1.Academic calendars

NARASARAOPETA ENGINEERING COLLEGE
NEC
(AUTONOMOUS)

ACADEMIC CALENDAR
(B.Tech. 2019 Admitted Batch, Academic Year 2022-23)

2019 Batch 4th Year 1st Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	25-07-2022		
1st Spell of Instructions	25-07-2022	10-09-2022	7 Weeks
I Assignment Examination	08-08-2022	13-08-2022	
II Assignment Examination	29-08-2022	03-09-2022	
I Mid Examination	12-09-2022	17-09-2022	1 Week
2nd Spell of Instructions	19-09-2022	05-11-2022	7 Weeks
III Assignment Examination	03-10-2022	08-10-2022	
IV Assignment Examination	24-10-2022	29-10-2022	
II Mid Examination	07-11-2022	12-11-2022	1 Week
Preparation & Practicals	14-11-2022	19-11-2022	1 Week
End Examinations	21-11-2022	03-12-2022	2 Weeks
2019 Batch 4th Year 2nd Semester			
Commencement of II Semester Class work	05-12-2022		
1st Spell of Instructions	05-12-2022	21-01-2023	7 Weeks
I Assignment Examination	19-12-2022	24-12-2022	
II Assignment Examination	09-01-2023	14-01-2023	
I Mid Examination	23-01-2023	28-01-2023	1 Week
2nd Spell of Instructions	30-01-2023	18-03-2023	7 Weeks
III Assignment Examination	13-02-2023	18-02-2023	
IV Assignment Examination	06-04-2023	11-04-2023	
II Mid Examination	20-03-2023	25-03-2023	1 Week
Preparation & Practicals	27-03-2023	01-04-2023	1 Week
End Examinations	03-04-2023	15-04-2023	2 Weeks

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ACADEMIC CALENDAR
(B.Tech. 2020 Admitted Batch, Academic Year 2022-23)

2020 Batch 3rd Year 1st Semester			
Description	**From Date**	**To Date**	**Duration**
Commencement of Class Work	25-07-2022		
1st Spell of Instructions	25-07-2022	10-09-2022	7 Weeks
Assignment Test-I	15-08-2022	20-08-2022	
I Mid examinations	12-09-2022	17-09-2022	1 Week
2nd Spell of Instructions	19-09-2022	05-11-2022	7 Weeks
Assignment Test-II	10-10-2022	15-10-2022	
II Mid examinations	07-11-2022	12-11-2022	1 Week
Preparation & Practicals	14-11-2022	19-11-2022	1 Week
Semester End Examinations	21-11-2022	03-12-2022	2 Weeks
2020 Batch 3rd Year 2nd Semester			
Commencement of Class Work	05-12-2022		
1st Spell of Instructions	05-12-2022	21-01-2023	7 Weeks
Assignment Test-I	26-12-2022	31-12-2022	
I Mid examinations	23-01-2023	28-01-2023	1 Week
2nd Spell of Instructions	30-01-2023	18-03-2023	7 Weeks
Assignment Test-II	20-02-2023	25-02-2023	
II Mid examinations	20-03-2023	25-03-2023	1 Week
Preparation & Practicals	27-03-2023	01-04-2023	1 Week
Semester End Examinations	03-04-2023	15-04-2023	2 Weeks
Commencement of 4th Year 1st Sem Class Work	05-06-2023		

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ACADEMIC CALENDAR
(B.Tech. 2021 Admitted Batch, Academic Year 2022-23)

2021 Batch 2nd Year 1st Semester			
Description	**From Date**	**To Date**	**Duration**
Commencement of Class Work	5-09-2022		
1st Spell of Instructions	5-09-2022	22-10-2022	7 Weeks
Assignment Test-I	26-9-2022	31-09-2022	
I Mid examinations	24-10-2022	29-10-2022	1 Week
2nd Spell of Instructions	31-10-2022	17-12-2022	7 Weeks
Assignment Test-II	21-11-2022	26-11-2022	
II Mid examinations	19-12-2022	24-12-2022	1 Week
Preparation & Practicals	26-12-2022	31-12-2022	1Week
Semester End Examinations	02-01-2023	14-01-2023	2 Weeks
2021 Batch 2nd Year 2nd Semester			
Commencement of Class Work	16-01-2023		
1st Spell of Instructions	16-01-2023	04-03-2023	7 Weeks
Assignment Test-I	06-02-2023	11-02-2023	
I Mid examinations	06-03-2023	11-03-2023	1 Week
2nd Spell of Instructions	13-03-2023	29-04-2023	7 Weeks
Assignment Test-II	03-04-2023	08-04-2023	
II Mid examinations	01-05-2023	06-05-2023	1 Week
Preparation & Practicals	08-05-2023	13-05-2023	1 Week
Semester End Examinations	15-05-2023	27-05-2023	2 Weeks
Commencement of 3rd Year 1st Sem Class Work	05-06-2023		

