112103109/11
3	https://nptel.ac.in/courses/122104014/4
4	https://easyengineering.net/engineeringmechanicsbooks/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ Chalk & Talk	✓ PPT	✓ Active Learning
✓ Web Resources	✓ Students Seminars	☐Case Study
✓ Blended Learning	✓ Quiz	✓ Tutorials
✓ Project based learning	✓ NPTEL/MOOCS	✓ Simulation
☐Flipped Learning	☐Industrial Visit	✓ Model Demonstration
✓Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3
CO2	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3
CO3	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3
CO4	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3
CO5	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3
Average	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
19BCC2TH11	2	2	-	2	1	-	-	-	-	-	-	1	-	-	3

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≤ 60% and >50% marks of allocated marks for that CO	Student secured ≤ 50% and >40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

COURSE INSTRUCTOR: DR.D.SUNEEL & CH.SEKHAR

Course Coordinator **Module Coordinator** **Head of the Department**

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopeta- 522601** **Department of Mechanical Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B. Tech Mechanical Engineering	
COURSE: **THERMODYNAMICS**	Semester: III CREDITS: **3**
COURSE CODE: **19BME3TH05** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **THERMAL**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

Course Code	Course Name	Description	Semester
19BCC1TH02	Engineering Physics	Knowledge of basic laws of physics	I
19BCC2TH02	Differential Equations & Vector Calculus	Knowledge of basic mathematics and differential equations	II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Illustrate** the concepts of heat, work, and forms of energy
CO2	**Classify** various thermal systems using thermodynamic laws and principles.
CO3	**Apply** the laws of thermodynamics for various thermodynamic systems.
CO4	**Evaluate** the performance parameters of pure substances and gas mixtures.
CO5	**Analyze** different thermodynamic cycles and estimate work done and performance

SYLLABUS:

UNIT	DETAILS
I	**BASIC CONCEPTS AND DEFINITIONS:** Thermodynamic fundamentals, Thermodynamic equilibrium and Quasi-static Process, thermodynamic path, cycle, Work and Heat, work done in various non-flow processes. **ZEROTH LAW OF THERMODYNAMICS:** Temperature Scales, Temperature measurement, Constant Volume Gas Thermometer, Advantages of gas thermometers over liquid thermometers
II	**FIRST LAW:** First law of thermodynamics for a system undergoing a cycle and for a change in state. First Law Analysis of Closed System, Thermodynamic processes, Different forms of stored energy, Energy-Forms of Energy, PMM-I. **FIRST LAW FOR FLOW SYSTEMS:** Steady flow energy equation and applications, limitations of first law of thermodynamics
III	**SECOND LAW OF THERMODYNAMICS:** Introduction, Thermal Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps, Kelvin-Planck & Clausius Statements of Second law of Thermodynamics, , Equivalence of Kelvin-Plank and Clausius Statements, PMM II, Differences between reversible and Irreversible Process, Carnot Cycle, Carnot Theorem. **ENTROPY:** Introduction, temperature-entropy Plot, Principle of increase of entropy, Entropy Change for Ideal gases, Applications of Entropy.
IV	**PURE SUBSTANCES:** Pure substance, vapour-liquid-solid phase equilibrium in a pure substance, Independent properties of a pure substance, Equations of state for vapour phase of a simple compressible substance, Tables of thermodynamic properties, thermodynamic surfaces. MIXTURES OF **PERFECT GASES**– Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive.
V	**POWER CYCLES:** Carnot, Otto, Diesel, Dual cycles– Description and representation on P-V and TS diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles, Brayton and Rankine cycles.

	REFRIGERATION CYCLES: Reversed Carnot cycle - Performance Evaluation, VCR system, BellColeman cycle.

TEXTBOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Thermodynamics An Engineering Approach– Y. A. Cengel & M. A. Boles, TMH, 6th Edition, New Delhi, 2010..
T2	Fundamentals of Classical Thermodynamics – G. Van Wylen, R.Sonntag, C.Borgnakke, John Wiley & Sons(Asia) Pvt Ltd., 4th Edition, 1997.
T3	Engineering Thermodynamics- P.K.Nag, TMH, New Delhi, 2009
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Thermal Engineering -Rajput, LaxmiPubl, New Delhi, 2012..
R2	Thermal Engineering – M.M. Rathore, TMH, New Delhi,2010
R3	Thermodynamics – J.P.Holman, 4th Edition, MGH, New York, 2002
R4	Engineering Thermodynamics by P.Chattopadhyay, Oxford Higher Edn Publications

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Heat Pipe Technology	PO5, PSO2
2	Introduction to Mass transfer	PO1,PO3, PSO3

WEB SOURCE REFERENCES:

1	www.nptel.iitm.ac.in
2	ww.sciencedirect.com
3	www.2.accessengineeringlibrary.com.
4	www.asmedl.aip.org
5	www.ieee.org/ieeexplore

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐Power Point Presentations	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Mechanical Engineering	
COURSE: **KINEMATICS OF MACHINERY**	Semester : **II-II** CREDITS: **3**
COURSE CODE: **19BME4TH01** REGULATION: **Autonomous**	COURSE TYPE (CORE /ELECTIVE / BREADTH / S&H) : **CORE**
COURSE AREA/DOMAIN: **DESIGN & ANALYSIS**	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CC1107	Engineering Mechanics	An ability to understand the Kinematics and Dynamics	I-II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Illustrate** the various types of kinematic links, kinematic joints & mechanisms.
CO2	**Interpret** the various types of lower pair mechanisms.
CO3	**Construct** the velocity and acceleration diagram of different mechanisms.
CO4	**Construct** the different CAM profiles.
CO5	**Demonstrate** the Gears and Gear Trains

SYLLABUS:

UNIT	DETAILS
I	**MECHANISMS:** Elements or Links – Classification of Links – Types of kinematic pairs –Types of constrained motion. Gubralrs criteria, Grashoff's law, Degrees of freedom, Kutzbach criterion for planar mechanisms **MECHANISM AND MACHINES:** Classification of machines – kinematic chain – inversion of mechanism– inversions of quadric cycle, chain – single and double slider crank chains.
II	**LOWER PAIR MECHANISM:** Exact and approximate copiers and generated types - Peaucellier, Hart and Scott Russul - Grasshopper - Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph. Conditions for correct steering - Davis Steering gear, Ackermans steering gear - velocity ratio; Hooke's Joint: Single and double - Universal coupling- application-problems.
III	**KINEMATICS:** Velocity and acceleration – Motion of a link in machine –Determination of Velocity and acceleration diagrams – Graphical method –Application of relative velocity method four bar

	chain. Velocity and acceleration analysis of a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration. Plane motion of body. **INSTANTANEOUS CENTER OF ROTATION:** centroids and axodes– relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.
IV	**CAMS:** Definitions of cam and followers – their uses – Types of followers and cams– Terminology – Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. Analysis of motion of Roller follower
V	**GEAR:** Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, velocity of sliding –phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact. **GEAR TRAINS:** Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio –Epicyclic gear trains.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	S.S.Ratan, Theory of Machines, Mc. Graw Hill Publ.
T2	Thomas Bevan,Theory of Machines ,CBS Publishers & Distributors
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Sadhu Singh ,Theory of Machines , Pearsons Education
R2	Khurmi,Theory of machines ,S.Chand publications
R3	Ashok G. Ambedkar ,Mechanism and machine theory , PHI Publications

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Tangent Cams	PO1, PO2,PO3, PO5 & PSO1
2	Relative Velocity Method	PO1, PO2,PO3, PO5 & PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/112104121/
2	https://www.slideshare.net/senthilkumar1311/kinematics-of-machinery
3	https://www.amazon.in/Kinematics-Machinery-Ramachandran-S ebook/dp/B01N6P33YT#reader_B01N6P33YT

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ Chalk & Talk	✓ PPT	✓ Active Learning
✓ Web Resources	✓ Students Seminars	✓ Case Study
✓ Blended Learning	✓ Quiz	✓ Tutorials

✓ Project based learning	✓ NPTEL/MOOCS	☐Simulation
✓ Flipped Learning	✓ Industrial Visit	✓ Model Demonstration
☐Brain storming	☐Role Play	✓ Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311.1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	-	-	-	3
C311.3	3	3	2	2	-	-	-	-	-	-	-	-	-	-	3
C311.4	3	3	3	2	-	-	-	-	-	-	-	-	-	-	3
C311.5	3	3	3	2	-	-		-	-	-	-	-	-	-	3
Average	3.00	2.80	2.40	2.00	-	-	-	-	-	-	-	-	-	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19BME4TH01	3.00	2.80	2.40	2.00	-	-	-	-	-	-	-	-	-	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Mechanical Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Mechanical Engineering	
COURSE: **Heat Power Engineering**	Semester : **I** CREDITS: **3**
COURSE CODE: REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **THERMAL**	PERIODS: **4**Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	Thermodynamics	Knowledge of Thermodynamic laws and relations are required	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Analyze the parametric influence on the Rankine cycle [K4]
CO2	Compare the components and it's adoptability for different locations [K2]
CO3	Classify the nozzles and its characteristics. [K2]
CO4	Explain the characteristics of turbine compounding [K3]
CO5	Solve analytical problems on cycles and differentiate the gas power cycles [K3]

SYLLABUS:

UNIT	DETAILS
I	**RANKINE CYCLE:** Schematic layout, thermodynamic analysis, methods to improve cycle performance, regeneration & reheating. **COMBUSTION:** Fuels and combustion, concepts of heat reaction, adiabatic flame temperature, flue gas analysis.
II	**BOILERS:** Classification, working principles of L.P & H.P boilers, mountings and accessories, working principles, boiler horsepower, equivalent evaporation, efficiency. **DRAUGHT:** Classification, Natural and Artificial draught, induced and forced draught, height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney.
III	**STEAM NOZZLES:** Function of a nozzle, applications, types, flow through nozzles, thermodynamic analysis, assumptions, velocity of fluid at nozzle exit, Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, nozzle design, Super saturated flow, its effects, degree of super saturation and degree of under cooling, Wilson line.
IV	**STEAM TURBINES:** Construction & working of steam turbines, Impulse & reaction principles, inlet & outlet velocity diagrams. Work output & efficiencies. Pressure & velocity compounding, regenerative feed water heating, reheat cycles, reheat factor, governing of turbine, back pressure & pass out turbine.

V	**GAS TURBINES:** Simple gas turbine plant, ideal cycle, essential components, parameters of performance, actual cycle, regeneration, inter-cooling and reheating, closed and semi-closed cycles, merits and demerits and types of combustion chambers. **JET PROPULSION:** Working principle, thrust power, propulsive force and efficiency. **ROCKET ENGINE:** Theory of operation and its applications, propellant and types.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Thermodynamics and Heat Engines, Volume 2, R.Yadav, Centralbook depot.
T2	Heat Engineering, V.P Vasandani and D.S Kumar, MetropolitanBook Company, New Delhi
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Gas Turbines and Propulsive Systems, P.Khajuria&S.P.Dubey, Dhanpatrai
R2	Gas Turbines, Cohen, Rogers and SaravanaMuttoo, Addison Wesley, Longman, John wiley& sons
R3	Thermal Engineering, R.S Khurmi, JS Gupta, S.Chand, Mechanical Engineering

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		
2		

WEB SOURCE REFERENCES:

1	https://en.wikipedia.org/wiki/Steam_turbine
2	https://www.brighthubengineering.com/machine-design/53163-modern-steam-turbines/
3	https://www.engineeringtoolbox.com/nozzles-d_1041.html
4	https://www.engineersedge.com/heat_exchanger/large_steam_condenser.htm
5	https://en.wikipedia.org/wiki/Boiler_(power_generation)
6	http://www.transformacni-technologie.cz/en_40.html#menu
7	https://www.youtube.com/watch?v=fNPPwmfE-SY&list=PL6Qggk0O9yRItYPKm51jEnZoM-mSOM4XA

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1:	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2:	0	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3:	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4:	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5:	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
Average	2.4	2.6	-	-	-	-	-	-	-	-	-	-	-	3	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311	3.00	2.6	-	-	-	-	-	-	-	-	-	-	-	3.00	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured <60% and ≥ 50% marks of allocated marks for that CO	Student secured < 50% and ≥40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
End Semester Examination (50%)	Direct	Student secured grades C* in External Exam	Student secured grades D* in External Exam	Student secured grades E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Sk. Bajivali
Course Coordinator

Module Coordinator

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1.The students will be able to understand the modern tools of machining which gives them good expertise on advanced manufacturing methods.

PSO2.The students will be able to design different heat transfer devices with emphasis on combustion and power production.

PSO3.The students are able to design different mechanisms and machine components suitable to automation industry.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1 Analyze the parametric influence on the Rankine cycle [K4]

CO2 Compare the boilers and it's adoptability for different locations [K2]

CO3 Classify the nozzles and its characteristics. [K2]

CO4 Explain the characteristics of turbine compounding [K3]

CO5 Differentiate the gas power cycles and solve analytical problems on cycles [K3]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain working principle of Rankine cycle?	K3	CO1
2	In a Rankine cycle, the steam at inlet to Turbine is saturated at a pressure of 35bar and the exhaust pressure is 0.2bar. solve i)the pump work ii) Turbine work iii) Rankine efficiency iv) Condenser heat flow v) the dryness at the end of expansion. Assume flow rate of 9.5kg/sec	K3	CO1
3	The following is the ultimate analysis of a sample of petrol by weight: Carbon =85%, Hydrogen=15%. Computes the ratio of air to petrol consumption by weight if the volumetric analysis of dry exhaust gas is CO_2=11.5%,CO=1.2%,O_2=0.9% and N_2=86%. Also find percentage excess air.	K3	CO1
	UNIT 2		
1	Differentiate following boilers? i) Externally fired and internally fired boilers. ii)Forced circulation and natural circulation	K2	CO2
2	Explain with neat sketches any three of the following mountings? i) water level indicator ii) Pressure gauge iii) Feed check valve	K2	CO2
3	Compare forced and induced draft, enumerate merits of induced draft over forced draught	K3	CO2
4	Compute Height of chimney for maximum discharge condition.	K3	CO2
	UNIT 3		
1	Computes an expression for maximum mass flow per unit area of flow through a convergent- divergent nozzle when steam expands isentropic ally from rest.	K3	CO3
2	What do you mean by compounding of steam turbine? Discuss various methods of Compounding steam turbines with merits and demerits?	K2	CO3
3	Dry air at a pressure of 12 bar and 300°C is expanded isentropically through a nozzle at a pressure of 2 bar. Computes the maximum discharge through the nozzle of 150mm^2 area.	K3	CO3

	UNIT 4		
1	Distinguishes between impulse and reaction turbines.	**K2**	**CO4**
2	Explain the Governing of steam Turbines	**K2**	**CO4**
3	In a De-lavel turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and at an angle of 20° to thedirection of motion of the blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25°. Estimates the inlet angle of the moving blade exit velocity of steam and its direction and work done per kg of steam.	**K2**	**CO4**
	UNIT 5		
1	Explain closed cycle gas turbine and calculate woke done.	**K3**	**CO5**
2	Distinguishes of Closed Cycle and Open Cycle Gas Turbines.	**K3**	**CO5**
3	Explain the working principle of Ram-Jet with diagram	**K3**	**CO5**

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COURSE INFORMATION SHEET

PROGRAMME: B.TECH MECHANICAL ENGINEERING	
COURSE: **DESIGN OF MECHANICAL COMPONENTS** **(Design Data Hand Book Allowed)**	Semester : **VI** CREDITS: **3**
COURSE CODE: REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **DESIGN**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16ME3104	**Principles of Machine Design**	Knowledge of design considerations in machine members and applying engineering principles in designing simple machine members (keys, cotters, couplings, springs)	**V**
R16ME2102	**Mechanics of Solids**	Knowledge of stress, strain, shear force and bending moment, center of gravity, slope and deflection, torsion.	**III**
R16CC1206	**Engineering Mechanics**	Knowledge of free body diagram, kinematics and dynamics, impulse and momentum.	**II**
R16CC1102	**Engineering Mathematics**	An ability to solve ordinary and differential equations	**I**

COURSE OUTCOMES:

S.NO	COURSE OUTCOME STATEMENT
CO1	Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constrains of bearings. **[K3]**
CO2	Identify the loads and stresses while designing the connecting rod and crank shaft. **[K3]**
CO3	Analyze stresses on the piston and cylinder depending upon Design and proportions. **[K4]**
CO4	Identify the loads and machine members subjected and calculate static and dynamic stresses to ensure safe design. **[K3]**

CO5	Compare capacities of power transmission of Belt, Rope and Chain Drives. **[K2]**
CO6	Choose type of Power Screws and Gears for Static and Dynamic loads. **[K1 & K3]**

SYLLABUS:

UNIT	DETAILS
I	**DESIGN OF BEARINGS:** Types of Journal bearings, Lubrication, Bearing Modulus, Full and partial bearings, Clearance ratio, Heat dissipation of bearings, bearing materials, Journal bearing design, Ball and roller bearings, Static loading of ball & roller bearings, Bearing life.
II	**DESIGN OF I.C ENGINE COMPONENTS:** Connecting Rod, Thrust in connecting rod, Stress due to whipping action on connecting rod ends, Cranks and Crank shafts, strength and proportions of over hung and centre cranks, Crank pins, Crank shafts.
III	Pistons, Forces acting on piston, Construction, Design and proportions of piston, Cylinder. Cylinder liners.
IV	**DESIGN OF CURVED BEAMS:** introduction, stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section, C – clamps. Design of crane hook.
V	**POWER TRANSMISSION SYSTEMS:** Transmission of power by Belt and Rope drives, Transmission Efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials, Chain drives.
VI	**DESIGN OF POWER SCREWS:** Square, ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures. Spur& Helical gear drives: Spur gears- Helical gears – Load concentration factor – Dynamic load factor. Surface Compressive strength – Bending strength – Estimation of Centre distance, module and face width.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Machine Design, V.B. Bandari, Tata McGraw Hill Publishers .
T2	Machine Design, Pandya & Shaw, Charotar publishers.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Machine Design, R.N. Norton, Pearson Publishers.
R2	Design Data hand book. Mahadevan, CBS Publishers.
R3	Mechanical Engineering Design, JE Shingly, Tata McGraw Hill Publishers.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO	DESCRIPTION	Associated PO & PSO
1	Introduction to Design of Machine Tool Elements.	PO1, PO2, PO3, PSO3

WEB SOURCE REFERENCES:

1	Student Resources provided in NEC website student login : http://www.nrtec.ac.in
2	https://lecturenotes.in/subject/426/design-of-machine-members-dmm
3	https://nptel.ac.in/courses/112106137/
4	http://www.jntumaterials.co.in/2015/03/jntu-mechanical-engineering-design-of.html
5	https://files.jntufastupdates.com/download/design-of-machine-members-ii-lecture-notes/
6	https://nptel.ac.in/downloads/112105125/
7	https://india.oup.com/product/design-of-machine-elements-9780199477647
8	http://www.jntukelearn.in/design-machines-course-detail.html
9	https://www.sanfoundry.com/1000-machine-design-questions-answers/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐✓Chalk & Talk	☐✓PPT	☐✓Active Learning
☐✓Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐✓Quiz	☐✓Tutorials
☐Project based learning	☐✓NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	1	-	1	1	-	1	1	1	2	-	-	3
CO2	3	3	3	2	-	2	1	-	1	1	2	2	-	-	3
CO3	3	3	3	2	-	1	1	-	1	1	2	2	-	-	3
CO4	3	3	3	2	-	2	1	-	1	1	2	2	-	-	3
CO5	3	3	3	1	-	-	1	-	1	1	1	1	-	-	3
CO6	3	3	3	1	-	-	1	-	1	1	1	1	-	-	3
Average	3	3	3	1.5	-	1	1	-	1	1	1.5	1.5	-	-	3

MAPPING COURSE WITH POs & PSOs:

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C311	3	3	3	1.5	-	1	1	-	1	1	1.5	1.5	-	-	3

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
Assessment tool with weightage	**Method**	**Attainment Level 3 (Excellent)**	**Attainment Level 2 (Good)**	**Attainment Level 1 (Average)**	**Attainment Level 0 (Poor)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Mechanical Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Mechanical Engineering	
COURSE: **Finite element methods**	Semester : **VII** CREDITS: **4**
COURSE CODE: **RT41033** REGULATION: **R13**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Design**	PERIODS: **5** Per Week.

: COURSE PRE-REQUISITES

C.CODE	COURSE NAME	DESCRIPTION	SEM
RT41033	**Mechanics of Solids**	Knowledge of beams, columns, types of loads , stress, strain their relations is needed.	**III**
RT32031	**Heat Transfer**	Knowledge of Heat flow phenomena and concepts	**VI**
RT11011	**Differential Equations**	An ability to solve ordinary and partial differential equations	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Apply the knowledge of mathematics, recognize the fundamentals of engineering and an engineering specialization solution of differential equations, multivariable calculus and complex engineering problems. **[K1 & K2]**
CO2	Identify the application and demonstrate the ability to create models for different components such as trusses, frames, plate structures, machine parts, bars, beams, plane isoperimetric elements, and 3-D element etc. Using ANSYS general-purpose software**[K3]**
CO3	Develop the element stiffness matrix characteristic equation procedure and generation of global stiffness equation applied able to numerically solve for stresses, strains and deformation of a structural component due to axial load, , and bending, acting individually or in combination **[K2 & K3]**
CO4	Able to apply Suitable boundary conditions to numerically solve a global structural equation and reduce to the solution of complex engineering problems **[K4]**
CO5	Formulate and analyze complex engineering problems reaching substantiated conclusions using first principles of natics such as differentiation and integration etc., for the finite element method and modeling to expand beyond the ral domain problems involving dynamics, heat transfer, and fluid flow. **[K4]**
CO6	Finite element methods and modeling two dimensional analysis for solving dynamic, Eigen values, Eigen vectors, e vibration analysis problems using ANSYS general-purpose software**[K2 & K3]**

SYLLABUS:

UNIT	DETAILS
I	**Introduction to finite element method:** stress and equilibrium, strain –displacement relations, stress – strain relations, plane stress and plane strain conditions, variational and weighted residual methods, concept of potential energy, one dimensional problems.
II	**Discretization of domain:** element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions.
III	**ANALYSIS OF TRUSSES:** Finite element modeling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations. **ANALYSIS OF BEAMS:** Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.
IV	Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.
V	**HIGHER ORDER AND ISOPARAMETRIC ELEMENTS:** One dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded isoparametric elements and numerical integration.
VI	**STEADY STATE HEAT TRANSFER ANALYSIS** : one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion. Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Introduction to Finite Elements in Engineering / Chandraputla, Ashok and Belegundu / Prentice – Hall.
T2	The Finite Element Methods in Engineering / SS Rao / Pergamon.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Finite Element Analysis- Saeed Moaveniu- Pearson Education
R2	An Introduction to Finite Element Method- JN Reddy- McGraw Hill
R3	Finite Element Method with application in Engineering-YM Desai- Pearson Publishers

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Heat Pipe Technology	PO5, PSO2
2	Introduction to Mass transfer	PO1,PO3, PSO3

WEB SOURCE REFERENCES:

1	Student Resources provided in SCET Mechanical website: http://www.swarnandhra.ac.in/student-resources Link to heat Transfer: https://drive.google.com/drive/folders/0Bw9aHO9qmpbQdXl1SDdxR2tnWFU
2	http://nptel.ac.in/courses/112101097/ Heat and Mass Transfer-Prof.S.P.Sukhatme&Prof.U.N.Gaitonde-IITB
3	http://nptel.ac.in/courses/112106155/ Conduction and Radiation -Prof.C.Balaji-IITM
4	http://nptel.ac.in/courses/112101002/ Convective Heat and Mass Transfer -Prof.A.W.Date-IITB
5	http://nptel.ac.in/112108149/ Heat and Mass Transfer(Web)- Prof. Pradip Dutta-IISc Bangalore
6	http://heattransfer.asmedigitalcollection.asme.org
7	www.vlab.co.in : Virtual Labs

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

N.V. Sekhar
Course Coordinator

N.V. Sekhar
Module Coordinator

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Design, model, simulate and analyze various mechanical systems or processes.
2. Obtain additional skills and knowledge to develop and implement thermal engineering systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

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COURSE INFORMATION SHEET

PROGRAMME: B.Tech Mechanical Engineering	
COURSE: **REFRIGERATION AND AIRCONDITIONING**	Semester : **VIII** CREDITS: **3**
COURSE CODE: **(R16ME4202)** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: THERMAL ENGINEERING	PERIODS:6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16ME315	**Heat power Engineering -**	An ability to understand the Enthalpy and second law of thermodynamics and also understand the heat source and heat pump.	**III- I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Understand the difference between refrigeration and air conditioning
CO2	Understand the difference between refrigeration and air conditioning
CO3	Identify the function of each component of VCR system
CO4	Observe the function of the refrigerant in a refrigeration system and trace its path
CO5	Report different air conditioning methods and its applications
CO6	Classify different components of air conditioning plant

SYLLABUS:

UNIT	.DETAILS
I	**INTRODUCTION TO REFRIGERATION:** Necessity and applications, unit of refrigeration and C.O.P., Mechanical refrigeration, types of ideal cycles of refrigeration. **AIR REFRIGERATION:** Bell Coleman cycle and problems, open and dense air systems, refrigeration systems used in aircrafts, simple cooling, simple evaporative cooling, Boot strap, Reduced ambient air cooling and Regenerative air-cooling systems and problems
II	**VAPOUR COMPRESSION REFRIGERATION:** Working principle and essential components of the plant, simple vapor compression refrigeration cycle, COP, representation of cycle on T-S and p-h charts, effect of sub cooling and super heating, cycle analysis, actual cycle influence of various parameters on system performance, use of p-h charts, numerical problems
III	**REFRIGERANTS,** Desirable properties, classification, refrigerants used, nomenclature, ozone depletion, global warming. **VCR SYSTEM COMPONENTS:** Compressors, general classification comparison, advantages and disadvantages of Reciprocating and scroll, Hermetic sealed types working principle only. Condensers, classification, working principles of air cooled, water cooled condensers, evaporators, finned tube, shell and tube, flooded type only, classification, working principles, expansion devices, types, capillary tube and thermostatic expansion valve, working

	principles
IV	**VAPOR ABSORPTION SYSTEM:** Calculation of maximum COP, description and working of NH3, water system and Li Br, water (Two shell & Four shell) System, principle of operation three fluid absorption system, salient features and its applications. **STEAM JET REFRIGERATION SYSTEM:** Working Principle and basic components. Principle and operation of (i) thermoelectric refrigerator (ii) vortex tube.
V	**INTRODUCTION TO AIR CONDITIONING:** Psychometric properties & processes, characterization of sensible and latent heat loads, need for ventilation, consideration of infiltration, load concepts of RSHF, GSHF problems, concept of ESHF and ADP temperature. Requirements of human comfort and concept of effective temperature comfort chart, comfort air conditioning, requirements of industrial air conditioning, air conditioning load calculations.
VI	**AIR CONDITIONING SYSTEM COMPONENTS:** Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. Working principle only. Heat pump, heat sources, Different heat pump circuits.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	. A Course in Refrigeration and Air conditioning, SC Arora & Domkundwar ,Dhanpatrai.
T2	Refrigeration and Air Conditioning, CP Arora , TMH
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Refrigeration and Air Conditioning, Manohar Prasad , New Age.
R2	Principles of Refrigeration -Dossat , Pearson Education
R3	. Basic Refrigeration and Air-Conditioning – Ananthanarayanan , TMH..

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Refrigeration	PO1, PO3, PO5 & PSO1
2	Airconditioning	PO1, PO3, PO5 & PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/112105129/2
2	https://nptel.ac.in/courses/112105129/5
3	https://nptel.ac.in/courses/112105129/6
4	https://nptel.ac.in/courses/112105129/8
5	https://nptel.ac.in/courses/112105129/12
6	https://easyengineering.net/me Refrigeration and air conditioning.
7	https://www.vidyarthiplus.com/vp/ Refrigeration and air conditioning - -Full-Lecture-Notes-All

DELIVERY/INSTRUCTIONAL METHODOLOGIES

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
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☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C422.1	3	-	-		-	-	-	-	-	-	-	-	-	3	-
C422.2	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-
C422.3	-	3	-	-	-	-	-	-	-	-	-	-	-	1	-
C422.4	3	-	-		-	-	-	-	-	-	-	-	-	2	-
C422.5	2	-	-	-	-	-	3	-	-	-	-	-	-	2	-
C422.6	3	-	-	-	-	-	2	-	-	-	-	-	-	2	-
Average	2.75	3	3	-	-	-	2.5	-	-	-	-	-	-	2	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C4202	2.75	3	3	-	-	-	2.5	-	-	-	-	-	-	2	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured < 60% and ≥ 50% marks of allocated marks for that CO	Student secured <50% and ≥ 40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
End Semester Examination (50%)	Direct	Student secured grades C* in External Exam	Student secured grades D* in External Exam	Student secured grades E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

Department of Electrical and Electronics Engineering

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Basic Sciences & Humanities**

COURSE INFORMATION SHEET

PROGRAMME: I B.Tech ENGLISH	
COURSE: TECHNICAL & COMMUNICATIVE ENGLISH-I	Semester : **I** CREDITS: **2**
COURSE CODE: R20CC1101 **REGULATION:** R20	COURSE TYPE (CORE /ELECTIVE / BREADTH/ BS&H): **BS&H**
COURSE AREA/DOMAIN: COMMUNICATIVE ENGLISH	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
HS	TECHNICAL & COMMUNICATIVE ENGLISH	Knowledge of Technical English and Communication Skills	I

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **.(Apply-K3)**
CO2	Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie charts and bar diagrams.**(create-K5)**
CO3	Build grammatically correct sentences using a variety of sentence structures.**(Apply-K3)**
CO4	Enhance word power and usage of lexicons.**(Apply-K3)**

SYLLABUS:

UNIT	DETAILS
I	**1. A Drawer Full of Happiness** b. **Listening** : Dialogues, Task based listening activities. c. **Speaking** : Asking and answering general questions. d. **Reading** : Skimming, Scanning. e. **Writing** : Punctuations, Paragraphs. f. **Grammar & Vocabulary** : Nouns, Adjuncts, GRE Vocabulary, Technical Vocabulary.
II	**2. Nehru's Letter to daughter Indira on her Birthday** a. **Listening** : Individual and pair based listening to the audio track. b. **Speaking** : Discussion in pairs / small groups on specific topics. c. **Reading** : Identifying sequence of ideas; recognizing verbal techniques. d. **Writing** : Summarizing, Paraphrasing. e. **Grammar & Vocabulary** : Articles, Adjectives, Prepositions Verbal Competence, Synonyms & Antonyms, Analogy,

	GRE Vocabulary, Technical Vocabulary.
III	**3. Stephen Hawking- Positivity 'Benchmark'** **a. Listening** : Listening for global comprehension and summarising. **b. Speaking** : Discussing specific topics in pairs (or) small groups and reporting the discussion, Complaining, Apologizing. **c. Reading** : Reading between the lines, Critical reading for evaluation. **d. Writing** : Official Letter writing, E-Mail etiquette, General Netiquette, Covering Letter & Resume writing. **e. Grammar & Vocabulary** : Phrasal verbs, Verbs, Tenses (Present, Past & Future), Concord: Subject-Verb Agreement, Verbal reason, Using equivalents, Word associations, GRE Vocabulary, Technical Vocabulary.
IV	**4. Like a Tree, Unbowed: Wangari Maathai- Biography** **a. Listening** : Making predictions while listening to conversations (or) transactional dialogues. **b. Speaking** : Role plays for practice of conversational English in academic contexts (formal and informal) . **c. Reading** : Information transfer (Tables, Bar Diagrams, Line Graphs, Pie Diagrams) **d. Writing** : Interpreting visual information, Statement of Purpose (SOP) **e. Grammar & Vocabulary** : Gender inclusive language (Gendered Noun, Gender-neutral Noun), Quantifying expressions, Adjectives, Adverbs, Degrees of comparison, GRE Vocabulary, Technical Vocabulary.
V	**5. "Stay Hungry, Stay Foolish"-** **a. Listening** : Identifying key terms, understanding concepts, interpreting the concepts. **b. Speaking** : Formal oral presentations on topics from academic contexts. **c. Reading** : Reading comprehension, The RAP strategy for in-depth reading, Intensive reading and extensive reading. **d. Writing** : Academic proposals, Poster presentation. **e. Grammar & Vocabulary** : Reported Speech, Reporting verbs for academic purposes, Corrections of sentences, GRE Vocabulary, Technical Vocabulary.

TEXT BOOK	
	BOOK TITLE/AUTHORS/PUBLISHER
	INFOTECH ENGLISH (MARUTHI PUBLICATIONS)
REFERENCE BOOKS	
	BOOK TITLE/AUTHORS/PUBLISHER
R1	Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
R2	Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers,* Oxford University Press, 2009
R3	Michael Swan, *Practical English Usage,* Oxford University Press, 1996

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Application of Effective Communication with Proper Exposure	

WEB SOURCE REFERENCES:

1	www.enchantedlearning.com
2	https://www.englisch-hilfen.de/en/
3	https://www.bbc.co.uk/learningenglish/
4	https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/
5	https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6 7	https://www.englishclub.com/speaking/ https://agendaweb.org/listening-exercises.html https://www.esolcourses.com/content/topicsmenu/listening.html https://www.esl-lab.com/ https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE https://www.myenglishpages.com/site_php_files/reading.php https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☑ Quiz	☑Tutorials
☐Project based learning	☑NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2103.1	-	-	-	-	-	-	-	-	-	3	-	1	-	-
C2103.2	-	-	-	-	-	-	-	-	-	3	-	1	-	-
C2103.3	-	-	-	-	-	-	-	-	-	3	-	1	-	-
C2103.4	-	-	-	-	-	-	-	-	-	3	-	1	-	-
Average	-	-	-	-	-	-	-	-	-	3	-	1	-	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2103	-	-	-	-	-	-	-	-	1	3	-	1	-	-

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator

Module Coordinator

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample Assessment Questions

UNIT 1

1. What could be the reason for the drawer remaining locked for close to twenty five years?
2. How does the writer support her statement that the 1990's had a 'fine balancing act'?
3. What could be the justification for the contrasting behaviors of mothers from different generations towards their young? Which generation mothers would you prefer?

UNIT 2

1. What suggestions did Nehru give to Indira in his letter?
2. According to Nehru, how does a great leader help?
3. During the freedom movement, what did Gandhiji focus on?

UNIT 3

1. What have you admired most about Prof . Hawking's life?
2. What are Prof. Hawking's greatest contributions to the field of science?
3. How does Hawking change the perceptions of people with disabilities?

UNIT 4

1. Mention any three qualities in Wangari Mathai that impressed you?
2. Do you think that the Green Belt Movement can be encouraged in India? Justify your answer
3. What are two similarities and two differences between the GBM and India's Chipko Movement?

UNIT 5

1. Why do we want to stay hungry, stay foolish? When we can 'stay full, stay smart'?
2. What are some don'ts Steve Jobs mentions for progress?
3. Do you agree that death is very likely the single best invention of life? Why?

COURSE OUTCOMES: Students will be able to

Co-1: Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **(Apply-K3)**

Co-2: Compose paragraphs, essays, compile emails, letters, reports, resume and information transfer.**(create-K5)**

Co-3: Build grammatically correct sentences using a variety of sentence structures. **(Apply-K3)**

Co-4: Enhance word power and usage of lexicons.**(Apply=K3)**

***

Subject Code: **R20CC1101** Title: **Technical & Communicative English-1** Max.Marks:**70.**

Time: **3 Hours** Program: **B.Tech.** Branch: **Common to all Branches.**

Question Paper Consists of Part-A and Part-B.
Answer all the questions in Part-A. Part-B has internal choice.

Part-A

Answer all questions **5 X 4M = 20 Marks.**

1. A) What could be the reason for the drawer remaining locked for close to twenty five years?
   B) According to Nehru, how does a great leader help?
   C) What are Prof. Hawking's greatest contributions to the field of the science?
   D) Mention any three qualities in Wangari Mathai that impressed you?
   E) What are some dont's Steve Job mentions for progress?

Part-B

2. A) What could be the justification for the contrasting behaviours of mothers from different generations towards their young? Which generation mothers would you prefer? (10M)

   OR

   B)Valuecomesfrom....beholder/riches/associations/distance/usefulness/memeories....which of these are true in this article? (5M)

   C) Rearrange the following words or phrases to make meaningful sentences. (5M)
   i. look/that/fat/you/of/thinks/us/none.
   ii. go/lunch/like/out/to/would/you/for?
   iii. before/check/the/you/go/out/weather.
   iv. wedding/to/at/be/planning/my/she/is.
   v. Silent/the/class/whole/principal/was/entered/when/the

3. A) What suggestions did Nehru give to Indira in his letter? (10M)

   OR

   B) Correct the following sentences if necessary (5M)
   i. He is an young research scholar.
   ii. I have a news for you.
   iii. Have you had the lunch?
   iv. I was standing besides her
   v. She cut her finger by a knife.

   C) Rewrite as directed: (5M)
   (i) The office is giving us a housing loan. (change the voice)
   (ii) He is curious_____many things (Fill the blank with suitable preposition)
   (iii) My friend visited me_____ May (Fill the blank with suitable preposition)
   (iv)_____ Gold is valuable metal. (Fill the blank with suitable Article)
   (v) Have you been to _____ Nilgiri hills. (Fill the blank with suitable Article)

4 A) Write a beautiful paragraph on "True friendship'. (5M)

B) Fill in the blanks with suitable verb forms. (5M)

i. Dolphins .....(live/lives) in water.

ii. Heera .....(see/saw) an accident while he was riding his bike.

iii. One of my books.....(are/is) missing.

iv. Most of the students .....(has/have) voted for Manju.

v. The Prime Minister ..... (speaks/spoke) to the victims yesterday.

OR

C) What are the eight lessons that one can learn from Prof. Hawking's life? (10M)

5. A) Write a letter to the Sub Inspector of Police of your area complaining the loss of your purse containing some money, credit cards and some other important papers. (5M)

B) Write an E-mail to your friend inviting him to a local festival after completion of your Semester Examinations. (5M)

OR

C) Maathai tells her fellow African women that the solutions to their problems lie within themselves. How far is it true for India and its problems? Justify. (10M)

6 A) Why do we want to 'stay hungry, stay foolish'? When we can 'stay full, stay smart'? (10M)

OR

B) Transform the following sentences as directed. (5M)

i. Shakespeare is the most famous of all writers in English (Change into positive degree)

ii. Greenland is larger than many other islands in the world (Change into superlative)

iii. He said, "I have passed the examination". (Change into Reported speech)

iv. 'Please, help me from starvation', said the beggar.(Change into Reported)

v. "Is it really time to get up?" said John.

C) Match the following (5M)

Column A	Column B
a. Let someone down	1. realise
b. Fall away	2. break
c. go on	3. disappoint
d. screw up	4. continue
e. dawn on someone	5. spoil

NEC

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electrical and Electronics Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical Engineering	
COURSE: EM - I	Year: II Semester : I CREDITS: 3
COURSE CODE: 19BEE3TH04 REGULATION: R19	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE
COURSE AREA/DOMAIN: Electrical and Electronics	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16BS1202	Engineering Physics	Basic electrical laws, semiconductor physics	II
R16BS1103	Basic Mathematics	Integrations, differentiations, matrixes, algebra	I
R16EC1206	Network Analysis	Basic KVL, KCL, Faraday's laws and Fleming's laws	II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Gain the knowledge of electromechanical energy conversion principles for rotating machines.. **[K1, K2 and K3].**
CO2	Determine the performance of D.C generator for various operating conditions **[K2 and K3]**
CO3	Select suitable speed control and testing methods of D.C motor for various applications. **[K1, K2 and K3]**
CO4	Acquire knowledge about the constructional details, principle of operation, testing and applications of single phase transformers. **[K2 and K3].**
CO5	Implement parallel operation and three phase transformer Connections. **[K2 and K3]**

SYLLABUS:

UNIT	DETAILS
I	**UNIT-I: Electromechanical Energy Conversion and introduction to DC machines:-** Principles of electromechanical energy conversion – singly excited and multi excited system– Calculation of force and torque using the concept of co-energy. Construction and principle of operation of DC machine – EMF equation for generator – Classification of DC machines based on excitation – OCC of DC shunt generator
II	**UNIT-II: Performance of D.C. Machines** Torque and back-emf equations of dc motors– Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors - losses and efficiency- applications of dc motors.
III	**UNIT-III: Starting, Speed Control and Testing of D.C. Machines** Necessity of starter – Starting by 3 point and 4 point starters – Speed control by armature voltage and field control – testing of DC machines - brake test, Swinburne's method – principle of regenerative or Hopkinson's method - retardation test -- separation of losses.
IV	**UNIT-IV: Single-phase Transformers** Types and constructional details - principle of operation - emf equation - operation on no load and on load – lagging, leading and unity power factors loads - phasor diagrams of transformers – Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test - equivalent circuit – regulation – losses and efficiency — All day efficiency – parallel operation with equal voltage ratios – auto transformer
V	**UNIT-V: 3-Phase Transformers** Polyphone connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ -- Third harmonics in phase

	voltagesthree winding transformers: determination of Zp, Zs and Zt -- transients in switching – off load and on load tap changers -- Scott connection

TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Electrical Machines by D. P. S Bhimbra, Khanna Publishers
T2	Theory and Performance of Electrical Machines by J. B. Guptha. S. k. kataria & Sons
T3	Electrical Machines, Vol – II by B.L Theraja & A.K Theraja
REFERENCE BOOKS	
R	BOOK TITLE/AUTHORS/PUBLISHER
R1	Electrical Machines by D. P.Kotharia, I.J. Nagarth, Mc Graw Hill Publications, 4th edition.
R2	Electrical Machines by R. K. Rajput, Lakshmi publication, 5th edition.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Design of Electrical Machines	PO1, PO2, PO3, PSO1 & PSO2

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=ZnXau5GhgGI&list=PLa4KQhDlGd7QCTX3gTz0LyoL93jVjtaMe
2	https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1
3	https://www.youtube.com/watch?v=6s7O8uA4e78&list=PL2UlrhJ_JwyCmZYpXvcWzVczhHlWYOyxr
4	https://www.youtube.com/watch?v=w8Dq8blTmSA&list=PL6A5175DB9EF79D22

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☐ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☐Project based learning	☐ Quiz	☐Tutorials
☑Brain storming	☐NPTEL/MOOCS	☐Model Demonstration

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2106.1	3	2	2	1	2	1	-	-	-	-	-	2	3	1	1
C2106.2	3	3	1	2	1	-	-	-	-	-	-	2	1	3	
C2106.3	3	3	2	1	-	-	-	-	-	-	-	1	2	2	1
C2106.4	3	3	2	1	1	-	-	-	-	-	-	1	3	2	
C2106.5	3	3	2	1	1	1							2	2	1
C2106.6	3	2	1	1	1	1							1	1	
Average	3.00	2.67	1.67	1.17	1.00	0.50	-	-	-	-	-	1.00	2.00	2.17	0.50

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2106	3.00	2.67	1.67	1.17	1.00	0.50	-	-	-	-	-	1.00	2.00	2.17	0.50

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

1.
2

Course Coordinator:

1. B. Praveen Kumar
2. G. Naveen

Module Coordinator

P.D.V.S.K. Kishore

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.
2. Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments
3. Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write.