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

ACADEMIC CALENDAR
(B.Tech. 2022 Admitted batch, Academic Year 2022-23)

B.Tech 2022 Batch 1st Year 1st Semester			
Description	**From Date**	**To Date**	**Duration**
Commencement of Class Work	26-09-2022		
Orientation/Induction programme	26-09-2022	29-10-2022	5 Weeks
1st Spell of Instructions	31-10-2022	17-12-2022	7 Weeks
I Assignment Test	21-11-2022	26-11-2022	
I Mid examinations	19-12-2022	24-12-2022	1 Week
2nd Spell of Instructions	26-12-2022	11-02-2023	7 Weeks
II Assignment Test	16-01-2023	21-01-2023	
II Mid examinations	13-02-2023	18-02-2023	1 Week
Preparation & Practicals	20-02-2023	25-02-2023	1 Week
Semester End Examinations	27-02-2023	11-03-2023	eeks
Commencement of Second Semester Class work	13-03-2023		
2022 Batch 1st Year 2nd Semester			
Commencement of Class Work	13-03-2023		7 Weeks
1st Spell of Instructions	13-03-2023	29-04-2023	
1 Assignment Test	03-04-2023	08-04-2023	1 Week
I Mid examinations	01-05-2023	06-05-2023	1 Week
2nd Spell of Instructions	08-05-2023	24-06-2023	7 Weeks
II Assignment Test	29-05-2023	03-06-2023	eek
II Mid examinations	26-06-2023	01-07-2023	1 Week
Preparation & Practicals	03-07-2023	08-07-2023	1 Week
Semester End Examinations	10-07-2023	22-07-2023	2 Weeks
Commencement of 2nd Year 1st Sem Class Work	24-07-2023		

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ACADEMIC CALENDAR: AY 2022-23
(M.Tech 2022 Admitted batch, Academic Year 2022-23)

M.Tech 2022 Batch I Year I Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	14-11-2022		
1st Spell of Instructions	14-11-2022	31-12-2022	7 Weeks
I Assignment Examination	12-12-2022	17-12-2022	1 Week
I Mid Examination	02-01-2023	07-01-2023	1 Week
2nd Spell of Instructions	09-01-2023	25-02-2023	7 Weeks
II Assignment Examination	06-02-2023	11-02-2023	1 Week
II Mid Examination	27-02-2023	04-03-2023	1 Week
Preparation & Practicals	06-03-2023	11-03-2023	1 Week
End Examinations	13-03-2023	25-03-2023	2 Weeks
Commencement of II Semester Class work	27-03-2023		
M.Tech 2022 Batch I Year II Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	27-03-2023		
1st Spell of Instructions	27-03-2023	13-05-2023	7 Weeks
I Assignment Examination	24-04-2023	29-04-2023	1 Week
I Mid Examination	15-05-2023	20-05-2023	1 Week
2nd Spell of Instructions	22-05-2023	08-07-2023	7 Weeks
II Assignment Examination	19-06-2023	24-06-2023	1 Week
II Mid Examination	10-07-2023	15-07-2023	1 Week
Preparation & Practicals	17-07-2023	22-07-2023	1 Week
End Examinations	24-07-2023	05-08-2023	2 Weeks
Commencement of III Semester Class work	07-08-2023		

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ACADEMIC CALENDAR: AY 2022-23
(MCA /MBA 2022 Admitted batch, Academic Year 2022-23)

MCA/MBA 2022 Batch I Year I Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	31-10-2022		
1st Spell of Instructions	31-10-2022	17-12-2022	7 Weeks
I Assignment Examination	28-11-2022	03-12-2022	1 Week
I Mid Examination	19-12-2022	24-12-2022	1 Week
2nd Spell of Instructions	26-12-2022	11-02-2023	7 Weeks
II Assignment Examination	23-01-2023	28-01-2023	1 Week
II Mid Examination	13-02-2023	18-02-2023	1 Week
Preparation & Practical's	20-02-2023	25-02-2023	1 Week
End Examinations	27-02-2023	11-03-2023	2 Weeks
Commencement of II Semester Class work	13-03-2023		

MCA/MBA 2022 Batch I Year II Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	13-03-2023		
1st Spell of Instructions	13-03-2023	29-04-2023	7 Weeks
I Assignment Examination	10-04-2023	15-04-2023	1 Week
I Mid Examination	01-05-2023	06-05-2023	1 Week
2nd Spell of Instructions	08-05-2023	24-06-2023	7 Weeks
II Assignment Examination	05-06-2023	10-06-2023	1 Week
II Mid Examination	26-06-2023	01-07-2023	1 Week
Preparation & Practical's	03-07-2023	08-07-2023	1 Week
End Examinations	10-07-2023	22-07-2023	2 Weeks
Commencement of III Semester Class work	24-07-2023		

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ACADEMIC CALENDAR: AY 2022-23
(MBA 2021 Admitted batch, Academic Year 2022-23)

MBA 2021 Batch II Year 1 Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Project Work	17-10-2022		
Project Work	17-10-2022	19-11-2022	5 Weeks
Commencement of Class Work	21-11-2022		
1st Spell of Instructions	21-11-2022	07-01-2023	7 Weeks
I Assignment Examination	19-12-2022	24-12-2022	1 Week
I Mid Examination	09-01-2023	14-01-2023	1 Week
2nd Spell of Instructions	16-01-2023	04-03-2023	7 Weeks
II Assignment Examination	13-02-2023	18-02-2023	1 Week
II Mid Examination	06-03-2023	11-03-2023	1 Week
End Examinations	13-03-2023	25-03-2023	2 Weeks
MBA 2021 Batch II Year II Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	27-03-2023		
1st Spell of Instructions	27-03-2023	13-05-2023	7 Weeks
I Assignment Examination	24-04-2023	29-04-2023	1 Week
I Mid Examination	15-05-2023	20-05-2023	1 Week
2nd Spell of Instructions	22-05-2023	08-07-2023	7 Weeks
II Assignment Examination	19-06-2023	24-06-2023	1 Week
II Mid Examination	10-07-2023	15-07-2023	1 Week
End Examinations	17-07-2023	29-07-2023	2 Weeks

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ACADEMIC CALENDAR: AY 2022-23
(MCA 2021 admitted batch, Academic Year 2022-23)

MCA 2021 Batch II Year III Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	17-10-2022		
1st Spell of Instructions	17-10-2022	03-12-2022	7 Weeks
I Assignment Examination	14-11-2022	19-11-2022	1 Week
I Mid Examination	05-12-2022	10-12-2022	1 Week
2nd Spell of Instructions	12-12-2022	28-01-2023	7 Weeks
II Assignment Examination	09-01-2023	14-01-2023	1 Week
II Mid Examination	30-01-2023	04-02-2023	1 Week
Preparation & Practical's	06-02-2023	11-02-2023	1 Week
End Examinations	13-02-2023	25-02-2023	2 Weeks
Commencement of IV Semester Class work	27-02-2023		
MCA 2021 Batch II Year IV Semester			
Description	**From Date**	**To Date**	**Weeks**
Commencement of Class Work	27-02-2023		
1st Spell of Instructions	27-02-2023	15-04-2023	7 Weeks
I Assignment Examination	27-03-2023	01-04-2023	1 Week
I Mid Examination	17-04-2023	22-04-2023	1 Week
2nd Spell of Instructions	24-04-2023	10-06-2023	7 Weeks
II Assignment Examination	22-05-2023	27-05-2023	1 Week
II Mid Examination	12-06-2023	17-06-2023	1 Week
End Examinations	19-06-2023	24-06-2023	1 Week

MCA 2021 Batch IV Semester (Project Work)

Description	From Date	To Date	Duration
Commencement of Project Work	27-02-2023	24-06-2023	17 Weeks
Thesis Submission Duration	26-06-2023	08-07-2023	2 Weeks

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DEPARTMENT OF BS&H
2022-23 I B.Tech I Semester Time Table (CSE-A)

ROOM NO:

	1	2	3		4	5	6	7
	9.10-10:00	10:00 -10.50	10:50 -11.40	11.40-12.30	12.30-1.20	1.20-2.10	2.20 -3.10	3.10-4.00
MON	ENG-1	AP	LA&C	**L U N C H**	AP	ENGLISH LAB		
TUE	PSC LAB				PSC	ENG-1	ENG-1	MENTORING
WED	LINUX LAB				LA&C	LA&C	PSC	ENG-1
THU	AP	AP	PSC		LA&C	PHYSICS LAB		
FRI	AP	AP	PSC		LINUX	ENG-1	ENG-1	LA&C
SAT	LA&C	LA&C	ENG-1		AP	LIB/SPORTS	LINUX	PSC

Subject Name	Faculty Name	Phone numbers
Engineering Physics	Dr.T. Anjaneyulu	9160606045
Linear Algebra & Calculus	Dr.R.Mohana Ramana	9492075546
Technical &Communicative English-I	Z.Mohana Rao	9030137574
Linux Programming	P Gayathri	9640511197
Problem Solving using C	G.Saranya	9848225735
Softskills & Communication Skills Lab	Z.Mohana Rao/Sk.Rafi	9030137574
Engineering Physics Lab	Dr.T. Anjaneyulu/ Dr.V.Poli Reddy	9160606045
Problem Solving using C Lab	G.Saranya	9848225735

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DEPARTMENT OF BS&H
2022-23 I B.Tech I Semester Time Table (Data Science)

	1	2	3		4	5	6	7
	9.10-10:00	10:00 -10.50	10:50 - 11.40	11.40-12.30	12.30-1.20	1.20-2.10	2.20 -3.10	3.10-4.00
MON	PSC LAB			L U N C H	PSC	LA&C	ENG-1	MENTORING
TUE	EDLD	EC	ENG-1		ENG-1	ES	EDLD	LA&C
WED	EDLD	ENG	LA&C		PSC	CHE LAB		
THU	LA&C	ES	EDLD		EC	EC	ENG-1	PSC
FRI	EC	PSC	EC		SPORTS/LIB	ENG LAB		
SAT	ENG-1	LA&C	EC		LA&C	PSC	EDLD	EDLD

Subject Name	Faculty Name	Phone numbers
Engineering Chemsitry	G.Nagaraju	9966323070
Linear Algebra & Calculus	Dr.G.Dharmaiah	9100265109
Technical &Communicative English-I	SK.Riyaz	9866540165
EDLD : Electronics Devices and Logic Design	N.Srinivasa Rao	9573462080
Problem Solving using C	Dr.G.L.N .Jayaprada	9848891421
Softskills & Communication Skills Lab	SK.Riyaz/M.Purnacha	9866540165
Engineering Chemistry Lab	G.Nagaraju/ Dr.J.Srinivasarao	9966323070
Problem Solving using C Lab	P.Ramani	7993931731
ENVIRONMENTAL STUDIES	Dr.T.Anusha	8919171806

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Signature of Principal

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NARASARAOPETA ENGINEERING COLLEGE (Autonomous)

Department of Electrical and Electronics Engineering

Academic year 2022-2023 (First semester)

Class Time Table

Class In-Charge:-Mr. Sk. Karimulla **Class: II B.Tech/I Sem/EEE-A** **Room No: - 3113** **w.e.f:-05-09-2022**

TIME / WEEK	09:10am-10:00am	10:00am-10:50am	10:50am-11:00am	11:00am-11:50am	11:50am-12:40pm	12:40pm-01:30pm	01:30pm-02:20pm	02:20pm-03:10pm	03:10pm-04:00pm
MON	NM&T	EMF		ECA-II	ECA-II	**LUNCH**	AE	EM-I	EMF
TUE	ES	EMF		NM&T	EM-I		ECA-I/EM-I		
WED	AE	AE/EM-I					ECA-II	EM-I	NM&T
THU	NM&T	AE/ECA-I					EM-I	EMF	AE
FRI	ES	ECA-II		EM-I	NM&T		EMF	AE	ECA-II
SAT	AE	NM&T		ECA-II	AE		PLC LAB		

S.No.		Name of the Subject	Name of the Faculty	No. of Periods/Week
1.	EMF	Electro Magnetic Fields	Mr. P.D.V.S.K.Kisore	5
2.	EM-I	Electrical Machines – I	Mr. P. Naganjaneyulu	5
3.	ECA-II	Electrical Circuit Analysis - II	Mr. Sk. Karimula	6
4.	NM&T	Numerical Methods & Transformation	Miss. B. Swapana	6
5.	AE	Analog Electronics	Mrs. P.Ragava Rani	6
6.	ES	Environmental Studies	Dr. K. Srinivasulu	2
7	EM -I LAB	Electrical Machines - I	Mr. P.D.V.S.K.Kisore / Mr. P. Naganjaneyulu/ Mr. Sk Abdul Kalam	6
8	ECA – LAB	Electrical Circuits Analysis Lab	Mr. Sk. Karimulla/ Dr. Sk.Md. Shareef/ · Mr. Sk Abdul Kalam	6
9	AE LAB	Analog Electronics Lab	Mrs. Raghavarani Sai / Mr.Chandra Sekhar	6
10.	PLC LAB (SC lab)	PLC Automation Lab	Mr.M Chandra Sekhar	3