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Understand the unifying principles of electro mechanical energy conversion. **[K1, K2 and K3].**

CO2: Understand the construction, principle of operation and performance of D.C Generators. **[K2 and K3]**

CO3: Learn the characteristics, performance, methods of speed control and testing of D.C Motors. **[K1, K2 and K3].**

CO4: Understand the construction, principle of operation and performance of 1-ϕ Transformers. **[K2 and K3].**

CO5: Understand the methods of testing of 1-ϕ transformers. **[K2 and K3]**

CO6: Analyze the three phase transformer and achieve three phase to two phase conversion. **[K2, K3 and K4]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	For a singly excited magnetic system, derive the expression for the magnetic energy stored in terms of reluctance	K2	CO1
2	Why most practical energy conversion devices use magnetic field as the coupling medium between electrical and mechanical systems?	K3	CO1
3	Explain the different methods of improving commutation in DC machines	K1	CO1
4	A short-shunt dc compound generator supplies 150 A at 100 V. The resistance of armature, series field and shunt field windings are 0.04, 0.03 and 60Ω respectively. Find the e.m.f generated. Also find the e.m.f generated if same machine is connected as a long shunt machine.	K3	CO1
	UNIT 2		
1	What are the losses that occur in dc machines? Derive the condition for maximum efficiency in a dc generator.	K2	CO2

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BEE2TH04 ELECTRICAL MACHINES-I

Time: 3 hours (EEE) Max. Marks: 60

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Marks
		Unit-I	
1	a	Discuss the multiple excited magnetic field system in electromechanical energy conversion systems and also obtain the expression for field energy in the system.	[12]
		OR	
	b	i)Define co-energy	[2M]
		ii) Explain the constructional details of the DC Generator with neat diagram.	[10M]
		Unit-II	
2	a	Explain about the Losses in a DC Machine.	[6M]
	b	Derive the Torque Equation for DC Motor	[6M]
		OR	
	b	Explain about the back emf in DC motor.	[6M]
		Write some of the application for DC Motor.	[6M]
		Unit-III	
3	a	Explain with a neat diagram the working of a three point starter used for d.c. shunt motor?	[12M]
		OR	
	b	Explain filed's test on DC series motors	[8M]
		What is Hopkinson's test and where is it applied	[4M]
		Unit-IV	
4	a	Draw the no load phasor diagram of a transformer. Explain.	[6M]
		Discuss about various types of transformers.	[6M]
		OR	
	b	Explain how hysteresis and eddy current losses are minimised	[6M]

2	A separately excited generator, when running at 1000 rpm supplied 200 A at 125V. What will be the load current when the speed drops to 800 rpm. If field current is unchanged? Given the armature resistance = 0.04Ω and brush drop = 2V.	K3	CO2
3	Two shunt generators running in parallel supply a load of 5000A. Each machine has an armature resistance of 0.03Ω and a field resistance of 60Ω. The emf's of the two machines are 600 V and 640 V respectively. Calculate the power output of each machine	K3	CO2
	UNIT 3		
1	Explain with the help of a neat sketch the principle of operation of a four-point starter.	K1	CO3
2	A 240 V shunt motor has an armature resistance of 0.2Ω and takes armature current of 20 A on full-load. The electromagnetic torque being constant, by how much must the flux be reduced to increase the speed by	K3	CO3
3	A 250 V dc shunt motor has a field resistance of 200 Ω _ and an armature resistance of 0.8 Ω _. It is operating at full-load, drawing an armature current 30A and by inserting resistance in the field circuit, the speed is increased to 1200rpm. If the load torque is linearly proportional to speed, find the value of external resistance in the field circuit.	K3	CO3
4	Explain with diagram how retardation test is performed on dc machine.	K2	CO3
	UNIT 4		
1	Distinguish between core-type and shell-type transformer. Why is the low voltage winding placed near the core? Why is the core of a transformer laminated?	K2	CO4
2	A single-phase transformer supplies a load of 20 kVA at a p.f. of 0.8 (lagging). The iron loss of the transformer is 200 W and the copper losses at this load are 180 W. Calculate (i) the efficiency (ii) the new efficiency if the load is now changed to 30 kVA at a p.f. of 0.9 (lagging).	K3	CO4
3	A 25 kVA, 440/110 V, 50 Hz single-phase step-down transformer is designed to work with 1.5 V per turn with a flux density not exceeding 1.35 T. Determine (i) the required number of turns on the primary and secondary windings respectively, (ii) the cross-sectional area of the iron core, and (iii) the secondary current.	K3	CO4
	UNIT 5		
1	Explain how parameters of transformer equivalent circuit can be found from open circuit and short circuit tests.	K2	CO5
2	A 20 kVA, 4000/200V, 50Hz transformer with an equivalent impedance of 0.02Ω is to operate in parallel with a 15 kVA, 4000/200 V, 50 Hz transformer with an equivalent impedance of 0.025Ω. The two transformers are connected in parallel and made to carry a load of 25 kVA. Assume both the impedances to have the same angle. (i) Find the individual load currents (ii) What percent of the rated capacity is used in each transformer?	K3	CO5
3	In an auto-transformer, the power transferred from primary to secondary circuit is partly by conduction and partly by induction. Explain.	K2	CO5
1	Explain with the help of connection and phasor diagrams how a Scott Connection is used to obtain two-phase supply from three-phase supply.	K2	CO5
2	Why are tapping's provided in transformers? Explain with the help of connection diagrams the operation of off-load tap changer.	K3	CO5
3	Draw the connection diagrams and explain the features of Y-Y, Y-Δ, Δ-Y & Δ-Δ-three-phase connections.	K4	CO5

			Derive the E.M.F equation of a single phase transformer.	[6M]
			Unit-V	
5	a		Derive the equivalent circuit of a three winding transformer.	[12M]
			OR	
	b		Explain with the help of connection diagrams the operation of off – load and on – load tap changers.	[12M]

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Electrical and Electronics Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical and Electronics Engineering		
COURSE:**DIGITAL LOGIC CIRCUITS**	Year: **II** Semester : **II**	CREDITS: **3**
COURSE CODE: **19BEE4TH03** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**	
COURSE AREA/DOMAIN:**ELECTICAL**	PERIODS: **5** Per Week.	

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BEE3TH02	**EDC**	Knowledge on Electronics Device and Circuits	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
CO2	Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
CO3	Design and analyze combinational circuits for various Applications.
CO4	Design and analyze sequential circuits for various Applications.
CO5	Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs.

SYLLABUS:

UNIT	DETAILS
I	**NUMBER SYSTEMS & CODES** Number systems: Representation of numbers of different radix, Conversation from one radix to another radix, r-1's compliments and r's compliments of signed numbers, Problem solving. Arithmetic operations (addition & subtraction): Binary, Octal, Decimal & Hexadecimal. Binary Codes: Classifications, BCD, Execess-3, Gray and their Properties.
II	**LOGIC OPERATIONS AND MINIMIZATION TECHNIQUES** **Logic Operations:** Basic logic operations- AND, OR, NOT, Universal building blocks, EX-OR, EX- NOR gates, Boolean theorems, Principle of complementation & Duality, De-Morgan theorems, Standard SOP & POS forms and their conversions, Two level NAND – NAND and NOR- NOR realizations. **Minimization Techniques:** Minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 4 variables, Tabular (Quine-McCluskey) minimization, Problem solving.
III	**COMBINATIONAL LOGIC CIRCUIT DESIGN** Introduction, Design of Half adder, Full adder, half subtractor, Full subtractor. Applications: 4-bit binary parallel adder, Binary parallel subtractor, Adder-Subtractor circuits & Look ahead carry adder. BCD adder circuit, Excess 3 adder circuit. Encoders & Decoder: Design of decoder, Encoder, priority encoder, Realization of Boolean functions using decoders. Multiplexers & Demultiplexer: Design, Higher order, Realization of Boolean functions using multiplexers & demultiplexer. Comparators: Design of 2, 3 & 4-bit digital comparator.
IV	**SEQUENTIAL LOGIC CIRCUIT DESIGN** Introduction, Distinctions between Combinational and Sequential circuits. **Latches and Flip Flops:** SR, JK, D and T type Flip Flops, Race around Condition in JK, JK Master Slave flip flop, Excitation table of all Flip Flops. Conversion from one flip-flop to

	another flip-flop. **Registers and Counters:** Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Bidirectional Shift Registers, and Universal Shift register. Design of synchronous and Asynchronous Counters, Design and Operation of Ring and Twisted Ring Counter.
V	**INTRODUCTION TO PLDs** Introduction to PLDs, Realization of switching functions using PROM, PLA and PAL, Basics structures, Programming tables of PLDs, Merits & demerits of PROM, PAL and PLA comparison, Implementation of code converters, Introduction to CPLDs and FPGAs.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt.Ltd, Second Edition, 2014.
T2	Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. PrakashRao, Tata McGraw-Hill, Second Edition, 2008.
T3	Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Modern Digital Electronics - R.P. Jain, TMH, Fourth Edition, 2009.
R2	Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005.
R3	Switching Theory and Logic Design--Bakshi S.Chand& Company Ltd.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	State Diagrams	PO5, PSO2

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc18_ee33/preview
2	https://www.coursera.org/learn/digital-systems
3	https://swayam.gov.in/courses/4860-july-2018-digital-circuits
4	https://www.youtube.com/watch?v=O5SWZ9i6ySc

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☐Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	2	-	1	-	-	-	-	-	2	1	3
C311.2	3	3	1	1	-	-	-	-	-	-	-	2	1	3
C311.3	3	3	1	-	-	-	-	-	-	-	-	1	-	-

C311.4	3	3	1	-	-	-	-	-	-	-	-	1	-	-
Average	3.00	3.00	1.00	1.50	-	1.00	-	-	-	-	-	1.50	1.00	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.00	1.50	-	1.00	-	-	-	-	-	1.50	1.00	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):
1. Analyze and design analog and digital circuits for a given specification and function.
2. Design a variety of electronic systems for applications including signal processing, communications, computer networks and control systems.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Knows the Boolean algebra & the underlying features of various number systems. **[K1].**
CO2: Design various combinational logic circuits. **[K6].**
CO3: Design and realize Boolean functions using PLDs. **[K1 & K6].**
CO4: Analyze and design various sequential circuits and illustrate basic gates with TTL, ECL, and MOS logic family. **[K4].**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Convert** A92H to octal	K2	CO1
2	**Define** the single error-correcting code for the information code 10111 for odd parity	K1	CO1
3	**Convert** and Encode the binary word 1011 into seven bit even parity Hamming code	K2	CO1

Model Question Paper

Code: 19BEE4TH03

R19

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

II B. Tech II Semester Regular Examinations

DIGITAL LOGIC CIRCUITS

Electrical and Electronics Engineering

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 33 Minutes x 5 Questions	165
3	Quick revision & Winding up	10
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S. No		Question	Cognitive Level	CO	Marks
		UNIT-I			
1	a	Given the 8bit data word 01011011, generate the 12 bit composite word for the hamming code that corrects and detects single errors.	K3	1	6M
	b	What is meant by BCD? Obtain binary codes for decimal digits in BCD and 2421codes?	K4	1	6M
		OR			
2	a	Perform the subtraction in Excess-3 using the 9'S complement 687-348	K3	1	6M
	b	Perform Decimal addition in 8-4-2-1 BCD for 679.6+536.8	K4	1	6M
		UNIT-II			
3	a	Convert the given expression in standard SOP form f(A,B,C)=AC+BA+BC	K3	2	6M
	b	Convert the given expression in standard POS form y=A.(A+B+C)	K3	2	6M
		OR			
4	a	Find the reduced POS form of the following function $F(W,X,Y,Z)=\sum M(5,6,7,12,13)+\sum d(4,9,14,15)$	K3	2	6M
	b	Simplify the following Boolean expressions using K-map and implement it by using NOR gates. F (W,X,Y,Z)=W'X'Y'Z'+ W X Y'Z' + W'X'YZ + WXYZ	K4	2	6M

	UNIT 2		
1	**Summarize** the following Boolean expressions using K-map and implement it by using NOR gates. F (A,B,C,D)=ABC+AC+ACD	K2	CO2
2	**Construct** and Implement the following functions using gate $F(A,B,C)= \sum m(0,1,3,7)+ \sum d(2,5)$	K3	CO2
3	**Slove** the reduced POS form of the following function $F(W,X,Y,Z)= \sum M(0,7,8,9,10,12)+ \sum d(2,5,13)$	K3	CO2
4	**Slove** the following function using K-map technique $F(A,B,C,D) = \Sigma m(0,1,4,8,9,10)$	K3	CO2
	UNIT 3		
1	**Design** a 1:8 Demultiplexer using two 1:4 Demultiplexer	K6	CO2
2	**Design** and draw a full adder which uses two half adders	K6	CO2
3	**Explain** the operation of half subtractor? Realize full subtractor using logic gates.	K2	CO2
	UNIT 4		
1	**Explain** the race around condition and how to avoid it along with circuit diagram	K2	CO3
2	What do you mean by triggering? **Explain** the various triggering modes with examples.	K3	CO3
3	**Convert** the following a) JK flip-flop to T flip-flop b) RS flip-flop to D flip-flop	K6	CO3
	UNIT 5		
1	Implement $f(A,B,C,D) = \sum(0,1,3,5,6,8,9,11,12,13)$ using PAL and **explain** its procedure.	K2	CO4
2	**Implement** the following multi Boolean function using 3*4*2 PLA PLD	K2	CO4
3	**Design** a combinational using a PROM. The circuit accepts 3-bit binary number and generates its equivalent Excess-3 code	K2	CO4

		UNIT-III			
5	**a**	Design BCD to gray code converter and realize using logic gates.	**K4**	**3**	**6M**
	b	Realize the following logic function using 4 to 16 decoder and logic gates **F(w, x, y, z)= wx′y′z+ wx′yz+ wy′**	**K4**	**3**	**6M**
		OR			
6	**a**	Implement the following logic functions using 8 × 1 multiplexer? f (A, B, C, D) = ∑m(0,2,6,10,11,12,13)+d(3,8,14)	**K3**	**3**	**12M**
		UNIT-IV			
7	**a**	Draw the logic diagram of a JK flip- flop and using excitation table explain its operation.	**K4**	**4**	**6M**
	b	What do you mean by triggering? Explain the various triggering modes with examples.	**K3**	**4**	**6M**
		OR			
8	**a**	Design a 8 bit comparator	**K3**	**4**	**12M**
		UNIT-V			
9	**a**	Implement the following functions using a PROM f (A,B,C,D) = ∑(0,1,3,5,6,8,9,11,12,13)	**K3**	**5**	**6M**
	b	Design a combinational circuit using PROM that accepts 3-bit binary number and generates its equivalent excess-3 code	**K3**	**5**	**6M**
		OR			
10	**a**	Implement the following functions using a PLA f (A,B,C,D) = ∑(0,1,3,5,6,8,9,11,12,13)	**K3**	**5**	**6M**
	b	Write the comparisons between PROM, PLA and PAL.	**K3**	**5**	**6M**

NEC

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electrical and Electronics Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical and Electronics Engineering	
COURSE POWER SYSTEM TRANSMISSION LINES	Semester : III Y I SEM CREDITS 3
COURSE CODE: R16EE3101 REGULATION: R16	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE
COURSE AREA/DOMAIN: ELECTRICAL POWER SYSTEMS	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EE2101	POWER SYSTEMGENERATION AND ECONAMIC ASSEPTS	Knowledge of power generation techniques and different power plants economic consideration of power plants	II-I
R16EE3101	POWER SYSTEM TRANSMISSION LINES	Power system transmission lines plays an important role in electrical engineering in this various transmission line parameters ,transmission loss,various effects in transmission lines efficiency of transmission lines, power system transaints and Mechanical design of transmission lines & Overhead Line Insulators	III-I

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Apply the knowledge of mathematics for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines.(K_2& K_3)
CO2	Find efficiency and regulation of different transmission lines.(K_1)
CO3	Analyze the factors affecting the power loss due to corona and suggest methods to minimize the corona loss.(K_4&K_1)
CO4	Classify the insulators used in power transmission and distribution system.(K_2)
CO5	Analyze the different waves and transients in power systems.(K_2&K_1)
CO6	Calculate Sag and Tension in Transmission lines.(K_1)

SYLLABUS:

UNIT	DETAILS
I	**Transmission Line Parameters** Introduction-Types of conductors-Bundled conductors - Skin and Proximity effects - Description and effect on Resistance of Solid Conductors- inductance of single phase two-wire system with composite conductors - inductance of three-phase lines: Equivalent(Symmetrical) Spacing, Unsymmetrical Spacing (Untransposed & Transposed), Inductance of three-phase double circuit line, Numerical Problems, Capacitance of a Single phase line &Three-phase lines, Capacitance of a Three-Phase double circuit line, Numerical Problems, Effect of Earth on Transmission line Capacitance.

II	**Performance of Short and Medium Transmission Lines** Introduction, Classification of Transmission Lines –Short Transmission line: A, B, C, D constants-efficiency and regulation – Medium Transmission line: Load End Capacitance Method, Nominal-T, Nominal-π, A, B, C, D Constants- efficiency and regulation-Numerical Problems.
III	**Performance of Long Transmission Lines** Introduction - Rigorous Solution- Interpretation of the Long Line equations - Evaluation of A, B, C, D constants-Ferranti effect – Charging Current – Efficiency & Regulation-Equivalent-T and Equivalent π network models. Surge Impedance and SIL of Long Lines-Numerical Problems.
IV	**Power System Transients** Introduction, Transients in simple circuits – Travelling waves on transmission lines – Open Circuited Line–Short Circuited Line – Line terminated through a resistance- Line connected to a cable- Reflection and Refraction at T-Junction– Line terminated through a capacitance-Attenuation of Travelling waves-Numerical Problems.
V	**Various Factors Governing the Performance of Transmission line** Power factor Improvement- causes , effects of low power factor-Advantages-Methods of power factor Improvement-Shunt Capacitor, Synchronous Condenser – Voltage control – Concepts of voltage control Methods –Corona – Description of the phenomenon–Factors affecting corona– Methods to decrease corona loss –Radio Interference-Numerical Problems.
VI	**Mechanical design of transmission lines & Overhead Line Insulators** Introduction- Sag and Tension calculations with equal and unequal heights of towers- effect of Wind and Ice loading- numerical Problems - Stringing chart and sag template. Types of Insulators-Potential distribution over a string of suspension insulators-calculation of string efficiency- Methods of equalizing the potential- Numerical Problems

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, DhanpatRai& Co Pvt. Ltd.
T2	2. Electrical power systems by C.L.Wadhwa, New Age International (P) Limited, Publishers.
T3	3. Power System Analysis by John J Grainger and William D Stevenson Jr. McGraw Hill
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	1. Electric Power Transmission and Distribution by S.Sivanagaraju & S.Satyanarayana.
R2	2. A course in Electrical Power systems by J.B. Gupta, Kataria Publications
R3	3. Electrical power systems by Dr.S.L.Uppal, Khanna publishers.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Power factor improvement methods	PO3, PSO2
2	Mechanical design of transmission line parameters	PO1,PO2, PSO3

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (30%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (10%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (50%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. **1. Engineering Knowledge:** An ability to apply knowledge of mathematics, science and Engineering appropriate to the Electrical and Electronics Engineering discipline.
2. **Problem Analysis:** An ability to identify, formulate and solve the complex Electrical and Electronics Engineering and related problems.
3. **Design/development of solutions:** An ability to design and develop a system, component, process as per specifications to meet the desired needs with appropriate consideration for public health and safety, culture, society and environment.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

WEB SOURCE REFERENCES:

1	https://learn.pjm.com/electricity-basics/transmission-distribution.aspx
2	https://www.nps.gov/subjects/renewableenergy/transmission.htm
3	www.electricalquizzes.com/electric-transmission-distribution/
4	https://www.nap.edu/read/12091/chapter/13
5	https://www.tataprojects.com/transmission-distribution1
6	https://www.aecom.com/nz/markets/power/transmission-distribution/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	1	-	-	-	-	-	-	-	2	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	-	3	2
CO3	3	3	2	2	1	-	-	-	-	-	-	2	-	3	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	-	3	2
CO5	2	2	3	2	2	-	-	-	-	-	-	3	-	2	2
CO6	3	2	3	2	3	-	-	-	-	-	-	-	-	3	1
Average	2.83	2.66	2.16	1.83	2.00	-	-	-	-	-	-	2.20	-	2.83	2.16

MAPPING COURSE WITH POs & PSOs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
Average	2.83	2.66	2.16	1.83	2.00	-	-	-	-	-	-	2.20	-	2.83	2.16

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and make effective presentations and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects.
12. **Life-long learning:** Develop confidence for self-education and ability for life-long learning.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. **PSO1:** Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems
PSO2: Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinaryenvironments.
PSO3: Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

CO1	Apply the knowledge of mathematics for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines.(K_2& K_3)
CO2	Find efficiency and regulation of different transmission lines.(K_1)
CO3	Analyze the factors affecting the power loss due to corona and suggest methods to minimize the

	corona loss.(K_4&K_1)
CO4	Classify the insulators used in power transmission and distribution system.(K_2)
CO5	Analyze the different waves and transients in power systems.(K_2&K_1)
CO6	Calculate Sag and Tension in Transmission lines.(K_1)

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Derive the expression for the inductance of a 3- phase line which is completely transposed.	K1	CO1
2	Derive the expression for capacitance of a 3- phase overhead line with unsymmetrical spacing	K2	CO1
3	What are bundled conductors? Discuss the merits and demerits of bundled conductors	K2	CO1
	UNIT 2		
1	1. Analyze a medium transmission line with nominal π method and draw the phasor diagram?	K1	CO2
2	Analyze a medium transmission line with nominal T method and draw the phasor diagram?	K1	CO2
3	Derive the A, B, C, D constants of a symmetrical medium transmission line	K2	CO2
4	Explain the performance of transmission lines	K2	CO2
	UNIT 3		
1	Analyze the long transmission line by rigorous solution?	K1	CO3
2	Explain about the equivalent 'π 'model of a long transmission line?	K1	CO3
3	Explain what is Ferranti effect?	K4	CO3
	UNIT 4		
1	Derive the travelling wave equations in a lossless transmission line.	K2	CO4
2	Derive the reflection of a line terminated with a resistance?	K2	CO4
3	What is transient in electrical power systems?	K4	CO4
	UNIT 5		
1	What are the various methods that are used for power factor improvement?	K1	CO5
2	Explain what is corona and specify its advantages and disadvantages.	K1	CO5

3	List and explain the factors affecting corona?	K4	CO5
	UNIT 6		
1	Derive the expression for sag of a transmission line between two supports of equal and un equal heights?	K4	CO6
2	Explain how the string efficiency can be improved by grading of insulators?	K2	CO6
3	Discuss the effect of wind and ice on the sag calculation of a transmission line?	K4	CO6

Model Question Paper - I

Code R16EE3101 **R16**

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
III B. Tech I Semester Regular Examinations
POWER SYSTEM TRANSMISSION LINE
ELECTRICAL ENGINEERING
[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	4
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 34 Minutes x 3Questions	136
4	Quick revision & Winding up	10
	Total	180

PART–A (12 Marks)
Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Define Geometric mean distance in a transmission line?	K1	1	2
	b	Classify the transmission lines based on the length?.	K1	2	2
	c	What is meant by surge impedance loading?.	K1	3	2
	d	What is meant by a travelling wave?	K2	4	2
	e	What are the disadvantages of low power factor?	K4	5	2
	f	Define string efficiency?	K1	6	2

PART–B (48 Marks)
Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	Derive the expression for the capacitance of a three phase line?	K1	1	6
	b	Calculate the loop inductance of a single phase line with two parallel conductors	K1	1	6
3	a	Analyze a short transmission line with the help of phasor diagram?	K1	2	6
	b	A 3-phase 50 Hz transmission line has conductors of section 90 mm2 and effective diameter of 1 cm and are placed at the vertices of an equilateral triangle of side 1 metre. The line is 20 km long and delivers a load of 10 MW at 33 KV and p.f. 0.8. Neglect capacitance and assume temperature of 20°C. Determine the efficiency and regulation of the line.	K4	2	6
4	a	Analyze the long transmission line by rigorous solution?	K4	2	6
	b	A single circuit 50 Hz, 3-phase transmission line has the following parameters per km: R = 0.2 ohm, L = 1.3 mH and C = 0.01 μF The voltage at the receiving end is 132 kV. If the line is open at the receiving end, find the rms value and phase angle of the following: (i) The incident voltage to neutral at the receiving end (reference). (ii) The reflected voltage to neutral at the receiving end. (iii) The incident and reflected voltages to neutral at 120 km from the receiving end	K1	3	6
5	a	Explain the transient behaviour of a line when it is open circuited at the receiving end	K1	4	6
	b	A 500 kV 2 μ sec rectangular surge on a line having a surge impedance of 350 ohms approaches a station at which the concentrated earth capacitance is 3000 pF. Determine the maximum value of the transmitted wave	K4	4	6
6	a	What are the various methods that are used for power factor improvement?	K2	5	6
	b	Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 110 kV which has conductor of 1.25 cm dia arranged in a 3.05 metre delta. Assume air density factor of 1.07 and the dielectric strength of air to be 21 kV/cm.	K1	5	6
7	a	Derive the expression for sag of a transmission line between two supports of equal heights?	K4	6	6
	b	A transmission line conductor having a dia of 19.5 mm weights 0.85 kg/m. The span is 275 metres. The wind pressure is 39 kg/m2 of projected area with ice coating of 13 mm. The ultimate strength of the conductor is 8000 kg. Calculate the maximum sag if the factor of safety is 2 and ice weighs 910 kg/m3.	K2	6	6

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electrical and Electronics Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech - Electrical and Electronics Engineering	
COURSE: **ELECTRICAL DISTRIBUTION SYSTEMS**	YEAR:- **III B.Tech** Semester : **II** CREDITS: **3**
COURSE CODE: **R16EE3204** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: **POWER SYSTEMS**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16EE2204	Power Generation and Economic Aspects	Knowledge about power Generation by different power plants	II - II
R16EE3101	Power System Transmission Lines	Knowledge about power Transmission	III –I

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Able to **Understand** the various factors of distribution system [K2]
CO2	Able to **Design** the substation and feeders. .[K3]
CO3	Able to **Determine** the voltage drop and power loss.[K2]
CO4	Able to **Understand** the protection and its coordination.[K2]
CO5	Able to **Understand** the effect of compensation on p.f improvement.[K2]
CO6	Able to **Understand** the effect of voltage control. [K2]

SYLLABUS:

UNIT	DETAILS
I	**General Concepts** Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.
II	**Substations** Location of substations: Rating of distribution substation – Service area within primary feeders – Benefits derived through optimal location of substations. **Distribution Feeders** Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.
III	**System Analysis** Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in lines – Manual methods of solution for radial networks – Three phase balanced primary lines.
IV	**Protection** Objectives of distribution system protection – Types of common faults and procedure for fault calculations – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

	Coordination Coordination of protective devices: General coordination procedure –Residual current circuit breaker RCCB (Wikipedia)..
V	**Compensation for Power Factor Improvement** Capacitive compensation for power–factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location..
VI	**Voltage Control** Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR –Line drop compensation.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Electric Power Distribution system, Engineering" – by TuranGonen, McGraw–hill Book Company.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press .
R2	Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.
R3	Electrical Power Distribution Systems by V.Kamaraju, Right Publishers

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO.	DESCRIPTION	Associated PO & PSO
1	Distribution system control	PO3, PSO1
2	Smart grid technologies	PO5, PSO1

WEB SOURCE REFERENCES:

W1	https://www.electricaleasy.com/2018/01/electric-power-distribution-system.html
W2	https://electrical-engineering-portal.com › ... › Electrical Engineering Guides
W3	https://www.electrical4u.com/electrical-power-distribution-system
W4	https://onlinecourses.nptel.ac.in/noc18_ee15
W5	https://nptel.ac.in/courses/108107112/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑ Web Resources	☑ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☑Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	3	3	2									1	
CO3	3	2	1	1									1	
CO4	3	2	1	1	2								2	
CO5	3	2	1	1									1	
CO6	3	2	1	1									1	
Average	3	2.16	1.33	1.16	0.33								1	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
R16EE3204	3	2.16	1.33	1.16	0.33								1	

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (25%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (05%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (60%)	Direct	Student secured greater than 60 marks in External Exam	Student secured between 60 and 50 marks in External Exam	Student secured Between 50 and 40 marks in External Exam	Student secured Less than 40 marks in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator
(SK.MD.SHAREEF)

Module Coordinator
(J.SUNIL BABU)

Head of the Department
(Dr.P.LAKSHMANAN)

ANNEXURE I

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Apply appropriate techniques and modern tools in the field of electrical and electronics engineering.

PSO2: Demonstrate the sustainable development in non-conventional Energy sources.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.
Create K6	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write.

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	Able to **Understand** the various factors of distribution system [K2]
CO2	Able to **Understand** the substation and feeders.[K2]
CO3	Able to **Determine** the voltage drop and power loss.[K2
CO4	Able to **Understand** the protection and its coordination.[K2]
CO5	Able to **Understand** the effect of compensation on p.f improvement.[K2]
CO6	Able to **Understand** the effect of voltage, current distribution system performance.[K2]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Explain** about the load modeling.	K2	CO1
2	**Explain** the characteristics of residential, industrial and commercial loads. .	K2	CO1
3	**Explain** how the loads are classified in distribution systems and how they are classified? Also explain their different characteristics.	K2	CO1

	UNIT 2		
1	**Describe** the design and operational aspects that affects the primary feeder voltage level.	K1	CO2
2	How is the rating of distribution substation decided? **Explain.**	K2	CO2
3	**Draw** the single line diagram of 33-kV / 11-kV substation and explain the purpose of each component	K1	CO2
	UNIT 3		
1	**Discuss** importance of voltage drop and power loss calculations in distribution system. .	K3	CO3
2	**How** do you analyse a substation service area with 'n' primary feeders. .	K1	CO3
3	**Discuss** how an ideal substation with feeders can be arranged? How is it analyzed for percentage of voltage drop?	K3	CO3
	UNIT 4		
1	**What** are the objectives of distribution system protection? What is the data required for selecting a protective device.	K1	CO4
2	**Explain** Fuse-circuit breaker coordination procedure	K2	CO4
3	**List** out types protective devices used and explain principle of operation of any two of themsystem?	K2	CO4
	UNIT 5		
1	**Compare** and **explain** the role of shunt and series capacitors for power factor correction.	K2	CO5
2	**Explain** in detail about the effect of shunt compensation on distribution system	K2	CO5
3	A 440 V, 50 cycles three phase line delivers 250 KW at 0.7 p.f (lag). It is desire to bring the line p.f to unity by installing shunt capacitors. **Calculate** the capacitance if they are: i) star connected ii) Delta connected.	K2	CO5
	UNIT 6		
1	**What** is meant by voltage control? List out the equipment that is used for voltage control. **How** an AVR can control voltage? With the aid of suitable diagram explain its function.	K1	CO6
2	**Describe** different types of equipment for voltage control with neat diagrams.	K1	CO6
3	**Briefly** write the various methods adapted for voltage control and write the merits and demerits of it.	K2	CO6

Model Question Paper

Code: R16EE3204 R16

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III B. Tech II Semester Regular Examinations

ELECTRICAL DISTRIBUTION SYSTEMS

ELECTRICAL & ELECTRONICS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Define coincidence factor and write its significance on distribution system	K2	1	2
	b	What is a substation? How substations are classified?	K1	2	2
	c	What is meant by voltage drop and voltage regulation? Derive relationship between them.	K2	3	2
	d	Discuss about the advantages and disadvantages of fuses.	K1	4	2
	e	Explain the significance of power factor improvement. Also mention the methods of power factor improvement	K2	5	2
	f	Explain the effect of series capacitors on control of voltage.	K2	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	What is meant by load factor and loss factor? Obtain the relation between load factor and loss factor.	K2	1	6
	b	Assume that the annual peak load of a primary feeder is 2000 KW, at which the power is 80 KW per three phases. Assuming an annual loss factor of 0.15. Determine i) The total annual energy loss due to the copper losses of the feeder. ii) The average annual power loss	K3	1	6
3	a	List the design and operational aspects that affects the primary feeder voltage level	K4	2	6
	b	How is the rating of distribution substation decided? Explain.	K2	2	6
4	a	Discuss importance of voltage drop and power loss calculations in	K2	3	6

		distribution system			
	b	A 2 wire DC distributor AB,600m long is loaded as under distance from Distance (mts) 150 300 350 450 Load (Amps) 100 200 250 300 The feeding point A is maintained at 440V and that of B at 430V. If each conductor has a resistance of 0.01 per 100 m , calculate: (i) The currents supplied from A to B (ii) The power dispatched in the distributor.	K3	3	6
5	a	Briefly discuss the general coordination procedure	K2	4	6
	b	List out the types of common faults occurred on distribution system and explain the procedure for fault calculations.	K2	4	6
6	a	Explain the practical procedure to determine the best capacitor location.	K2	5	6
	b	A synchronous motor having a power consumption of 40 KW is connected with a load of 150KW, a lagging p.f of 0.8. If the combined load has a power factor of 0.9, what is the leading reactive KVA supplied by the motor and at what p.f is it working.	K3	5	6
7	a	Describe different types of equipment for voltage control with neat diagrams.	K2	6	6
	b	Explain the line drop compensation on voltage control.	K2	6	6

❖

NEC	**Narasaraopeta Engineering College** (Autonomous) Yallmanda(Post), Narasaraopet- 522601 **Department of Electrical and Electronics Engineering**

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical & Electronics Engineering	
COURSE: **PLC and Automation**	Year: IV Semester : I CREDITS: 3
COURSE CODE: **R16EE4104** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: CONTROL SYSTEMS	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	Year/Sem
R16EE1104	Programming with C	Knowledge of programming	I/I
R16EE2201	Digital Electronics	Knowledge of Logic gates	II/II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Describe the Characteristics of Registers, module addressing, holding registers, input registers, output registers and determine its importance in Ladder diagram **[K2]**
CO2	Apply the knowledge of programming formats for construction of PLC ladder diagrams in Boolean algebra systems. **[K3]**
CO3	Develop ladder diagrams for process control. **[K4]**
CO4	Describe the Analog modules and systems, Analog signal processing, multi bit data processing. **[K2]**
CO5	Understand various Industrial applications of PLC. **[K1]**
CO6	Understand PID principles, tuning and functions. **[K1]**

SYLLABUS:

UNIT	DETAILS
I	**UNIT-I: PLC Basics** PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.
II	**UNIT-II: PLC Programming** Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.
III	**UNIT-III: PLC Registers** Characteristics of Registers, module addressing, holding registers, input registers, output registers.
IV	**UNIT-IV: PLC Functions** PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.
V	**UNIT-V: Data Handling Functions** Data handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.
VI	**UNIT-VI: Analog PLC Operation** Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator

	with PID control, PID modules, PID tuning, PID functions.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI.
T2	Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Programmable Logic Controllers Hardware and Programming by Max Rabiee GoodheartWilcox
R2	Programmable Logic Controllers by Frank D. Petuzeela McGraw-Hill
R3	ndustrial Automation and Process control by Jon Stenerson Prentice-Hall.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

S.NO.	DESCRIPTION	Associated PO & PSO
1	Control of DC Motors using PLC	PO3, PSO2

WEB SOURCE REFERENCES:

1	https://youtu.be/vprLiEKQ1gU /Prof. Ritula Thakur
2	https://youtu.be/PLYosK87D8E
3	https://youtu.be/sjiGYtzNuns
4	http://jjackson.eng.ua.edu/courses/ece485/lectures/
5	https://nptel.ac.in/courses/112102011/11

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C223.1	3	2		2			3						1		2
C223.2	3	2	3	2	3		2						1		1
C223.3	3			2	2								1		1
C223.4	3			2	2		3						1	2	1
C223.5	3	2				1								2	
C223.6	3			2	2		3						1		1
Average	3	1	0.5	1.66	1.5	0.166	1.83						0.83	0.66	1

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C223	3	1	0.5	1.66	1.5	0.166	1.83						0.83	0.66	1

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 50% and < 60% marks of allocated marks for that CO	Student secured ≥ 40% and <50% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades O*&E* in External Exam	Student secured grades A*&B* in External Exam	Student secured grades C*&P* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: O: >91%-100%; E: 81%-90%; A: 71%-80%; B: 61%-70%; C: 51%-60%; P: 40%-50%; F: <40%

Course Coordinator
(Mr. B.Praveen Kumar)

Module Coordinator
(Mr. M. Chandra Sekhar)

Head of the Department
(Dr. P. Lakshmanan)

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.
2. Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments.
3. Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: On completion of this course, the student will be able to

CO1. Describe the Characteristics of Registers, module addressing, holding registers, input registers, output registers and determine its importance in Ladder diagram.

CO2. Apply the knowledge of programming formats for construction of PLC ladder diagrams in Boolean algebra systems.

CO3. Develop ladder diagrams for process control.

CO4. Describe the Analog modules and systems, Analog signal processing, multi bit data processing.

CO5. Understand various Industrial applications of PLC.

CO6. Understand PID principles, tuning and functions.

S. NO.	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain advantages and disadvantages of PLC based control system over conventional based relay system.	K1	CO1
2	Draw and explain DC input card of PLC.	K2	CO1
3	Discuss about the programming formats of PLC.	K2	CO1
	UNIT 2		

1	Explain interfacing of different inputs and outputs/actuators with PLC with suitable examples and diagrams.	K2	CO2
2	Write a short note on scan time of PLC and also explain the importance of scan time.	K1	CO2
3	Explain about typical PLC input devices.	K2	CO2
	UNIT 3		
1	Explain different conventions adopted in ladder diagram.	K1	CO3
2	Explain ON delay timer and OFF delay timer instructions with timing diagrams.	K2	CO3
3	Explain NOT gate and relay and PLC equivalents.	K2	CO3
	UNIT 4		
1	What are the characteristics of PLC registers?	K2	CO4
2	Explain different counter instructions in plc with suitable examples.	K2	CO4
3	Explain jump instructions in PLC with suitable examples.	K2	CO4
	UNIT 5		
1	How the analog inputs and outputs handled by PLC? Explain in detail?	K2	CO5
2	A handicap door opener has a button that will open two doors when the button is pushed (momentarily) the first door will start to open immediately the second door will start to open 2 seconds later, the first door power will stay open for a total of 10 seconds, and the second door power will stay on for 14 seconds. Design a PLC FBD to excite this sequence correctly.	K2	CO5
3	Explain operation of Industrial three axis robot control.	K2	CO5
	UNIT 6		
1	How JUMP differs from SKIP and MCR functions?	K1	CO6
2	Enlist different data comparison instructions in PLC and explain all of them in detail.	K2	CO6
3	Explain jump instructions in PLC with suitable examples.	K2	CO6

Model Question Paper

Code: R16EE4104 R16

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

IV B. Tech I Semester Regular Examinations

PLC AND AUTOMATION

ELECTRICAL AND ELECTRONICS ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

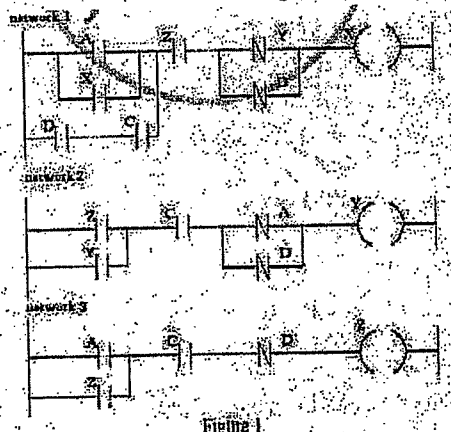
Answer ALL Questions.

S. No.		Question	Cognitive Level	CO	Marks
1	a	Draw the schematic of input modules of PLC.	K1	1	2
	b	Explain about typical PLC input devices.	K2	2	2
	c	Explain NAND gate and relay and PLC equivalents.	K2	3	2
	d	Write different types of PLC arithmetic functions.	K1	4	2
	e	What is the significance of Cascaded sequencers in PLC programming?	K1	5	2
	f	Write short notes on ONS and CLR functions.	K2	6	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No.	Question	Cognitive Level	CO	Marks
1	Explain advantages and disadvantages of PLC based control system over conventional based relay system.	K2	1	12

2	a	Explain interfacing of different inputs and outputs/actuators with PLC with suitable examples and diagrams.	K2	2	6
	b	Write a short note on scan time of PLC and also explain the importance of scan time.	K1	2	6
3	a	Explain different conventions adopted in ladder diagram.	K2	3	6
	b	Design FBD programe for the ladder diagram given in fig.1  Figure 1	K3	3	6
4		Explain different counter instructions in PLC with suitable examples.	K2	4	12
5	a	How the analog inputs and outputs handled by PLC? Explain in detail?	K2	5	6
	b	A handicap door opener has a button that will open two doors when the button is pushed (momentarily) the first door will start to open immediately the second door will start to open 2 seconds later, the first door power will stay open for a total of 10 seconds, and the second door power will stay on for 14 seconds. Design a PLC FBD to excite this sequence correctly.	K2	5	6
6	a	Enlist different data comparison instructions in PLC and explain all of them in detail.	K2	6	6
	b	Explain ON delay timer and OFF delay timer instructions with timing diagrams.	K2	6	6

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NEC

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of Electrical and Electronics Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical Engineering	
COURSE: SOFT COMPUTING TECHNIQUES FOR ELECTRICAL ENGINEERN\ING	Year: IV Semester : II CREDITS: 3
COURSE CODE: R16EE4201 REGULATION: R16	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE
COURSE AREA/DOMAIN: Computer Science Engineering.	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	-	-	-

COURSE OUTCOMES: Students will be able to

SNO	Course Outcome Statement
CO1	**Understand** the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network.**[K1]**
CO2	Understand the back propagation networks and algorithm. **[K1]**
CO3	**Apply** the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers- Operations on Fuzzy Numbers, Fuzzy Relations. **[K4]**
CO4	**Explain** the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic. **[K2]**
CO5	**Understand** the Genetic algorithms and evolutionary computation, Applications of Genetic Algorithms. .**[K1]**
CO6	**Explain** the applications of soft computing techniques. **[K2]**

SYLLABUS:

UNIT	DETAILS
I	**UNIT-I: Artificial Intelligent Systems** Artificial Intelligent systems – Neural Networks, Fuzzy Logic. Artificial Neural Networks – Biological neural networks – Model of an artificial neuron- Comparison between biological neuron and artificial neuron– Basic models of artificial neural network –Learning methods – Activation function and Terminologies of ANN- Mc Culloch Pitts Neuron –Perceptron Networks
II	**UNIT-II: Back Propagation Networks** Back propagation Networks : Architecture - Multi layer perceptron –Back propagation Learning – Input layer- Hidden Layer - Output Layer computations- Calculation of error- Training of ANN- Back propagation Algorithm- Selection of various parameters in BP networks.
III	**UNIT-III: Classical and Fuzzy Sets** Fuzzy verses crisp sets – Crisp sets – operations and properties of crisp sets- partition and covering- Fuzzy sets- membership function – operation and properties of fuzzy sets- crisp relations- Cartesian product- other crisp relations- operations on relations- fuzzy relations- fuzzy Cartesian product- operations on fuzzy relations.
IV	**UNIT-IV: Fuzzy Logic System Components** Crisp logic- laws of propositional logic- inference in propositional logic- fuzzy logic- fuzzy propositions- fuzzy connectives- fuzzy quantifiers- fuzzy inference- fuzzy rule base system- Defuzzification- Types of Defuzzification- fuzzy logic controller- components of FLC
V	**UNIT- V: Genetic Algorithms** Genetic Algorithms- Basic Concepts- Creation of off- springs- Working Principle- Encoding-

	Fitness function- Reproduction- Roulette- Wheel Selection, Boltzmann Selection- Tournament selection- Rank Selection- Cross Over- Inversion and deletion- Mutation Operator- Bitwise operators
VI	**UNIT- VI: Applications to Electrical Engineering** Speed control of D.C and A.C motors- Reactive Power Control- Load Frequency Control- Economic load dispatch- load flow studies- Load forecasting.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd. [Module I& III].
T2	R.Rajasekharan and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications, Prentice Hall of India. [Module II, & IV
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Fakhreddine O.Karray, Clarence De Silva, Intelligent Systems Design, Theory, Tools and Application, Pearson Education
R2	S. Haykins, Neural Networks – A Comprehensive Foundation, Prentice Hall 2002

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
***	***	***

WEB SOURCE REFERENCES:

1	https://www.digimat.in/nptel/courses/video/106105173/L01.html
2	https://www.youtube.com/watch?v=mlfM4SGOAgo

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑Chalk & Talk	☑ PPT	☐Active Learning
☑Web Resources	☑ Students Seminars	☐Case Study
☑Project based learning	☐ Quiz	☐Tutorials
☑Brain storming	☐NPTEL/MOOCS	☐Model Demonstration

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2101.1	2	2	3	1			-	-	-	-	-			
C2101.2	3	2	2	1		1	-	-	-	-	2			
C2101.3	2	2	3	2		1	-	-	-	-	-	2		
C2101.4	2	2	1	2		1	1	-	-	-	2		2	1
C2101.5	3	2	2	2		2	2				1	1	2	1
C2101.6	3	2	2		2	2					2	2	2	1
Average	2.5	2.0	2.2	1.33	0.33	1.16	0.5	-	-	-	1.16	0.83	1.00	0.5

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2101	2.5	2.0	2.2	1.33	0.33	1.16	0.5	-	-	-	1.16	0.83	1.00	0.5

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured <40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured <60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator | Module Coordinator | Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs):

1. Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.
2. Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi-disciplinary environments

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO-1:- Understand the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network.

CO-2:- Understand the back propagation networks and algorithm.

CO-3:- Apply the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers- Operations on Fuzzy Numbers, Fuzzy Relations.

CO-4:- Explain the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic.

CO-5:- Understand the Genetic algorithms and evolutionary computation, Applications of Genetic Algorithms.