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech., I Semester, ECE-A Class Time Table for the A.Y. 2022-2023

ROOM.NO:3301 — W.E.F: 05.09.2022

	1	2	3	4		5	6	7
FROM	09:10	10:00	11:00	11:50	12:40	01:30	02:20	03:10
TO	10:00	10:50	11:50	12:40	01:30	02:20	03:10	04:00
MON	STLD	EDC	NM&T	S&S	LUNCH BREAK	DLD/EDC LAB		
TUE	S&S	EDC	STLD	LCS		DLD/EDC LAB		
WED	LCS	EDC	S&S	STLD		ES	NM&T	LCS
THU	ES	EDC	LCS	NM&T		S&S LAB		
FRI	S&S	DSA&RPI LAB				NM&T	S&S	STLD
SAT	NM&T	EDC	S&S	LCS		STLD	LCS	NM&T
BREAK 10:50-11:00								

THEORY

NM&T :	NUMERICAL METHODS AND TRANSFORMATIONS	Mr.D.UMASHANKAR
EDC :	ELECTRONIC DEVICES AND CIRCUITS	Dr.V.VENKATARAO
S&S :	SIGNALS AND SYSTEMS	Mr. M.H.H.SASTRY
STLD :	SWITCHING THEORY AND LOGIC DESIGN	Mrs.T.INDIRA
LCS :	LINEAR CONTROL SYSTEMS	Mr.PDVSK.KISHORE
ES :	ENVIRONMENTAL STUDIES	Dr.K.SRINIVASULU

LABORATORY

EDC LAB:	ELECTRONIC DEVICES AND CIRCUITS LAB	Mr.D.SUNEEL
S&S LAB:	SIGNALS AND SYSTEMS LAB	Mr.P.S.S.CHAKRAVARTHY Mr.M.H.H.SASTRY
DLD LAB :	DIGITAL LOGIC DESIGN LAB	Mrs.T.INDIRA
DSA & RPI LAB:	DESIGN OF SYSTEMS USING ARDUINO & RASPBERRY PI LAB	Mr.SK.MD.SHAREEF/ Mr.P.JAYA BABU

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NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS): NARASARAOPET

DEPARTMENT OF CIVIL ENGINEERING

II B.TECH I SEM TIME TABLE - AUGUST, 2022

Section - ALL Room No: **1306** **w.e.f : 05-09-2022**

Time	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30.-2.20	2.20-3.10	3.10-4.00
MON	SM	FM	BREAK	NMT	NMT	LUNCH BREAK	SUR/BMCT - LAB		
TUE	FM	SM/CABD - LAB					ES	SURVEYING	CT
WED	NMT	FM		SM	SM		SURVEYING	CT	ES
THU	CT	SM		FM	SM		SURVEYING	NMT	NMT
FRI	CT	SURVEYING		SM	NMT		SUR/BMCT - LAB		
SAT	FM	CT		SURVEYING	FM		SM/CABD - LAB		

Class Incharge: Mr. V. SURESH

CODE	SUBJECT NAME	FACULTY NAME
R20CC2101	Numerical Methods and Transformation	Dr. RAVI BABU
R20CE2102	Fluid Mechanics	Mr. M.N.S.SAMBA SIVA RAO
R20CE2103	Strength of Materials-I	Mr. K. JEYA VIGNESH
R20CE2104	Surveying and Geomatics	Mrs. M. VASAVI
R20CE2105	Concrete Technology	Mr. MD. IMRAN KHAN
R20CE21L1	Strength Of Materials - Lab	Mr. K. JEYA VIGNESH/ N. MOHAN
R20CE21L2	Computer Aided Building Drawing - Lab	Mr. MD. IMRAN KHAN/ NM.SUBHANI
R20CE21L3	Surveying Field Work - Lab	Mrs. M. VASAVI/ N M SUBHANI
R20CE21SC1	Building Materials and Construction Technology - Lab	Mr. N. VENKATESWARA RAO/ N. MOHAN
R20CC21MC1	Environmental Studies	Dr. M. SRINIVASA RAO