CO-6:- Explain the applications of soft computing technique

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Discuss about the Humans and computers?	K1	CO1
2	Illustrate the characteristics of neural networks?	K2	CO1
3	What are the different learning processes? Explain briefly	K1	CO1
4	Discuss the methods of AI techniques?	K1	CO1
	UNIT 2		
1	Implement the Mc-Culloch pitts networks for XOR logic function?	K1	CO2
2	Describe the linear non separable problem with example?	K1	CO2
3	Describe how a pattern can be trained and classified using discrete perceptron algorithm?	K1	CO2
4	What are the different types of activation functions with neat schematic?	K4	CO2
	UNIT 3		
1	How can you distinguish the crisp and fuzzy sets with examples?	K4	CO3
2	Illustrate the basic fuzzy set operations with examples?	K4	CO3
3	Explain the operations on fuzzy relations?	K4	CO3
4	Describe the operations on crisp sets with examples?	K4	CO3
	UNIT 4		
1	Discuss about the membership value assignment?	K1	CO4
2	Explain about the development of rule base system?	K1	CO4
3	What are the different ways to assign membership values to fuzzy variables?	K3	CO4
4	Lambda-cut can be considered as an example of a way to convert a fuzzy set into a crisp one. What is this conversion necessary for?	K2	CO4
	UNIT 5		
1	What is the importance of cross over mask uniform cross over? Explain the matrix cross over with neat sketch	K2	CO5
2	Define GA search space? Explain the most important aspects of using genetic algorithm	K4	CO5
3	What do you mean by fitness function? Explain with help of two bar pendulum.	K2	CO5
4	Define the objective function. Discuss the creation of offspring	K2	CO5
	UNIT 6		
1	Explain the concept of load frequency control? Explain how do you control load frequency in power system using fuzzy logic?	K1	CO6
2	What do you mean by load forecasting? How do you estimate the forecasting of load in power system using Neural networks?	K2	CO6

3	Discuss about the reactive power control? Explain how you control the reactive power in power system by using neural networks?	K3	CO6
4	What do you mean by economic load dispatch? Explain the economic load dispatch by using fuzzy logic controller with neat sketch?	K1	CO6

Model Question Paper

Code: R16EE4201 **R16**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

IV B. Tech II Semester Regular Examinations

SOFT COMPUTING TECHNIQUES FOR ELECTRICAL ENGINEERING

ELECTRICAL ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	4
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 34 Minutes x 4 Questions	136
4	Quick revision & Winding up	10
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Compare Biological neuron and Artificial neuron.	K1	CO1	2
	b	Write a short note on Multilayer Network with a neat diagram?	K1	CO1	2
	c	List out the properties of crisp sets and compare with fuzzy sets.	K1	CO2	2
	d	Define Fuzzy Inference Systems.	K1	CO3	2
	e	What is meant by cross over rate?	K1	CO4	2
	f	Mention the applications of Soft computing techniques.	K1	CO4	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	How do you classify the methods of Soft computing techniques? Explain any one method With neat schematic	K2	1	6
	b	Discuss the McCulloch-Pitts model of an artificial neuron	K2	1	6
3		Derive the equation for weight change in the input layer and hidden layer for Back Propagation Network.	K2	2	12
4	a	Explain fuzzy versus crisp set operations with an example.	K2	3	6
	b	Define the following with example i) Membership ii) power set iii) super set iv) cardinality	K2	3	6
5		Explain the following i) centroid method ii) center of sums iii) Knowledge base iv) Fuzzification	K2	4	12
6		Define GA search space? Explain the most important aspects of using genetic algorithm.	K2	4	6
7		How can an Artificial Neural Network be applied for speed control of ac motor? Explain in detail	K2	4	12

❖

Department of Civil Engineering

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Dept. of Civil Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Civil Engineering	
COURSE: **ENGINEERING GEOLGY**	Semester : II-I CREDITS: **3**
COURSE CODE: 19BCE3TH02 REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: **ENGINEERING GEOLOGY**	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCE3TH02	ENGINEERING GEOLOGY	An ability to understand the basic concepts of basement, rocks, folds, joints,unconforites ,earthquakes ,dams tunnels	II-I

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	To know the weathering process and mass movement. K1&K2
CO2	Distinguish geological formations. K1&K2
CO3	Identify geological structures and processes for rock mass quality K1&K2
CO4	Identify subsurface information and groundwater potential sites through geophysical investigations K1&K2
CO5	Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels. K1&K2

SYLLABUS:

UNIT	DETAILS
I	**Importance of geology from Civil Engineering point of view:** Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Important branches of geology; Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers. Types of weathering, its effect over the properties of rocks, importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite".
II	**Mineralogy:** Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and

	Bauxite. **Petrology:** Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Forms of igneous rocks. Common structures and textures of igneous, sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.
III	**Structural Geology:** Geological maps – attitude of beds, out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types and case studies. Fundamental aspects of rock mechanics and environmental geology.
IV	**Earth Quakes and Geophysical Investigations:** Earth Quake Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence. **Importance of Geophysical Studies:** Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc..
V	**Geology of Dams, Reservoirs, and Tunnels:** Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Geological factors influencing water Lightness and life of reservoirs – Purposes of tunneling, Effects of Tunneling on the ground, Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
T2	Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015..
T3	Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
T4	4.Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
R2	.Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
R3	Engineering Geology by Subinoy Gangopadhyay, Oxford university press

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Applied geology	PO1, PO2, PO5,PO6 ,PO7& PSO2&PSO3

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc19_ce02/preview
2	https://www.journals.elsevier.com/engineering-geology
3	https://www.sciencedaily.com/terms/engineering_geology.htm
4	https://www.youtube.com/results?search_query=engineering+geology+in+civil+engineering
5	https://www.youtube.com/watch?v=k8h4FKBPYoY&list=PLdM-WZokR4tZoAqn1B6Py_cYYnQ78lQS3

6	https://www.youtube.com/watch?v=6k9mtTmvPjw&list=PLbFCE9PA9MyRW9YExs56xkJZyCdZ9IZ

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓☐Chalk & Talk	✓☐ PPT	☐Active Learning
✓☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	✓☐ Quiz	☐Tutorials
☐Project based learning	✓☐NPTEL/MOOCS	☐ Simulation
✓☐Flipped Learning	☐Industrial Visit	✓☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2						2	-		-	-	3			
CO2	-	-	-	-		2	-	-		-	-	3		3	3
CO3	-	2	-	2	3	-	-	-		-	-	3		3	
CO4	-	-	-	-		-	-	-		-	-	3		3	3
CO5	2	2		2		2	2					3		3	3
Average	1.0	1.0	-	1.0	0.75	0.5	-	-		-	-	3.00		2.25	1.5

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
19BCE3TH02	1.0	1.0	-	0.5	0.75	0.5	-	-		-	-	3.00		2.25	1.5

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO

End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.Applying technical skills and modern engineering tools for civil engineering day to day practice.

PSO2.Participate in critical thinking and problem solving of civil engineering field that requires analytical and design requirements.

PSO3.Pursue lifelong learning and professional development to face the challenging and emerging needs of our society.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Keywords
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selects, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Give a brief account of the importance of geology in civil engineering. Explain Your answer by giving suitable example	**K1 & K2**	**CO1**
2	What are the types of geological agents? Describe briefly the natural agencies.	**K1 & K2**	**CO1**
3	Define weathering? Different types of weathering	**K1 & K2**	**CO1**
4	Define geology ? Branches of geology. Give a brief account of the river process and development.	**K1 & K2**	**CO1**
	UNIT 2		
1	a) what is metamorphic rock? Discuss the various agents of metamorphism b) Explain how are the metamorphic rocks formed? Describe the various structures & textures present in the rocks.	**K1 & K2**	**CO2**
2	a)). Explain how are the sedimentary rocks formed? Describe the various structures Present in the rocks. b) Describe the physical properties of minerals.	**K2& K3**	**CO2**
3	Describe the geological classification and give the characters of igneous rocks	**K2 & K3**	**CO2**
4	Explain how are the igneous rocks formed? Describe the various structures &textures Present in the rocks.	**K2 & K3**	**CO2**

	UNIT 3		
1	What is fold? Describe the parts of fold. Attempt the classification of folds in brief. Discuss the important of fold in the field of civil engineering.	K1 & K2	CO3
2	Define unconformity, explain deferent types of unconformities.	K1 & K2	CO3
3	Explain the advantages to study the branch of structural geology? Write and explain various Faults with the help of neat sketches.	K1 & K2	CO3
4	What are the reasons for folding? Discuss how a recumbent fold differs from a monocline fold and illustrate your answers with the help of neat sketches.	K1 & K2	CO3
	UNIT 4		
1	a) Explain the classification, effects, causes and intensity of earthquakes and give their preventive manures for construction of building in earthquake prone areas. b) Explain the preventive measures for constructions of buildings in Earthquake Prone areas.	K1 & K2	CO4
2	What are landslides? Discuss briefly their types, causes and preventive measures	K1 & K2	CO4
3	a) What is Water table? Give their types of water. Write about under zone of aeration b) Define the terms porosity and permeability. Explain the classification of rocks based on porosity and permeability, and importance of rock types for groundwater point of view	K1 & K2	CO4
4	a What is the difference between free ground water and artesian water? Explain the various Properties and functions of an aquifer.	K1 & K2	CO4
5	Describe the importance of Electrical Resistivity studies in civil engineering.	K1 & K2	CO4
6	What are the principles of geophysical exploration? Discuss any one method used for interpreting subsurface structures.	K1 & K2	CO4
7	Write the importance of seismic refraction methods in civil engineering.	K2 & K1	CO4
8	Write the physical property, principle, parameters and equipment's in Gravity methods.	K1 & K2	CO4
	UNIT 5		
1	What is a dam? With what purposes it will be constructed? Explain in detail the geological investigations of a good dam site. .	K1 & K2	CO5
2	Explain the influence of geological structures, water table, and scope for preventive leakage for successful reservoir.	K1 & K2	CO5
3	a) What are the effects of tunnels? What is the influence of ground water conditions for successful tunnels?.	K1 & K2	CO5
4	Explain the influence of geological structures, water table, and scope for preventive leakage for successful reservoir. b) Explain how faults and folds affect the choice of locations for dams and tunnels.	K1 & K2	CO5

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BCE2TH03 ENGINEERING GEOLOGY

Time: 3 hours (CE) **Max. Marks: 60**

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Marks
		Unit-I	
1	a	What is geology? Explain about main and allied branches of geology	[8M]
		Discuss the importance of Geology in the field of Civil Engineering	[4M]
		OR	
	b	Define weathering? Explain frost action and thermal effects in weathering.	[4M]
		Describe briefly different process are responsible for physical ,chemical and biological weathering	[8M]
		Unit-II	
2	a	What is texture of a rock? Discuss the various types of textures in sedimentary rocks	[6M]
		Describe the physical properties of minerals	[6M]
		OR	
	b	Describe the forms of igneous rocks.	[6M]
		What are the structure of metamorphic rock	[6M]
		Unit-III	
3	a	What is fold? Describe the parts of fold. Attempt the classification of folds in brief. Discuss the important of fold in the field of civil engineering.	[12M]
		OR	
	b	Define unconformity, explain deferent types of unconformities	[6M]
		Classify and describe different types of joints in rock with neat sketches.	[6M]
		Unit-IV	
4	a	What are landslides? What are their causes? How landslides can be prevented?	[8M]
		Geological controls of ground water movement.	[4M]
		OR	
	b	Describe the importance of Electrical Resistivity studies in civil engineering.	[6M]
		Write the importance of seismic refraction methods in civil engineering.	[6M]
		Unit-V	
5	a	What is a dam? With what purposes it will be constructed? Explain in detail the geological investigations of a good dam site.	[12M]
		OR	
	b	What are the geological conditions necessary for the stability of a dam and life of a reservoir?	
		Explain with neat diagram favorable and unfavorable dips at a Tunnel site..	[12M]

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BCE2TH03 ENGINEERING GEOLOGY

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Marks
		Unit-I	
1	a	Discuss the geological work of river	[4M]
		What are the types of geological agents? Describe briefly the natural agencies.	[8M]
		OR	
	b	Explain effects and importance of weathering of rocks with reference to civil engineering	[4M]
		Explain effects and importance of geology with dams, reservoir, and tunnels reference to civil engineering.	[8M]
		Unit-II	
2	a	Describe the physical properties of minerals (i) Asbestos (ii) Hematite (iii) quartz	[8M]
		Define the Porphyritic and poiklitic texture in igneous rocks	[4M]
		OR	
	b	Describe following Rock properties in detail: (i) Basalt, (ii) Marble, (iii) Phyllite. (iv) Lime stone	[8M]
		What are the major difference dykes and sills?	[4M]
		Unit-III	
3	a	What is fault? What are the parts of faults? Give their types of faults with sketches	[12M]
		OR	
	b	Define the term strike, dip and outcrop.	[6M]
		Explain about Tension joints and compressional joints.	[6M]
		Unit-IV	
4		What is earthquake? Explain the classification, effects, causes and intensity of earthquakes and give their preventive manures for construction of building in earthquake prone areas.	[12M]
		OR	
	b	Write short note on importance of Geophysical Methods	[4M]
		What is the importance of geophysical methods? Explain the study of magnetic method in civil engineering prospecting	[8M]
		Unit-V	
5	a	Explain the geological considerations for successful construction of dams in view of rocks, structures and ground water point of view with sketches.	[12M]
		OR	
	b	What is tunnel? What are the purposes of tunnels?	[6M]
		Discuss geological considerations for a successful reservoir site	[6M]

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Dept. of Civil Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Civil Engineering	
COURSE **FLUID MECHANICS AND HYDRAULIC MACHINERY**	Semester : II-II CREDITS: **3**
COURSE CODE: **19BCE4TH04** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: **FLUID MECHANICS AND HYDRAULIC MACHINERY**	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCE4TH04	**FLUID MECHANICS AND HYDRAULIC MACHINERY**	An ability to understand about Fluid statics, kinematics& Dynamics and to know about open channel flow and Hydraulic machinery concepts	**II-II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Explain the application of properties of fluids. K2&K3
CO2	Analyze the kinematic behavior through various laws of fluids and the theory of boundary layer. K2&K3
CO3	Analyze the dynamic behavior through various laws of fluids and flow through closed conduits. K2&K3
CO4	Apply the types of Flows and Flow measurement in channels and pipes K2&K3
CO5	Explain the working and performance characteristics of various hydraulic machines like pumps and turbines. K2&K3

SYLLABUS:

UNIT	DETAILS
I	Fluid Mechanics: Properties of fluids- Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers, Forces on immersed bodies.
II	Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure, Meta-center. Derivations and problems.

	Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows– Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis. Potential flow, applications of momentum and energy equations; Flow in pipes, pipe networks; Concept of boundary layer and its growth.
III	Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Navier – Stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend. Closed Conduit Flow: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.
IV	Hydraulics: Open Channel Flow: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections.Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows. Channel Hydraulics – Energy-depth relationships, specific energy, critical flow, slope profile, hydraulic jump, uniform flow and gradually varied flow
V	Basics of hydraulic machines, specific speed of pumps and turbines; Kinematics of flow, velocity triangles; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) Ltd., New Delhi.
T2	Fluid Mechanics by Modi and Seth, TEXT BOOKS house.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Fluid mechanics and fluid machines by Rajput, S. Chand & Co.
R2	Hydraulic Machines by Banga & Sharma Khanna Publisher.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Advanced fluid mechanics	PO1, PO2, PO5,PO6 ,PO7& PSO2&PSO3

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓☐Chalk & Talk	✓☐ PPT	☐Active Learning
✓☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	✓☐ Quiz	☐Tutorials
☐Project based learning	✓☐NPTEL/MOOCS	☐ Simulation
✓☐Flipped Learning	☐Industrial Visit	✓☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3					2		1					1		
CO2	3			3									1	2	
CO3	3			3									2	2	
CO4	3			3	2	2	2	3					2		
CO5	1			3	2		1	2					2	3	
Average	2.6			2.4	0.8	0.8	0.6	1					1.6	1.4	

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
19BCE4TH04	2.6			2.4	0.8	0.8	0.6	1					1.6	1.4	

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.Applying technical skills and modern engineering tools for civil engineering day to day practice.

PSO2.Participate in critical thinking and problem solving of civil engineering field that requires analytical and design requirements.

PSO3.Pursue lifelong learning and professional development to face the challenging and emerging needs of our society.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Keywords
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selects, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs,

		differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Define a) mass density b) specific weight c) specific volume d) specific gravity e) viscosity If 5 m^3 of oil weighs 40 KN. Estimate i) specific weight ii) Mass density iii) specific gravity	**K1 & K3**	**CO1**
2	Explain about Newton's law of viscosity If the equation of velocity distribution is given by $V= 2Y-Y^2$ .What is the velocity gradient Shear stress at the boundary and at 15 cm from the boundary if Dynamic viscosity is 8.6 poise	**K2 & K3**	**CO1**
3	Define Surface tension. How do you estimate the pressure inside a liquid drop, soap bubble and liquid jet	**K1**	**CO1**
4	What is capillarity? Derive the expression for capillary rise and Capillary fall	**K1 & K2**	**CO1**
5	What do you understand about micro manometer & pressure gauge and discuss any of the pressure gauge.	**K2**	**CO1**
	UNIT 2		
1	Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane submerged in the liquid	**K2**	**CO2**
2	Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also.	**K3**	**CO2**
3	Define continuity equation. Obtain an expression for continuity equation for a three-dimensional flow.	**K2 & K3**	**CO2**
4	i) Define velocity potential and stream functions. ii) The velocity potential function is given by $\Phi = 5(x^2-y^2)$. Calculate the velocity components at the point (4, 5).	**K2 & K3**	**CO2**
	UNIT 3		
1	State and explain about Bernoulli's theorem and write down the assumptions for it	**K1 & K2**	**CO3**
2	What do you understand about Pipes in Parallel and Pipes in series	**K1 & K2**	**CO3**
3	Derive the expression for major headloss through pipes	**K1 & K2**	**CO3**
4	What are the various minor losses	**K1 & K2**	**CO3**
	UNIT 4		
1	a) Differentiate Pipe flows and open channel flows b) Derive Chezy's equation	**K1 & K2**	**CO4**
2	What is most economical channel section and derive the expression for most economical Trapezoidal channel section	**K1 & K2**	**CO4**
3	What do you understand about surface profiles	**K1 & K2**	**CO4**
4	What is Hydraulic Jump? Discuss about the Principle involved in it.	**K1 & K2**	**CO4**

	UNIT 5		
1	What do you understand about Buckingham Pi theorem What are Various Dimensional less numbers? Derive them.	K1 & K2	CO5
2	What is Specific Speed of a Turbine? Derive the expression.	K2	CO5
3	A venturimeter is used to measure liquid flow rate of 7500 litres per minute. The difference in pressure across the venturimeter is equivalent to 8 m of the flowing liquid. The pipe diameter is 19 cm. Calculate the throat diameter of the venturimeter. Assume the coefficient of discharge for the venturimeter as 0.96.	K3	CO5
4	Discuss about Pelton wheel turbine	K2	CO5 CO3

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BCE4TH04 FLUID MECHANICS AND HYDRAULIC MACHINERY

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All FIVE Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Marks
		Unit-I	
1	a	i. Define a) mass density b) specific weight c) specific volume d) specific gravity e) viscosity	[6M]
		ii. . If 5 m^3 of oil weighs 40 KN. Estimate i) specific weight ii) Mass density iii) specific gravity	[6M]
		OR	
	b	i Define absolute, vacuum and gauge pressures?	[6M]
		ii Explain about U-tube differential manometer and inverted U-tube differential manometer?	[6M]
		Unit-II	
2	a	A circular plate 2.5 m diameter is immersed in water, its greatest and least depth below the free surface being 3 m and 1 m respectively. Find (a) the total pressure on one face of the plate, and (b) the position of center of pressure	[12M]
		OR	
	b	Define the equation of continuity. Obtain the expression for continuity equation in three dimensions?	[12M]
		Unit-III	
3	a	i. State Bernoulli's equation? Write the assumptions for such a derivation?	[6M]
		ii. Define momentum equation and derive an expression for force exerted by a flowing fluid on a pipe bend?	[6M]
		OR	
	b	The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m, and 210m and of diameters 300mm, 200mm and 400mm respectively is 12m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively. Considering: (i) minor losses (ii) neglecting minor losses.	[12M]
		Unit-IV	
4	a	i. Derive chezy's equation	[6M]

		ii.Deive the expression for most economical trapezoidal channel section	[6M]
		OR	
	b	A rectangular channel 7.5 m wide has a uniform depth of flow of 2.0 m and has a bed slope of 1 in 3000.If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.75 m, determine the water surface slope with respect to horizontal at this section. Assume Manning's n = 0.02.	[12M]
		Unit-V	
5	a	i. Write short note on impact of jet on vanes.	[6M]
		ii. What are unit quantities? Derive the expressions for unit discharge, unit speed and unit power.	[6M]
		OR	
	b	State and explain Buckingham's pi theorem. Give one example	[12M]

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular/Supple. **Examinations,** Month/Year

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Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

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Q.No.		Questions	Marks
		Unit-I	
1	a	i.If the equation of velocity distribution is given by $V= 2Y-Y^2$ .What is the velocity gradient Shear stress at the boundary and at 15 cm from the boundary if Dynamic viscosity is 8.6 poise	[6M]
		ii. What is capillarity? Derive the expression for capillary rise	[6M]
		OR	
	b	i) Show that the rate of increase of pressure in a vertical direction in a fluid at rest is equal to the weight density of the fluid at that point.	[6M]
		ii) Explain the Pascal's law. Prove that pressure acting on wedge submerged in fluid is equal in all directions	[6M]
		Unit-II	
2	a	Derive the expression for depth of center of pressure on submerged vertical plane.	[12M]
		OR	
	b	Define velocity potential function and stream function and list out its properties. What is the relationship between the stream function and velocity potential function	[12M]
		Unit-III	
3	a	What are the surface and body forces associated with fluid flow? How are they incorporated in Euler's equation?	[12M]
		OR	
	b	A compound piping system consists of a1600m of 0.4m diameter, 1200m of 0.3m diameter and 800m pipe of 0.25m diameter cast iron pipes connected in series. Convert the system to (i) an equivalent length of 0.4m pipe and (ii) an equivalent size pipe 3000m long..	[12M]
		Unit-IV	
4	a	Prove that for a channel of circular section the depth of flow d = 0.95 D for maximum discharge where d = depth of flow and D = diameter of circular channel	[12M]
		OR	

	b	Obtain an expression for the depth after the hydraulic jump and the loss of head Due to the jump. Write the assumptions made	[12M]
		Unit-V	
5	a	An impulse turbine of 2.75 m diameter is rated at 11000kW at 300 r.p.m under a head of 490 m. It uses 2.7 m3 /sec discharge if the turbine is operated under a head of 400 m. (a) What will be the speed, power and discharge. (b) Determine the size of the wheel to develop 7000kW power under a head of 300 m. Also determine the speed and discharge	[12M]
		OR	
	b	What are the different laws on which models are designed for dynamic similarity? Where are they used?	[12M]

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Dept. of Civil Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Civil Engineering	
COURSE: **GROUND IMPROVEMENT TECHNIQUES**	Semester : III-II CREDITS: **3**
COURSE CODE: **16CE3207** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
Course area/domain: **GROUND IMPROVEMENT TECHNIQUES**	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
16CE3207	GROUND IMPROVEMENT TECHNIQUES	Ground improvement is the procedure typically defined as using mechanical means to improve poor ground conditions. improve the engineering properties of the soil mass which is treated to meet project performance requirements.	III-II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	By the end of the course- the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations . K1&K2
CO2	The student should be in a position to design a reinforced earth embankment and check its stability . K2&K3
CO3	The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice. K3
CO4	The student should be able to understand the concepts and applications of grouting… K2

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION:** Need for engineered ground improvement- classification of ground modification techniques; suitability- feasibility and desirability of ground improvement technique; objectives of improving soil.
II	**IN-SITU DENSIFICATION METHODS IN GRANULAR SOILS:** Introduction- Vibration at the ground surface- impact at the ground surface- vibration at depth- impact at depth. **IN-SITU DENSIFICATION METHODS IN COHESIVE SOILS:** Introduction- preloading- sand drains- sand wicks- band drains- stone and lime columns.Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

III	**DEWATERING SYSTEMS:** open sumps and ditches- well point system- deep well system- vaccum dewatering- Electro-Osmosis method.
IV	**STABILIZATION OF SOILS:** Methods of soil stabilization- mechanical- cement- lime- bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.
V	**REINFORCED EARTH:** Principles- components of reinforced earth- governing design of reinforced earth walls- stability checks- soil nailing. **GEOSYNTHETICS:** Introduction- types of geotextiles- functions and their applications- tests for geotextiles- geogrids and its functions.
VI	**GROUTING:** Objectives of grouting- grouts and their applications- methods of grouting- stage of grouting. Case studies indicating the efficiency and importance of ground improvement Technique

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Ground Improvement Techniques' by Purushotham Raj- Laxmi Publications- New Delhi.
T2	Hausmann M.R (1990) Engineering Principles of ground modification- McGraw-Hill International edition.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Current Practices in Geotechnical Engineering Vol.-I- Alam Singh and Joshi- International Book Traders- New Delhi.
R2	An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu- Universities Press.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	GROUND MODIFICATION	PO1, PO2, PO5,PO6 ,PO7& PSO2&PSO3

WEB SOURCE REFERENCES:

1	https://oiipdf.com/download/ground-improvement-techniques-by-purushothama-raj
2	http://library.abes.ac.in/E-Books/Ground-Improvement-Techniques-Notes.pdf
3	https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_GIT_NOTES_0.pdf

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓☐Chalk & Talk	✓☐ PPT	☐Active Learning
✓☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	✓☐ Quiz	☐Tutorials
☐Project based learning	✓☐NPTEL/MOOCS	☐ Simulation
✓☐Flipped Learning	☐Industrial Visit	✓☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	1	1	1	2	1	**2**	1	3	2	3
CO2	2	3	2	2	3	1	1	1	1	1	-	-	2	3	2
CO3	2	2	1	1	1	1	-	-	1	1	1	-	2	2	1
CO4	2	1	3	1	3	2	1	1	-	-	3	-	2	1	3
Average	2.25	2	2.25	1.5	2.75	1.75	0.75	0.75	1	0.75	1.5	0.25	2.25	2	2.25

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
16CE3207	**1.5**	2	2.5	1	2	1	**1**	**1**	1	**1**	1.5	**1.5**	2	2	2

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
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Course Coordinator **Module Coordinator** **Head of the Department**

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S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain classifications of ground modification techniques?	**K2**	**CO1**
2	a)What are the Factors affecting choice of Ground improvement method? (b)Explain four types of rollers used in ground improvement?	**K1**	**CO1**
3	(a)Explain the need and suitability.fesiability of the ground improvement technique for different types of soils (b)Write abount Ground improvement & ground modification?	**K2**	**CO1**
4	a)Explain any two classifications of ground modification techniques? (b)What are the objectives of ground improving soil?	**K1**	**CO1**
	UNIT 2		
1	a) Describe the vibroflotation technique of densifying granular soil. (5M) b) Explain sand drains with a neat sketch. (5M)	**K2**	**CO1**
2	Explain working principles and soil improvement mechanism using 'Rammed Stone Column' and 'Vibro-Replacement' methods. Also highlight the typical characteristics and the relative effectiveness of both the methods.	**K2**	**CO1**
3	a) List the objectives of compacting soil and explain the purpose of compaction. b) What is Dynamic Compaction? Discuss how it is carried out. Also write its benefits and limitations.	**K1**	**CO1**
4	What is advantage of using vertical drains along with pre-loading?	**K1**	**CO1**
	UNIT 3		
1	Explain single and multistage well point system of dewatering. b) How are sumps and ditches used in dewatering?	**K1 & K2**	**CO2**
2	What is dewatering? Explain the practical situation and purpose with examples where the dewatering techniques are employed commonly. b) Explain with neat sketches the electro osmosis technique of dewatering from soil.	**K1 & K2**	**CO2**
3	Explain the vacuum dewatering systems in neat sketch	**K2**	**CO2**

4	Explain in detail with a neat sketch the method of dewatering using sumps and ditches stating its advantages and disadvantages. (Or) How the dewatering is carried out during the construction in detail a monocline fold and illustrate your answers with the help of neat sketches.	**K2**	**CO2**
	UNIT 4		
1	(a) Discuss cement, lime and bitumen stabilization along with its merits and demerits.?	**K2**	**CO2**
2	Discuss the applicability of industrial wastes in soil stabilization.	**K2**	**CO2**
3	Explain the principal and applications of soil-lime stabilisation.	**K2**	**CO2**
4	Explain polymer stabilization?	**K1**	**CO2**
	UNIT 5		
1	a) Explain about the mechanism involved in soil nailing with a neat sketch. b) Discuss in brief about the following component of reinforced earthen walls: (i) Reinforcement (ii) Backfill	**K1 & K2**	**CO3**
2	What are the different types of geotextiles? Discuss the differences between geogrids and geocell	**K2**	**CO3**
3	(a) Explain the properties and applications of geotextiles.. Write a short note on geomembranes and gabions.	**K2 & K1**	**CO3**
4	What is the role of reinforced earth construction in ground improvement?	**K1**	CO3
	UNIT 6		
1	What is a grout? Explain in detail the applications of grouting. b) Describe briefly different grouting techniques.	**K1 & K2**	**CO4**
2	a)Explain in detail with the help of a neat sketch the different stages of grouting. b) Explain in detail the post grout tests.	**K1 & K2**	**CO4**
3	What is the difference in single, double and triple fluid jet grouting?	**K1 & K2**	**CO4**
4	(a) Discuss in detail all the methods of grouting.. Explain different types of grouting techniques.	**K1 & K2**	**CO4**

Code No: 16CE3207

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
(AUTONOMOUS)
III-B.TECH II SEMESTER REGULAR EXAMINATIONS -
GROUND IMPROVEMENT TECHNIQUES
Model Question Paper -I

TIME: 3 Hrs. **Max. Marks: 60M**

PART –A

1. Answer all the Following Questions **6x2=12M**

a) List out various application of mechanical method.
b) Explain in-situ tests to characterize problematic soils.
c) Write the applications of dynamic tamping?
d) List out the functions of compaction pile.
e) What do you mean by elctro-osmosis
f) Define on geo-drains.

[2+2+2+2+2+2]

PART-B

[4 X 12 = 48]

2.a)Explain, briefly the need and objectives of ground modification.
b) Explain the various electrical methods of densifying cohesive soils.

3.a) How can you densify cohesion less soil with the help of vibro compaction technique?
b) Describe the method of densification by Blasting? Explain its effectiveness.

4.a) Explain the properties of a material to be selected as a Geo-synthetics?
b)Explain briefly different types of grouting techniques.

5 What is vertical drain explain the design of vertical drain?

6 .a) Differentiate between the compaction grouting and displacement grouting.
b) Write a short notes on shotcreting.

7 .a) Write a short notes on grid reinforced soil.
b) Discuss about reinforcement with strip.

Code No: 16CE3207 NEC R16

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
(AUTONOMOUS)
III-B.TECH II SEMESTER REGULAR EXAMINATIONS -
GROUND IMPROVEMENT TECHNIQUES
Model Question Paper -II

TIME: 3 Hrs. Max. Marks: 60M

PART –A

1. Answer all the Following Questions 6x2=12M

1a)Distinguish between sand drains and geodrains.
b) Discuss about multistage well points.
c) Mention different types of limes.
d) Define soil nailing.
e) What are the properties of geogrids?
f) Explain about post grout tes

PART-B

[4 X 12 = 48]

2. a) Explain the importance of stone column technique.
b) Explain the objectives of densification in cohesion less soils.

3. a) Describe with neat sketches about dewatering by sumps and ditches.
b) Explain the principle of electro-osmosis method of dewatering.

4. a) Explain the stabilization of expansive soils by calcium chloride.
b) Explain about the mechanical stabilization, along with its affecting factors.

5. a) What are design principles of reinforced earth walls?
b) Explain the stability checks of reinforced earth walls.

6. a) Explain in detail the function of geotextile used as a separator.
b) Explain the properties of geotextiles.

7. a) What is Hydraulic fracturing? What are its uses and applications?
b) Explain about stage grouting in detail.

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Dept. of Civil Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Civil Engineering	
COURSE: **ENVIRONMENTAL ENGINEERING- II**	Semester : IV-I CREDITS: **3**
COURSE CODE: **16CE4102** REGULATION: **R16**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: **ENVIRONMENTAL ENGINEERING- II**	PERIODS: 8 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16CE4102	**ENVIRONMENTAL ENGINEERING- II**	An ability to understand the basic principles and design of Sewage Collection, Conveyance, treatment and disposal.	**IV-I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Plan and design the sewerage systems. K3&K4
CO2	Characterization of Sewage. K2
CO3	Select the appropriate appurtenances in the sewerage systems. K2
CO4	Selection of suitable treatment flow for sewage treatment. K3
CO5	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river. K5

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION TO SANITATION** :systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers – materials for sewers appurtenances in sewerage – cleaning and ventilation of sewers
II	**WASTE WATER COLLECTION AND CHARACTERSTICS:** Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.
III	**WASTE WATER TREATMENT:** Layout and general outline of various units in a waste water treatment plant – primary treatment: design of screens – grit chambers – skimming tanks – sedimentation

	tanks – principles of design – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds.
IV	**SEWERAGE MAINTENANCE:** man holes-drop manholes-ejectors-storm water relief works-Inverted siphon- gutters.
V	**SOLID WASTE MANAGEMENT:** Characteristics- generation- collection and transportation of solid wastes- engineered systems for solid waste management-ISWM-WTE-ULB- (reuse/ recycle energy recovery- treatment and disposal).
VI	**PLUMBING:** Introduction to plumbing—types of fixtures- fire protection system, Fuel and Gas piping system. TRAPS: Types and sizes of traps-vent pipes and their types - hydraulic fittings- brazing-fasteners.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers
T2	Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
T3	Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
T4	Water supply and sanitary Engineering by S.K.Garg,Khanna Pubiilshers
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K.- Khanna Publishers.
R2	Sewage treatment and disposal by Dr. P.N. Modi& Sethi.
R3	Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
R4	Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Industrial wastewater treatment	PO1, PO2, PO5,PO6 ,PO8,PO10& PSO2&PSO3

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc22_ce27/preview
2	https://ascelibrary.org/journal/joeedu
3	https://www.eeer.org/
4	https://www.youtube.com/watch?v=zVZ9c6EXfTA
5	https://www.youtube.com/watch?v=Ej-WdDJvids&list=PL1BFC82F3A63B4172&index=4
6	https://www.youtube.com/watch?v=6nM1bShwRNw

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓☐Chalk & Talk	✓☐ PPT	☐Active Learning
✓☐Web Resources	☐ Students Seminars	✓☐Case Study
☐Blended Learning	✓☐ Quiz	☐Tutorials

✓☐Project based learning	✓☐NPTEL/MOOCS	☐ Simulation
✓☐Flipped Learning	☐Industrial Visit	✓☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	3	-	-	-	2	-	-	-	-	3	3	2	-
CO2	-	-	-	-		-	2	2	2	2	-	3	-	3	3
CO3	-	-	-	-	-	-	2	2	2	2	-	3	-	3	-
CO4	2	2	2	2	-	2	2	-	-	-	-	3	-	3	3
CO5	2	2	2	2	2	-	2	2	-	-	-	-	-	2	2
Average	1.4	1.2	1.4	0.8	0.4	0.4	2	1.2	0.8	0.8	-	2.4	0.5	2.6	1.6

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
R16CE4102	1.4	1.2	1.4	0.8	0.4	0.4	2	1.2	0.8	0.8	-	2.4	0.5	2.6	1.6

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1.Applying technical skills and modern engineering tools for civil engineering day to day practice.

PSO2.Participate in critical thinking and problem solving of civil engineering field that requires analytical and design requirements.

PSO3.Pursue lifelong learning and professional development to face the challenging and emerging needs of our society.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Keywords
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.

Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, selcts, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	What are two products of sewage treatment? Define Population Equivalent	**K1 & K2**	**CO1**
2	What is sewerage and classify the sewerage system.	**K1 & K2**	**CO1**
3	Differentiate between a) Separate system, Combined system b) Sewerage	**K1 & K2**	**CO1**
4	Estimate sewage flow and describe the fluctuations?	**K1 & K2**	**CO1**
	UNIT 2		
1	Explain the meaning and significance of time of concentration	**K1 & K2**	**CO2**
2	What is suspended solids ,What is the effect of suspended solids on water bodies	**K2& K3**	**CO2**
3	What is BOD (Biochemical oxygen demand), COD (Chemical oxygen demand)? Derive an equation for BOD.	**K2 & K3**	**CO2**
4	What are the factors affecting Characteristics and composition of sewage and their significance	**K2 & K3**	**CO2**
	UNIT 3		
1	Explain the legal requirements and standards regarding treatment of sewage	**K1 & K2**	**CO3**
2	Distinguish between high rate and low rate trickling filter.	**K1 & K2**	**CO3**
3	Explain the design and construction of oxidation ponds.	**K1 & K2**	**CO3**
4	Explain primary treatment and biological treatment of wastewater.	**K1 & K2**	**CO3**
	UNIT 4		
1	a) Summarize about manhole and specify about its location? b) Explain about the functioning of overflow weir with a neat sketch.	**K1 & K2**	**CO4**
2	a) Explain about the functioning of drop manhole. b) Why inverted syphons are called depressed sewers and what are the considerations that govern syphon profile?	**K1 & K2**	**CO4**
3	What are the types of storm water regulators in a sewerage system and explain each of these with neat sketches.	**K1 & K2**	**CO4**

4	Sketch and describe about inverted syphon and a syphon spillway. Also outline the advantage of using a syphon spillway instead of other storm sewer works.	K1 & K2	CO4
	UNIT 5		
1	What are the physical characteristics of solid waste and explain its significance.	K1 & K2	CO5
2	What is meant by solid waste? Draw Hierarchy of municipal solid waste management	K2	CO5
3	Explain the sources and types of solid wastes.	K2 & K1	CO5
4	Explain the Improper handling of wastes and Principle of solid waste management.	K1	
	UNIT 6		
1	Describe the fire protection system that can be adopted to a residential building.	K1 & K2	CO6
2	Explain types of traps with a neat sketch.	K1 & K2	CO6
3	Explain plumbing and types of fixtures adopted in a building.	K1 & K2	CO6
4	What are the hydraulic fittings in a building and explain its importance.	K1 & K2	CO6

Code No: **NEC R16**

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
(AUTONOMOUS)
IV-B.TECH I SEMESTER REGULAR EXAMINATIONS -
ENVIRONMENTAL ENGINEERING - II
Model Question Paper -I

TIME: 3 Hrs. **Max. Marks: 60M**

PART –A

1. Answer all the Following Questions **6x2=12M**

a) Define population equivalent.

b) What is significance of time of concentration?

c) What are the advantages of using circular sewers over rectangular sewers?

d) What are the physical characteristics of wastewater and its role in wastewater treatment.

e) Define the term Activated sludge.

f) What is an Oxidation pond and its significance in wastewater treatment? [2+2+2+2+2+2]

PART-B

[4 X 12 = 48]

2a) Discuss the comparative merits and demerits of sewerage system. [6M]

b) A 25cm diameter sewer is running full with an invert slope of 1 in 400. Calculate velocity and rate of flow in the sewer for both full flow and half flow conditions? Take n = 0.015. Compare the results from above problem and specify whether the sewer can be termed as self-cleansing at full flow condition. [6M]

3 a) Explain in detail about BOD & COD and Derive a mathematical expression for BOD? [8M]

b) Explain about the time of concentration and also its significance the design of sewers? [4M]

4. A 4% of sewage sample is incubated for 5 days at 20oc. The depletion of oxygen was found to be 10ppm. Determine BOD of sample. [12M]

5 a) Explain the importance of coagulation in sewage? How to determine the optimum dose of coagulant for a sewage sample. [6M]

b) How can temperature relate with solubility of gases and explain the importance of temperature in sewage characterization. [6M]

6 Give a brief description of sewage decomposition. Distinguish between aerobic, anaerobic and facultative micro-organisms and their role in decomposition of organic matter with chemical reactions. [12M]

7 a) Explain bacteria-algae symbiosis in oxidation pond [6M]
b) What is solid waste and explain its disposal methods in detail. [6M]

Code No: 16CE203 NEC R16

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET
(AUTONOMOUS)
II-B.TECH II SEMESTER REGULAR EXAMINATIONS -
ENGINEERING GEOLOGY
Model Question Paper -II

TIME: 3 Hrs. **Max. Marks: 60M**

PART –A

1. Answer all the Following Questions **6x2=12M**

1a) What are the considerations while finalizing the type of sewerage system?

b) What is plumbing and its importance?

c) What do you understand by the following terms (i) sewage (ii) sullage

d) Describe the purpose of the aeration system.

e) Define Nitrification and Denitrification.

f) Analyze the role of sludge management in Sewage Treatment

PART-B

[4 X 12 = 48]

2. a) Explain the operation and maintenance of sewers. [8]
b) What do you understand by the following terms (i) sewage (ii) sullage (iii) sewer and (iv) sewerage . [4]

3 Explain briefly the following one. (i) Bar Screens (ii) Grit Chamber
(iii) Skimming Tank (iv) Primary Sedimentation Tank [12]

4 a) A test bottle containing only seeded dilution water has its DO level drop by 1.0 mg/L in a 5- day incubation. A 300 mL BOD bottle filled with 10 mL of wastewater and the rest seeded dilution water experiences a DO drop of 6.2 mg/L in the same time period. What would be five day BOD of the wastewater? [6]
b) Explain in detail BOD and COD with equations. [6]

5 a) Explain the cycles of aerobic and anaerobic decomposition. [8]
b) Explain the working principle of standard rate trickling filter with neat sketch. [4]

6 a) Explain in detail Oxidation Pond for Municipal Wastewater Treatment. [8]
b) Explain briefly secondary waste water treatment. [4M]

7 a) Enumerate one and two pipe system of plumbing along with merits and demerits of each system. [8M]
b) Define Trap? Explain types of traps in a residential building. [4M]

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Department of MBA

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF MBA
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19MBAITH03	BUSINESS ENVIRONMENT	1	MBA	5	A

COURSE OUTCOMES: Students are able to

CO1: Understand the nature and basic concepts of business environment and its components.[K2]
CO2: Analyse the structure of Indian economy.
CO3: List the components of fiscal policy and analyse balance of payments.
CO4: Evaluate different trade related policies like WTO, GATS, TRIMS and TRIPS.
CO5: Understand the environmental laws and consumer protection act 1985.[K2]
CO6: Analyse the codes and laws relating to corporate governance.

Unit No	Outcome	Topics/Activity		Ref Text book	Total Periods	Delivery Method
1	**CO 1.[K2]** Understand the nature and basic concepts of business environment and its components.	**Unit-1. Introduction To Business Environment.**				
		1.1	Concept, nature and importance of businessenvironment.BE at national and international level	T1, T2, R1	8	Chalk & Talk, PPT
		1.2	problem and challenges – factors both internal and external influencing business environment	T1, T2, R1		
		1.3	Industrial policies since independence and their significance	T1, T2, R1		
		1.4	Five – year plans and their importance.	T1,R1		
2	**CO2.[K2]** Analyse the structure of Indian economy.	**Unit-2. Structure of Indian Economy**				
		2.1	Nature and Significance of Indian economy& Economic Systems	T1, T2, R1	09	Chalk & Talk, PPT & Case Study
		2.2	Economic reforms in various sectors	T1, T2, R1		
		2.3	Problems and procedures of Disinvestment mechanism.	T1, T2, R1		
		2.4	Sickness in Indian industry	T1, T2, R1		
		2.5	Competition Act 2002	T1,R1		
MID I EXAMINATION DURING SIXTH WEEK						
3	**CO 3[K2]** Understand the fiscal policy and analyse balance of payments.	**Unit-3 Importance of Fiscal Policy**				
		3.1	Nature and significance of fiscal policy	T1, T2, R1	08	Chalk & Talk, PPT
		3.2	Public revenues, Expenditure, Debt, development activities allocation of funds.	T1, T2, R1		
		3.3	Nature, structure & major components of Balance of payments	T1, T2, R1		

		3.4	Causes for disequilibrium in balance of payments and correction measures.	T1, T2, R1		
4	**CO 4.[K2]** Evaluate different trade related policies like WTO, GATS, TRIMS and TRIPS	**Unit-4. Indian Trade Policy**				
		4.1	India's Trade policy	T1, T2, R2	10	Chalk & Talk, PPT &Case Study
		4.2	Nature, significance, challenges and mechanisms of International business environment	T1, T2, R2		
		4.3	Agreements in the Uruguay round including TRIPS, TRIMS and GATS	T1, T2, R2		
		4.4	Disputes settlement mechanism	T1, T2, R2		
		4.5	Dumping and antidumping measures	T1		
5	**CO 5.[K2]** Understand the environmental laws and consumer protection act 1985	**Unit 5. Legal Frame Work**				
		5.1	Special features of the SICA	T1, T2, R3	13	Chalk & Talk, PPT, & Case Study
		5.2	Consumer protection act 1986	T1, T2, R3		
		5.3	Environmental laws (Control and prevention of Air and Water pollution)	T1, T2, R2		
		5.4	Essential Commodities Act 1955.	T1,R2		
6	**CO 6. [K2]** Analyse the codes and relating to corporate gove nance.	**Unit 6. Corporate Governance**				
		6.1	Introduction to corporate governance	T1, T2, R1	12	Chalk & Talk, PPT & Case Study
		6.2	Committees on corporate governance	T1, T2, R1		
		6.3	Role and functions of chairman and managing director	T1, T2, R1		
		6.4	Audit committee and Remuneration committee	T1, T2, R1		
		6.5	Introduction to business ethics and relationship between business ethics and business.	T2,R1		
				Total	60	
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

Text Books:

T1 Aswathappa K: "**Essentials of Business Environment**", Himalaya Publishing House, New Delhi, 2011.

T2 Francis Cherunilam: "***Business Environment-Text and Cases***", Himalaya Publishing House, Mumbai.

Reference Books:

R1 ShaikhSaleem: "**Business Environment**", Pearsons, New Delhi,

R2 Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.

R3 VeenaKeshavPailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012

Faculty HOD Principal

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601

DEPARTMENT OF MBA
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19MBA02TH01	FINANCIAL MANAGEMENT	II	MBA	5	A&B

COURSE OUTCOMES: Students are able to

CO1: Outline the basic concepts of Financial Management. [K1]
CO2: Comprehend the various methods of Investment Analysis and apply various techniques of capital budgeting. [K3]
CO3: Adapt the concepts of leverage, capital structure and its effect on the long term survival of the firm. [K6]
CO4: Appraise various methods of computation of cost of capital. [K5]
CO5: Appraise the valuation methods of dividends and the dividend policies of Indian corporates. [K5]
CO6: Assess the working capital requirement of a firm and comprehend the nitty-gritty of current assets management. [K5]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1. Outline the basic concepts of Financial Management		**Unit-1. Introduction to Financial Decisions**			
		1.1	Definition Financial Management, Nature and scope of financial management, Objectives of Financial Management	T1, T2, R1	10	Chalk & Talk, PPT, Active Learning & Tutorial
		1.2	Profit Maximization and Wealth Maximization, EPS Maximization, Role of a financial manager, Classification of assets and liabilities	T1, T2, R1		
		1.3	Financial Decisions: Investment, Financing, Liquidity and Dividend decision	T1, T2, R1		
		1.4	Time Value of the money, Compounding & Discounting, Risk & Return trade off	T1		
2	CO2. Comprehend the various methods of Investment Analysis and apply various techniques of capital budgeting		**Unit-2. Investment Decision**			
		2.1	Investment or Capital Budgeting decision and types of capital budgeting decisions , Features of investment decisions & classification investment decision	T1, T2, R3	15	Chalk & Talk, PPT Tutorial, Active Learning & Case Study
		2.2	Investment Process: Project Generation, Evolution, Selection, Execution and follow-up, Traditional techniques: Payback period, merits and demerits, Accounting Rate of Return, Discounted cash flow techniques:NPV, IRR, Conflicts between NPV & IRR	T1, T2, R3		
		2.3	Accounting Rate of Return, Discounted cash flow techniques:NPV, IRR, Conflicts between NPV & IRR	T1, T2, R3		
		2.4	Profitability Index(PI), Risk in capital budgeting decision: Risk Adjusted discount rate & certainty of equivalents	T1, T2, R3		
		2.5	Case Studies	T1		
3	CO 3. Adapt the concepts of leverage, capital structure and its effect on the long term survival of the firm		**Unit-3. Financing Decisions**			
		3.1	Meaning of Capital Structure and optimal capital structure, Sources of finance: long term, medium term and short term capital, EBIT-EPS analysis	T1, T2, R1	10	Chalk & Talk, PPT, Tutorial
		3.2	Meaning of Leverage & types of leverages, Financial Leverage, Operating Leverage & Combined leverage	T1, T2, R1		
		3.3	Point of Indifference, Capital Structure theories: Net income approach	T1, T2, R1		
		3.4	Net Operating income approach	T1, T2, R1		

		3.5	Case Studies	T1		
MID I EXAMINATION DURING EIGHT WEEK						
4	CO 4. Appraise various methods of computation of cost of capital	**Unit-4. Cost of Capital**				
		4.1	Concept of cost of capital & importance of cost of capital,	T1, T2, R3	8	Chalk & Talk, PPT & Tutorial, , Industrial Visit, Demonstration with models.
		4.2	Importance of cost of capital in financial decisions ,Cost of debt: cost of redeemable debt issued at par, discount & premium, Cost of irredeemable debt issued at par, discount & premium	T1, T2, R3		
		4.3	Cost of redeemable & irredeemable preference share issued at par, discount & premium, Computation weighted cost of capital or overall cost of capital	T1, T2, R3		
		4.4	Computation weighted cost of capital or overall cost of capital	T1, T2, R3		
		4.5	Case Studies	T1		
5	CO 5. Appraise the valuation methods of dividends and the dividend policies of Indian corporates	**Unit 5. Dividend Decision**				
		5.1	Meaning of dividend & importance of dividend decision	T1, T2, R3	10	Chalk & Talk, PPT, Virtual labs, Tutorial, & Project based learning.
		5.2	Factors effecting the dividend policy, Types of dividends.	T1, T2, R3		
		5.3	Relevance theory of dividend: Walter's approach, Gordon's approach, Basic valuation models, Bonus shares, rights issue & share splits	T1, T2, R3		
		5.4	Case Studies	T1		
6	CO 6. Assess the working capital requirement of a firm and comprehend the nitty-gritty of current assets management	**Unit 6. Liquidity Decisions**				
		6.1	Working Capital Management, components of working capital, gross vs. net working capital, determinants of working capital needs, and the operating cycle approach	T1, T2, R1	12	Chalk & Talk, PPT Tutorial, Active Learning & Seminars
		6.2	Planning of working capital & estimation of working capital, Financing of working capital through Bank finance and Trade Credit.	T1, T2, R1		
		6.3	Management of current assets – Cash: objectives of cash management, cash budget	T1, T2, R1		
		6.4	objectives of inventory management, inventory management techniques-ABC analysis, EOQ, Inventory levels: minimum, maximum and reorder level.	T1, T2, R1		
		6.5	Case Studies	T1		
				Total	65	
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

Text Books:

T1 P.Vijaya Kumar, P.S.Ravindra, V. Kirankumar **"FinancialManagement"**, Himalaya Publishing House, New Delhi,2013.

T2 Sudarshan Reddy, **"Financial Management"**, Himalaya Publishing House, New Delhi,2012.

T3 D. Chandra Bose, **"Fundamentals of Financial Management"**, PHI Publications, New Delhi,2012.

Reference Books:

R1 Rajiv Srivastava, Anil Misra: **"Financial Management"**, Oxford University Press, New Delhi,2012

R2 Brigham,E.F: **"Financial Management Theory and Practice"**, Cengae Learning, New Delhi, 2013

R3 I.M. Pandey: **"Financial Management"**,Vikas Publishers, New Delhi, 2013.

PRINCIPAL **HOD** **FACULTY**

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF MASTER OF BUSINESS ADMINSTRATION
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19MBA3THM1	CBCRM (R19)	III	MBA	5	1

COURSE OUTCOMES: Student is able to

CO1: Outline the basic concepts of Customer Relationship Management. [K2]
CO2: Appraise the customer profile and perception of customer behaviour in relationship perspectives. [K4]
CO3: Analyse strategies for customer acquisition models of CRM. [K4]
CO4: Evaluate the consumer behaviour and business strategies. [K5]
CO5: Apply the various consumer behaviour models. [K3]
CO6: Build the psychological process and develop the effective strategy in terms of impact on consumer behaviour. [K6]

Unit No	Outcome	Topics/Activity		Ref Text book	Total Periods	Delivery Method
1	CO1: Outline the basic concepts of Customer Relationship Management.	**UNIT-1 INTRODUCTION TO CRM**				
		1.1	Definitions - Concepts and Context of relationship Management	T1, T2, R1	10	Chalk & Talk, PPT, & Tutorial
		1.2	Evolution	T1, T2, R1		
		1.3	Transactional Vs Relationship Approach	T1, T2, R1		
		1.4	CRM as a strategic marketing tool	T1, T2, R1		
		1.5	CRM significance to the stakeholders.	T1, T2, R1		
2	CO2: Appraise the customer profile and perception of customer behaviour in relationship perspectives	**UNIT-2 UNDERSTANDING CUSTOMERS**				
		2.1	Customer information Database ,Customer perception,	T1, T2, R3	12	Chalk & Talk, PPT & Case Study
		2.2	Customer Profile Analysis Expectations analysis	T1, T2, R1		
		2.3	Customer behavior in relationship perspectives	T1, T2, R2		
		2.4	Individual and group customer's - Customer life time value – Selection of Profitable customer segments.	T1, T2, R2		
3	CO3: Analyse strategies for customer acquisition models of CRM.	**UNIT-3 CRM STRUCTURES**				
		3.1	Elements of CRM ,CRM Process	T1, T2, R1	12	Chalk & Talk, PPT, Tutorial
		3.2	Strategies for Customer acquisition	T1, T2, R1		
		3.3	Retention and Prevention of defection ,Models of CRM	T1, T2, R1		
		3.4	CRM road map for business applications	T1, T2, R1		
MID I EXAMINATION DURING EIGHTH WEEK						

4	CO4: Evaluate the consumer behaviour and business strategies.	**UNIT-4 INTRODUCTION TO CONSUMER BEHAVIOUR**				
		4.1	Understanding consumers and market Segments	T1, T2, R3	08	Chalk & Talk, PPT & Tutorial,
		4.2	Evolution of consumer Behaviour,	T1, T2, R3		
		4.3	consumer analysis	T1, T2, R3		
		4.4	Business strategy.	T1, T2, R3		
5.	CO5: Apply the various consumer behaviour models.	**UNIT- 5 CONSUMER BEHAVIOR MODELS**				
		5.1	Models of Buyer Behaviour, Howard Model, Howard-.	T1, T2, R3	11	Chalk & Talk, PPT, Tutorial, & Seminars
		5.2	Sheth Model, EKB Model, Webster and Wind Model and Sheth Industrial Buyer Behaviour Model	T1, T2, R3		
		5.3	Social and Cultural Environment Economic, Demographic, Cross Cultural and Socio–Cultural Influences	T1, T2, R3		
		5.4	Social Stratification, Reference Groups and Family, Personal influence.	T1		
6	CO6: Build the psychological process and develop the effective strategy in terms of impact on consumer behaviour	**UNIT-6: PSYCHOLOGICAL FOUNDATIONS OF CONSUMER BEHAVIOR**				
		6.1	Consumer Motivation, Perception, Personality and Behavior	T1, T2, R1	07	Chalk & Talk, PPT Learning & Seminars
		6.2	Learning and Behavior Modification,	T1, T2, R1		
		6.3	Information Processing,	T1, T2, R1		
		6.4	Memory Organization and Function,	T1, T2, R1		
		6.5	Attitude Formation and Attitude Change	Total	66	
MID-II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

TEXT BOOKS:

1. Customer Relation Management, H.Peeru Mohamed and A.Sahadevan, Vikas Publishing2005.

2. The Eight Competencies of Relationships selling, Jim Catheart, Macmillan India, 2005.

REFERENCES:

1. Consumer Behaviour, David L Loudon and Albert J Della Bitta, 4/e, TMH, New Delhi, 2002.
2. Consumer Behaviour, Schiffman, L.G and Kanuk L.L, 8/e, Pearson Education, New Delhi, 2003.

Principal HOD Faculty

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601

DEPARTMENT OF MBA
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19 MBA4THF2	Financial Risk Management & Derivatives	IV	MBA	5	Batch II

COURSE OUTCOMES: Students are able to

CO1: Understand the concept of risk management and various types of risk.[K2]
CO2: Measure different type's risks by applying various tools and techniques.[K6]
CO3: Appraise the role and importance of derivatives and players in the derivatives market.[K3]
CO4: Understand the forward and future contracts and its pricing.[K2]
CO5: Develop swap strategies in order to minimise the risk.[K6]
CO6: Build the option strategies in order to minimise the risk.[K6]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO1: Understand the concept of risk management and various types of risk.		**UNIT-I: INTRODUCTION TO RISK MANAGEMENT**			
		1.1	Concept, nature and scope of risk.	T1, T2, R1	10	Chalk & Talk, Active Learning & Tutorial
		1.2	Risk Management Process: risk identification, risk measurement & evaluation, risk control, risk finance.	T1, T2, R1		
		1.3	Types of risk: interest rate risk, credit risk, market risk and capital market risk.	T1, T2, R1		
		1.4	An integrated approach to corporate risk management and methods.	T1,R3		
		1.5	Comprehensive view of Risk in Financial Institutions, Risk reporting process–internal and external	T1,R3		
2	CO2: Measure different type's risks by applying various tools and techniques.		**UNIT –II :MEASUREMENT AND MANAGEMENT OF RISK**			
		2.1	Value at risk (VaR).	T1, T2, R3	10	Chalk & Talk, Tutorial, Active Learning & Case Study
		2.2	Cash flow at risk (CaR)	T1, T2, R3		
		2.3	VaR and CaR to make investment decisions.	T1, T2, R3		
		2.4	Non- Insurance methods of Risk management vs. Risk avoidance, Loss Control, Risk retention and Risk transfer.	T1, T2, R3		
		2.5	Asset-liability Management (A.L.M)	T1,R3		

3	CO 3: Appraise the role and importance of derivatives and players in the derivatives market.	**UNIT –III:** TECHNIQUES AND TOOLS OF RISK MANAGEMENT				
		3.1	The concept of Derivatives		8	Chalk & Talk, Workshops , Tutorial
		3.2	Importance of Derivatives and	T1, T2, R1		
		3.3	Types of Derivatives.	T1, T2, R1		
		3.4	The role of Derivative securities to manage risk and to exploit opportunities to enhance returns.	T1, T2, R1		
		3.5	Players in the stock/ derivative market: Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market.	T1,R3		
4	CO4: Understand the forward and future contracts and its pricing.	**UNIT –IV:** FORWARD CONTRACTS				
		4.1	Definition, features and pay-off profile of Forward contract, marking to the market.	T1, T2, R3	10	Chalk & Talk, Tutorial, Work Shops & Demonstra --ion with models.
		4.2	Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk-	T1, T2, R3		
		4.3	Limitations of Forward contract. Futures contracts: Definition of future contracts. clearing house, margin requirements,	T1, T2, R3		
		4.4	Valuation of futures contracts.	T1, T2, R3		
		4.5	Risk management with Futures contracts	T1		
5	CO5: Develop swap strategies in order to minimise the risk.	**UNIT –V:** TECHNIQUES AND TOOLS OF RISK MANAGEMENT				
		5.1	SWAPS; Definition and features.	T1, T2, R3	10	Chalk & Talk, Work Shops, Tutorial, & Project based learning
		5.2	Types of swaps: Interest rate swaps, Currency swaps, equity swap, credit default swap & commodity swap.	T1, T2, R3		
		5.3	Valuation & Pricing of interest rate Swaps.	T1, T2, R3		
		5.4	Currency Swaps: Types of Currency Swaps. Valuation & Pricing of currency swaps	T1,R4		
6	CO6: Build the option strategies in order to minimise the risk.	**UNIT –VI:** TECHNIQUES AND TOOLS OF RISK MANAGEMENT				
		6.1	Options; Definition of an option. Types of options: call option, put option,	T1, T2, R1,R4	12	Chalk &
		6.2	Style of option: American option and European option. Options in the money,	T1, T2, R1,R4		
		6.3	At the money and out of the money.	T1, T2,		

				R1,R4		Talk, Tutorial, Active Leaning & Seminars
		6.4	Pay-off option positions, Pricing of call and put options at expiration and before expiration.	T1, T2, R1,R4		
		6.5	The Binominal option pricing model (BOPM): assumptions - single and two period models	T1,R1,R4		
				Total	60	
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

TEXT BOOKS:

1. Financial Risk Management, Vijayakumar P., Naidu.BVR, Venkateswarlu.Ch. Himalaya Publication, New Edition, 1st Edition, 2015.
2. Fundamentals of Financial Derivatives, Prafulla Kumar Swain., Himalaya Publishing House, 1st Edition, 2012.
3. Derivatives and Risk Management, Dhanesh Kumar Khatri , MacMillon,2nd Edition, 2012

REFERENCES:

1. Options, Futures and Other Derivatives ,John C. Hull & Sankarshan Basu, 7th Edition, Pearson Education.
2. Bank Management & Financial Services : Peter S. Rose & Sylvia C. Hudgins, , 7th Edition, Tata McGraw-Hill.
3. Derivatives Valuation and Risk Management, Rajiv Srivastava , Oxford University Press.2nd Edition, 2012.
4. Financial Risk Management, Dun and Bradstreet TMH, Delhi, 2nd Edition, 2011.

Principal **HOD** **Faculty**

Department of MCA

NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601** **Department of Mechanical Engineering**

COURSE INFORMATION SHEET

PROGRAMME: I MCA I Sem	
COURSE: **C programming & Data Structures**	Semester : **I** CREDITS: **4**
COURSE CODE: **R20MCA101** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Programming	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
--	**Computer Fundamentals**	Knowledge of peripheral devices and fundamental topics	--

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Formulating algorithmic solutions to problems and implementing algorithms. **[K1 and K2]**
CO2	To understand the various steps in Program development. [K2]
CO3	To understand the basic concepts in Program. [K2]
CO4	Comprehensive knowledge of data structures and ability to implement the same in software applications. [K4]

SYLLABUS:

UNIT	DETAILS
I	Introduction to Computers, HW and SW concepts, Algorithm, pseudo code, flowchart, program development steps, Introduction to various IDE's and their use in C program development, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Control structures such as if, goto, labels, and switch statements.
II	**Loops-** while, do-while and for statements, break, continue, Arrays – concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1- D arrays other than strings, 2-D character arrays – 2-D arrays other than character arrays – Multidimensional arrays.
III	**Functions:** basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C pre-processor. Passing 1-D arrays, 2-D arrays , and functions. **Pointers:** concepts, initialization of pointer variables, pointers and function arguments, passing by address –dangling memory, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions, command line arguments.

IV	**Derived types:** structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations
V	**Data Structures:** Introduction to Data Structures – Time Complexity – Space Complexity – Pattern matching – naive method – Robin Karp Algorithm - Searching – Linear and binary search methods, sorting – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.
VI	Single linked lists,doubly linked lists,circular lists,representing stacks,queues in C using arrays and linked lists,infix to post fix conversion,postfix expression evaluation.trees binary trees,graphs,prims algorithm.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Computer science, A structured programming approach using C, B.A.Forouzan and R.F. Gilberg, Third edition, Thomson.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	1. Fundamentals of Data Structures in C , Horowitz, Sahni, Anderson-Freed, 2nd ed, Universities Press,2008.
R2	Classic Data Structures, Samanta,2nd ed, PHI, 2009.
R3	The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson.
R4	C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
R5	DataStructures Using C , A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson.
R6	Programming in C , Stephen G. Kochan, III Edition, Pearson .
R7	Data Structures and Program Design in C, R.Kruse,, Tondo, Leung, Shashi M, 2nd Edition, Pearson.
R8	Data Structures and Algorithms, Aho, Hopcroft, Ullman, Pearson ,2006
R9	C and Data Structures, Ashok N.Kamthane, Pearson.
R10	C Programming and Data Structures, E Balaguruswamy, TMH, 2008.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Heap Sort, Balanced Trees	PO5, PSO2

WEB SOURCE REFERENCES:

1	www.udemy.com
2	https://hackr.io/tutorials/learn-c
3	https://www.includehelp.com/.../top-5-websites-for-learning-c-programming-language...

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (30%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (40%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (60%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

V.M

Course Coordinator

V.M

Module Coordinator

Head of the Department

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Design, model, simulate and analyze various mechanical systems or processes.
2. Obtain additional skills and knowledge to develop and implement thermal engineering systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Formulating algorithmic solutions to problems and implementing algorithms. **[K1 and K2]**
CO2: To understand the various steps in Program development. [K2]
CO3: To understand the basic concepts in Program. [K2]
CO4: Comprehensive knowledge of data structures and ability to implement the same in software applications. [K4]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain Basic Structure of a C Program.	K2	CO1
2	Explain Control structures with examples.	K2	CO1
3	Write a short notes on i) bit-wise operators ii) assignment operators iii) type conversions, conditional expressions	K2	CO1
	UNIT 2		
1	Explain different types of loops.	K3	CO2
2	Define String? Explain syntax of string with Example.	K3	CO2
3	Define Array. Explain types of Arrays.	K3	CO2
4	Explain Multidimensional Arrays.	K4	CO2
	UNIT 3		
1	Define function ?Explain syntax of function with Example	K2	CO3
2	Distinguish between user defined function and standard library function	K3	CO3
3	Define pointer? Explain dynamic memory management allocations	K2	CO3
	UNIT 4		
1	Define structure?Explain Intialization of Structure.	K2	CO3
2	Explain nested structures with Example	K2	CO3
3	Explain file operations	K3	CO3
	UNIT 5		

1	Explain Bubble sort with Example	K3	CO3
2	Define Data structure? Explain Insertion sort Algorithm	K3	CO3
3	Explain a)Time Complexity b) Space Complexity	K3	CO3
	UNIT 6		
1	Define lists. Explain Single linked lists with Example.	K4	CO4
2	Explain stacks and queue using arrays	K3	CO4
3	Explain binary trees with Example.	K4	CO4

Model Question Paper

Code: R20MCA101 **R20**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

MCA I YEAR I SEM Regular Examinations

C programming & Data Structures

MASTER OF COMPUTER APPLICATIONS

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 45 Minutes x 3 Questions	135
4	Quick revision & Winding up	10
	Total	180

PART–A (22 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Define Hardware and Software.	K2	1	2
	b	Define loop.Explain types of loops.	K2	2	2
	c	Define Stack	K3	3	2
	d	Explain traversing techniques	K2	3	2
	e	Define Quick sort	K2	3	2
	f	Define Pointer	K4	4	2

PART–B (48 Marks)

Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
1	a	Explain Basic Structure of a C Program	K2	1	10
	b	Explain Control structures with examples.	K2	1	6
2	a	Explain different types of loops.	K2	2	6
	b	Define String? Explain syntax of string with Example.	K4	2	10
3	a	Define function ?Explain syntax of function with Example	K3	3	8
	b	Define pointer? Explain dynamic memory management allocations	K3	3	8
4	a	Define structure?Explain Intialization of Structure.	K2	3	8
	b	Explain nested structures with Example	K3	3	8
5	a	Explain Bubble sort with Example	K3	3	8
	b	Define Data structure? Explain Insertion sort Algorithm	K3	3	8
6	a	Define lists. Explain Single linked lists with Example.	K3	4	6
	b	Explain binary trees with Example.	K4	4	10

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

Department of MASTER OF COMPUTER APPLICATIONS

COURSE INFORMATION SHEET

PROGRAMME: I MCA II Sem	
COURSE: Object Oriented programming Using Java	Semester : II CREDITS: **4**
COURSE CODE: **R20MCA202** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Java	PERIODS: **7** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20MCA101	**C &DS**	Proficiency in C language	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	To be able to analyses the real world problems in an Object Oriented way. **[K1 &K2].**
CO2	Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems. **[K2 & K3].**
CO3	To be able to create Java console, GUI and Web applications in Java **[K4 & K6].**
CO4	To be able to create lightweight multithreaded applications with synchronization **[K2 & k3]**

SYLLABUS:

UNIT	DETAILS
I	**Basics of Object Oriented Programming(OOP):** Problems with Procedure Oriented Programming and Need for OO paradigm. A way of viewing world-Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overridding and exceptions, summary of oops concepts, coping with complexity, abstraction mechanisms.
II	**Java Basics:** Data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects - concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing , recursion, string handling.
III	**Packages, Interfaces and Inheritance:** Defining, creating and accessing a package, understanding CLASSPATH, importing packages. Differences between classes and interface. Defining an interface, applying interfaces, variables in interface and extending interfaces. Hierarchical abstraction, base class objects, Subclass, sub type, substitutability, forms of inheritance, Specialization, specification, construction extension,limitation,combination, benefits of inheritance, costs of inheritance. Member access rules, Super uses, using final with inheritance, polymorphism, abstract classes.
IV	**Exception handling and Multithreading:** Concept of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, Usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Differences between

	multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.
V	**Event Handling, AWT and Swings:** Events, Event sources, Event classes, Event listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components – labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choice, lists, panels- scroll pane, dialogs, menu bar, graphics, layout manager - layout manager types - border, grid, flow, card and grid bag.
VI	**Applets and Swings:** Concepts of applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameter to applets. Limitation of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and Component, Icons and Labels, text fields, buttons - The JButton class, Check boxes,Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Java-The complete reference,7/e, Herbert schildt, TMH.
T2	JAVA:How to program, 8/e, Dietal , Dietal,PHI.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Introduction of programming with JAVA,S.Dean,TMH.
R2	Introduction to Java programming, 6/e, Y.Daniel Liang, Pearson
R3	Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann,Gary
R4	Object Oriented Programming through Java, P.Radha Krishna, University Press
R5	Introduction to JAVA Programming, 7/e, Y.Daniel Liang, Pearson

WEB SOURCE REFERENCES:

1	http://www.w3schools.in/java/
2	https://docs.oracle.com/javase/tutorial/
3	https://docs.oracle.com/javase/tutorial/java/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☒Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3

Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)
Internal tests (40%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (20%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (30%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option

* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :
1. Have a broad understanding of database concepts and database management system software
2 Be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: To be able to analyses the real world problems in an Object Oriented way **[K1 &K2].**
CO2: Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems**[K2 & K3].**
CO3: To be able to create Java console, GUI and Web applications in Java **[K4 & K6].**
CO4:To be able to create lightweight multithreaded applications with synchronization **[K2 & k3]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO

	UNIT I		
1	Explain the summary of oops concept.	**K2**	**CO1**
2	List 6 major differences between C++ and JAVA.	**K1&K2**	**CO1**
3	Define type casting? Explain type casting with an example	**K2**	**CO1**
4	write a Java program to find the factorial of a given number.	**K2**	**CO1**
	UNIT 2		
1	Write a java program to print the following series using "for" loop. 1 2 3 4 5 6	**K2**	**CO2**
2	Why do we need control statement? Name and explain any five important control statements in Java.	**K1&K2**	**CO2**
3	what is a constructor ? How do we invoke a constructor? What are its special properties ?	**K2**	**CO2**
4	Explain the methods of StringTokenizer class.	**K2**	**CO2**
	UNIT 3		
1	Compare and contrast overriding and overloading methods ?	**K2**	**CO3**
2	What are the major differences and similarities between interface and class?	**K3**	**CO3**
3	What is an abstract class and explain with examples ?	**K2**	**CO3**
4	What do you mean by multiple inheritance of an interface explain?	**K2**	**CO3**
	UNIT 4		
1	Define multithreading? Explain the differences between multithreading and multitasking?	**K2**	**CO3**
2	What is an exception? Explain the exception handling in Java.	**K2**	**CO3**
3	what are the checked and unchecked exceptions and explain it?	**K2**	**CO3**
4	Briefly explain the following: i) dead lock ii) daemon thread iii) thread group iv) thread priorities	**K2**	**CO3**
	UNIT 5		
1	Explain Delegation event model	**K3**	**CO3**
2	Explain mouse events with example.	**K3**	**CO3**
3	Explain various components in AWT ?	**K3**	**CO3**
	UNIT 6		

1	Briefly explain the following: i) Check box ii) Text component iii) Focus event iv) JButton	K2	CO4
2	Compare and contrast AWT and Swings?	K4	CO4
3	What is an applet ? Explain life cycle of an applet ?	K2	CO4

Model Question Paper

Code: R20MCA202 **R20**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

I MCA II Semester Regular Examinations

Object Oriented programming Using Java

MASTER OF COMPUTER APPLICATIONS

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any FOUR Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (12 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Explain how Java is more secured than other languages	K2	1	2
	b	Define class and object with suitable examples.	K2	2	2
	c	Define package with suitable examples	K3	3	2
	d	Explain the usage of throws using an example	K2	3	2
	e	What is an event and explain it?	K2	3	2
	f	Explain limitations of AWT.	K2	4	2

PART–B (48 Marks)

Answer any FOUR Questions

S. No		Question	Cognitive Level	CO	Marks
1	a	List 6 major differences between C++ and JAVA.	K2	1	6
	b	Explain the summary of oops concepts	K2	1	6
2	a	Write a java program to print the following series using "for" loop. 1 2 3 4 5 6	K2	2	6
	b	what is a constructor ? How do we invoke a constructor? What are its special properties ?	K4	2	6
3	a	Compare and contrast overriding and overloading methods ?	K3	3	6
	b	What do you mean by multiple inheritance of an interface explain?	K3	3	6
4	a	Define multithreading? Explain the differences between multithreading and multitasking?	K2	3	6
	b	What is an exception? Explain the exception handling in Java.	K3	3	6
5	a	Explain various components in AWT ?	K3	3	6
	b	Explain Delegation event model with example.	K3	3	6
6	a	Compare and contrast AWT and Swings?	K3	4	6
	b	What is an applet ? Explain life cycle of an applet ?	K4	4	6

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NEC

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601

Department of MCA

COURSE INFORMATION SHEET

PROGRAMME: II M.C.A III Sem.,	
COURSE: **Design And Analysis of Algorithms**	Semester : **III** CREDITS: **4**
COURSE CODE: **R19MCATH03** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: DESIGNING	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16MCA201	**Software Engineering**	An ability to analyze and design of particular problems	**III**
R16MCA101	**Data Structures**	Knowledge of Linear Data Structures and Nonlinear Data Structures concepts	**I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Analyze worst case running times of algorithms using asymptotic analysis.**[k4]**
CO2	Describe the divide and conquer paradigm and explain when an algorithmic design situation calls for it. [k1]
CO3	Describe the greedy, dynamic programming paradigm and explain when algorithmic design situation calls for it. [k1]
CO4	Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. [k2]

SYLLABUS:

UNIT	DETAILS
I	**Introduction:** Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation, little-oh notation, little-Omega notation). Disjoint Sets: Disjoint set operations, union and find algorithms
II	**Divide and Conquer:** General method, Applications: Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.
III	**Greedy method:** General method, Applications: 0/1 Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.
IV	**Dynamic Programming:** The General method, Applications: All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.
V	**Backtracking:** The General method, Applications: n-queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.
VI	**Branch and Bound:** The method, Applications: 0/1 knapsack problem, Travelling sales person, LC Branch and Bound Solution NP-Hard and NP-complete problems: Basic concepts, non-deterministic algorithms, cook's theorem.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Fundamentals of Computer Algorithms. Second Edition – Ellis Horowitz, sarataz sahani and Rajasekaram, University Press.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Design and Analysis of Algorithms, First Edition – S.Sridhar, Oxford
R2	Design and Analysis of Algorithms, Second Edition – Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education
R3	Design and Analysis of Computer Algorithms – Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education.
R4	Introduction to the Design and Analysis of Algorithms, Third Edition-Anany Levitin, Pearson Education.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	AVL Trees, 2-3 Trees	

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in
2	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	**METHOD**	**ATTAINMENT LEVEL 3 (EXCELLENT)**	**ATTAINMENT LEVEL 2 (GOOD)**	**ATTAINMENT LEVEL 1 (AVERAGE)**	**ATTAINMENT LEVEL 0 (POOR)**
Internal tests (30%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (10%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (50%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs)

On successful completion of the M.C.A. course, a student should be able to:

PO1: Grasp, understand and comprehend the fundamentals of Information Technology and computer-based systems enabling them to apply their learnt knowledge, skills with right attitude after critical evaluation of approaches, procedures, trade-offs, results related engineering problems and issues in ethically responsible manner for the good of the society through the developments in the current state of the art, and future issues.

PO2: Apply knowledge of Mathematics, Science, and Computer Applications.

PO3: Design and conduct experiments, as well as to analyze and interpret data.

PO4: Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PO5: Function on multidisciplinary teams.

PO6: Identify, formulate, and solve real-world problems using Computer Apps.

PO7: Get an understanding of professional and ethical responsibility.

PO8: Communicate effectively.

PO9: Appreciate the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

PO10: Recognize the need for, and an ability to engage in life-long learning.

PO11: Possess the knowledge of contemporary issues.

PO12: Have abilities to use the techniques, skills, and modern engineering tools necessary for software engineering practice.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: To design and develop algorithms for business and computer applications.

PSO2: To apply security mechanisms for online applications.

PSO3: To apply standard practices and techniques in software project development.

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Define and explain the basic concepts regarding different modes of Heat transfer **[K1 & K2].**
CO2: Analyze conduction mode of heat transfer and demonstrate its applicability in one dimensional mode **[K4 & K3].**
CO3: Summarize convection mode of heat transfer and apply it for different real life systems **[K2 & K3].**
CO4: Illustrate radiation mode of heat transfer with the help of governing laws **[K4].**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	What are Asymptotic notations? Explain.	K2	CO1
2	Explain Time & Space complexity.	K2	CO1
3	What are Disjoint sets? Explain with examples.	K2	CO1
	UNIT 2		
1	Explain Binary search algorithm with example.	K3	CO2
2	Explain Merge sort algorithm with example.	K3	CO2
3	Explain Quick sort algorithm with example.	K3	CO2
4	What is Strassen's matrix multiplication? Explain.	K4	CO2
	UNIT 3		
1	Explain Greedy general method	K2	CO3
2	Explain 0/1 knapsack problem by using greedy method.	K3	CO3
3	Explain Job sequencing with deadlines.	K2	CO3
4	Explain single source shortest path algorithm with example.		
	UNIT 4		
1	Explain All pairs shortest path algorithm in dynamic programming.	K2	CO3
2	Explain OBST.	K2	CO3
3	What is Reliabilty design?	K3	CO3
4	Explain travelling sales person problem with example by using dynamic programming.		
	UNIT 5		
1	Explain n-queen problem in back tracking.	K3	CO3
2	Explain sum of subsets problem in backtracking.	K3	CO3
3	Explain graph coloring in backtracking.	K3	CO3
4	Explain Hamiltonian cycle in backtracking.		
	UNIT 6		
1	Explain 0/1 Knapsack problem in branch & bound.	K4	CO4
2	Explain LC branch & bound.	K3	CO4
3	Expain Travelling sales person problem in branch & bound.	K4	CO4
4	Briefly Explain NP Hard & NP Complete.		

Model Question Paper

Code: R19MCATH03

Narasaraopeta Engineering College

(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
II MCA III SEM., Regular Examinations
Design And Analysis Of Alogithms

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any THREE Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	5
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 45 Minutes x 3 Questions	135
4	Quick revision & Winding up	10
	Total	180

PART–A (22 Marks)
Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	What is an algorithm?	K2	1	4
	b	What is searching?	K2	2	4
	c	What is Greedy method	K3	3	3
	d	What is dynamic programming?	K2	3	3
	e	What is back tracking?	K2	3	4
	f	What is NP-Hard Problem	K4	4	4

PART–B (48 Marks)
Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
1	a	What are Asymptotic notations? Explain.	K2	1	6
	b	What are Disjoint sets? Explain with examples.	K2	1	6
2	a	Explain Binary search algorithm with example.	K2	2	6
	b	Explain Quick sort algorithm with example.	K4	2	6
3	a	Explain 0/1 knapsack problem by using greedy method.	K3	3	6

	b	Explain single source shortest path algorithm with example.	K3	3	6
4	a	Explain OBST.	K2	3	12
5	a	Explain sum of subsets problem in backtracking.	K3	3	6
	b	Explain graph coloring in backtracking.	K3	3	6
6	a	Explain Travelling sales person problem in branch & bound.	K3	4	12

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	b	Define Curse of Dimensionality.	K2	2	2
	c	Explain features of OLAP & OLTP.	K3	3	2
	d	Define Confusion matrix.	K4 and k5	4	2
	e	Explain Candidate generation & pruning.	K4 and k5	4	2
	f	Discuss strengths & weaknesses of DBSCAN Algorithm.	K4 and k5	4	2

PART–B (48 Marks)

Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
1	a	Define Attribute. Explain different types of Attributes.	K1 and k2	1	6
	b	Explain different types of data sets.	K1 and k2	1	6
2	a	Defend the following a)SMC b) Cosine similarity c) Correlation.	K2	2	6
	b	Explain Discretization & Binarization with Example	K2	2	6
3	a	Demonstrate the OLAP operations in Multi-dimensional data model.	K3	3	6
	b	Explain Indexing OLAP data.	K3	3	6
4	a	Explain SVM.	K4 and k5	4	6
	b	Analyzes the performance of Classifier.	K4 and k5	4	6
5	a	Explain Apriori Algorithm with Example.	K4 and k5	4	6
	b	Discuss different methods to handle Continuous Attributes.	K4 and k5	4	6
6	a	Explain K-Means Algorithm.	K4 and k5	4	6
	b	Agglomerative Hierarchical clustering Algorithm.	K4 and k5	4	6

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

Department of MCA

COURSE INFORMATION SHEET

PROGRAMME: III M.C.A V Sem.,	
COURSE: DataScience With R Programming	Semester : **V** CREDITS: **4**
COURSE CODE: R16MCA503 **REGULATION: R16**	**COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE**
COURSE AREA/DOMAIN: DataScience	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R16MCA202	DBMS	Knowledge of RDBMS, Data Models, E-R Model etc	II
R16MCA403	DW&M	Knowledge of Data Marts, Visualization patterns, star, snow flake schemas etc	IV

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Gain a foundational understanding of business analytics. [K2]
CO2	Understand and use the various graphics in R for data visualization. [K2] and [k3]
CO3	Gain a basic understanding of the various statistical concepts. [k3] and [K4]
CO4	Understand and use hypothesis testing method to drive business decisions. [K3] and [K5]
C05	Learn and use the various association rules and Apriori algorithm. [K2] and [k3]
C06	Learn and use clustering methods including K-means, DBSCAN and hierarchical clustering. [k3]

SYLLABUS:

UNIT	DETAILS
I	Introduction to Big Data Analytics Big Data Overview: Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, Bl Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics.
II	Data Analytics Lifecycle: Data Analytics Lifecycle Overview: Key Roles for a Successful Analytics Project, Background and Overview of Data Analytics Lifecycle, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model building Phase 5: Communicate Results, Phase 6: Operationalize.
III	Introduction, how to run R, First R Sessions, Functions, Data Types, Vectors, Matrices & Arrays: Creating Matrices, General Matrix Operations, Adding and Deleting Matrix Rows and Columns, Naming Matrix Rows and Columns Lists: Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists. Control Statements, Loops, - Looping Over Non vector Sets- If-Else, Arithmetic and Boolean Operators and value S.
IV	Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors, Power and Sample Size, ANOVA.
V	Advanced Analytical Theory and Methods-I: Association rule-Apriori algorithm, Clustering: Overview of Clustering, K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Diagnostics.
VI	Advanced Analytical Theory and Methods-II: Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naive Bayes' Theorem, Nai've Bayes Classifier Nai've Bayes in R.

TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services 2014 (Unit 1,2,4,5,6).
T2	The Art of R Programming, Norman Matloff, Cengage Learning (Unit -3).
REFERENCE BOOKS	
R	BOOK TITLE/AUTHORS/PUBLISHER
R1	R for Every One (Advance analytics and Graphics) Jared P. Lander

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Statistical Graphics, Data Reshaping, Probability Distributions	PO5, PSO5

WEB SOURCE REFERENCES:

1	https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf
2	https://nptel.ac.in/courses/106106179/
3	https://nptel.ac.in/courses/111104100/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐Chalk & Talk	☐ PPT	☐Active Learning
☐Web Resources	☐ Students Seminars	☐Case Study
☐Blended Learning	☐ Quiz	☐Tutorials
☐Project based learning	☐NPTEL/MOOCS	☐ Simulation
☐Flipped Learning	☐Industrial Visit	☐Model Demonstration
☐Brain storming	☐Role Play	☐Virtual Labs

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	-	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	-	3.00

COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):					
ASSESMENT TOOL WITH WEIGHTAGE	METHOD	ATTAINMENT LEVEL 3 (EXCELLENT)	ATTAINMENT LEVEL 2 (GOOD)	ATTAINMENT LEVEL 1 (AVERAGE)	ATTAINMENT LEVEL 0 (POOR)

Internal tests (30%)	Direct	Student secured ≥ 60% marks of allocated marks for that CO	Student secured ≥ 60% and < 50% marks of allocated marks for that CO	Student secured ≥ 50% and <40% marks of allocated marks for that CO	Student secured < 40% marks of allocated marks for that CO
Assignments (10%)	Direct	Student secured ≥ 80% marks allocated for that CO	Student secured ≥ 70% and <80% marks allocated for that CO	Student secured ≥ 60% and <70% marks allocated for that CO	Student secured < 60% of marks allocated for that CO
End Semester Examination (60%)	Direct	Student secured grades A*&S* in External Exam	Student secured grades C*&B* in External Exam	Student secured grades D*&E* in External Exam	Student secured grades F* in External Exam
Course end Survey (10%)	Indirect	Student selected option	Student selected option	Student selected option	Student selected option
* Grade Definition: S: >= 90%; A: 80%-89%; B: 70%-79%; C: 60%-69%; D: 50%-59%; E: 40%-49%; F: <40%					

Course Coordinator **Module Coordinator** **Head of the Department**

ANNEXURE I:

(A) PROGRAM OUTCOMES(POs) Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Design, model, simulate and analyze various mechanical systems or processes.
2. Obtain additional skills and knowledge to develop and implement thermal engineering systems

Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Key words
Remember	K1	Defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understand	K2	Comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Apply	K3	Applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyse	K4	Analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluate	K5	Appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports
Create	K6	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, write

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1 Gain a foundational understanding of business analytics. [K2]

CO2 Understand and use the various graphics in R for data visualization. [K2] and [K3]

CO3 Gain a basic understanding of the various statistical concepts. [K3] and [K4]

CO4 Understand and use hypothesis testing method to drive business decisions. [K3] and [K5]

CO5 Learn and use the various association rules and Apriori algorithm. [K2] and [K3]

CO6 Learn and use clustering methods including K-means, DBSCAN and hierarchical clustering. [K3]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	a) Explain Data Structures in Big Data Analytics. b) Discuss State of the Practice in Analytics.	K6	CO1
2	a) Distinguish between BI and Data Science. b) Define and Explain Drivers of Big Data.	K4 and k6	CO1
3	a) Explain Key Roles for the New Big Data Eco System. b) What are examples of Big Data Analytics.	K6	CO1

	UNIT 2		
1	Explain Data Analytics Life Cycles Phases.	**K6**	**CO2**
2	Explain key roles for a successful analytics project.	**K6**	**CO2**
3	Explain Data Preparation phase in Data Analytics Life Cycles Phases.	**K6**	**CO2**
4	Define Model Planning and Model Building.	**K2**	**CO2**
	UNIT 3		
1	a) Explain functions in R Programming b) Explain Data Types in R Programming	**K6**	**CO3**
2	Define Matrix and Array. And explain with syntaxes in R Programming with example.	**K2**	**CO3**
3	How to access the List Components and values in R programming.	**K3**	**CO3**
	UNIT 4		
1	What are Statistical Methods for Evaluation in R programming.	**K1**	**CO4**
2	Explain Wilcoxon Rank-Sum Test.	**K6**	**CO4**
3	Define ANOVA. And explain with examples.	**K2**	**CO4**
	UNIT 5		
1	Explain Apriori Algorithm with example.	**K6**	**CO5**
2	Define K-Mean. What are the Applications of K Mean.	**K2**	**CO5**
3	How to determining the number of clusters in advance analytical theory.	**K3**	**CO5**
	UNIT 6		
1	Define Decision Tree. And Explain how to construct the decision tree with Algorithm.	**K3**	**CO6**
2	How to describes a evaluating Decision Tree.	**K5**	**CO6**
3	Explain Navie Bayes Classifier in R Programming.	**K4**	**CO6**

Model Question Paper

Code: R16MCA503

R16

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

III MCA V Semester Regular Examinations

DATA SCIENCE WITH R PROGRAMMING

MASTER OF COMPUTER APPLICATIONS

[OUTCOME BASED EDUCATION PATTERN]

Time: 3 Hrs **Max. Marks: 60**

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answering the question in Part-A is compulsory
3. Answer any THREE Questions from Part-B

Execution Plan

Sl. No	Activities	Time (Minutes)
1	To study the Question Paper and choose to attempt	10
2	Part-A 5 Minutes x 6 Questions	30
3	Part-B 30 Minutes x 4 Questions	120
4	Quick revision & Winding up	20
	Total	180

PART–A (22 Marks)

Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Explain **Quasi Structured Data** with example.	K2	1	2
	b	Explain **Data Conditioning.**	K2	2	2
	c	Explain **Class function** with example.	K3	3	2
	d	Explain **Hypothesis Testing.**	K2	4	2
	e	Explain **Unsupervised Technique** with example	K2	5	2
	f	what is **Decision Tree** and how to construct a decision tree.	K4	6	2

PART–B (48 Marks)

Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
1	a	Discuss Current Analytical Architecture of Big Data Analytics.	K2	1	10
	b	Explain Drivers of Big Data.	K2	1	6
2	a	Explain Phase 3 and Phase 4 in Data Analytics Life cycle.	K2	2	6
3	a	Explain Control Statements and Loops in R Programming.	K3	3	8
	b	Explain how to create Matrices and Arrays in R programming with example.	K3	3	8
4	a	Discuss Hypothesis testing with example.	K2	4	8

	b	Explain ANOVA in statistical methods for evaluation. .	K3	4	8
5	a	Explain K Means with example.	K3	5	8
	b	How to determining the number of Clusters in Advanced Analytical Theory.	K3	5	8
6	a	Explain Naïve Bayes Theorem.	K3	6	6
	b	Discuss General Algorithm for Decision tree.	K4	6	10

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