TIME TABLE I/C

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NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET (AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
II B.TECH I SEM TIME TABLE
Section-A

ROOM NO: 1216 **Wef: 06/09/2022**

	1	2	BREAK	3	4		5	6	7
TIMINGS	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30-2.20	2.20-3.10	3.10-4.00
MON	NMT			MOS		LUNCH	FM&HM		ES
TUE	TD			M&I			MOS&M / M&I LAB		
WED	FM&HM			TD			SM / FM&HM LAB		
THU	ES	SM / FM&HM LAB					NMT		FM&HM
FRI	M&I	MOS&M/ M&I LAB					MOS		TD
SAT	MOS			M&I			NMT	FM&HM	TD

CODE	SUBJECT	FACULTY
NM&T	Numerical Methods and Transformations	Mrs.A.Aparna
FM&HM	Fluid Mechanics &Hydraulic Machinery	Mr. T.V. Rao
M&I	Metrology& Instrumentation	Mr.K.Kiran Chand
TD	Thermodynamics	Mr.K.Jail Sing
MOS	Mechanics of Solids	Mr.MD.Taju
FM&HM LAB	Fluid Mechanics &Hydraulic Machinery Lab	Mr. K.John Babu/ A.Pavan Kumar
MOS&M LAB	MOS & Metallurgy Lab	Dr.P.Suresh Babu/ MD.Taju
M&I LAB	Metrology& Instrumentation Lab	Dr.M.Venkanna Babu/ R.China Rao
SM	Solid Modelling	Dr. T. R. Santhosh kumar /Mr.M.Srinivasa Rao
ES	Environmental Studies	Dr.K.Srinivasulu

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DEPARTMENT OF MECHANICAL ENGINEERING
III B.TECH I SEM TIME TABLE
Section-A

ROOM NO: 1320 **Wef: 25/07/2022**

	1	2	BREAK	3	4		5	6	7	
TIMINGS	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30-2.20	2.20-3.10	3.10-4.00	
MON	OR		B R	HPE	PEHV	LUNCH	HPE/AI&ML LAB			
TUE	MCMT	ROBOTICS& 3-D PRINTING LAB					HPE		AI&ML	
WED	HPE	AI&ML	E A	OR			DME-I		Honors/Minors	
THU	PEHV	HPE/AI&ML LAB					ROBOTICS& 3-D PRINTING LAB			
FRI	DME-I		K	AI&ML			MCMT		HPE	Honors/Minors
SAT	OR			DME-I			MCMT	AI&ML	HPE	Honors/Minors

CODE	SUBJECT	FACULTY
MCMT	Metal Cutting & Machine Tools	Dr.D.Suneel
HPE	Heat Power Engineering	Mr. T.Narender
DME-I	Design of Machine Elements -I	Dr.M.Venkanna Babu
AI&ML	Artificial Intelligence & Machine Learning	Dr.D.Jagadish
OR	Operation Research	Mr. T.Ashok Kumar
PEHV	Professional Ethics & Human Values	Mr.Y.Suresh
HPE Lab	Heat Power Engineering Lab	Mr. E.Saidulu / M. Venkaiah
ROB& 3D PRINTING LAB	ROBOTICS& 3-D PRINTING LAB	Mr. CH.Sekhar /Mr. T.Narender
AI&ML LAB	Artificial Intelligence & Machine Learning Lab	Dr.D.Jagadish /Mr. T.Ashok Kumar

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DEPARTMENT OF MECHANICAL ENGINEERING
IV B.TECH I SEM TIME TABLE
Section-A

ROOM NO: 1315

Wef: 25/07/2022

	1	2	BREAK	3	4		5	6	7
TIMINGS	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30-2.20	2.20-3.10	3.10-4.00
MON	CAD/CAM	IEM	B	MCT		LUNCH	FEM		LSCM
TUE	MCT	MECHATRONICS & SIMULATION LAB					CAD/CAM	LSCM	CAD/CAM
WED	MCT	PPE	REAK	FEM			IEM		PPE
THU	PPE			IEM			MECHATRONICS & SIMULATION LAB		
FRI	CAD/CAM			LSCM	MCT		FEM		LSCM
SAT	LSCM			CAD/CAM	IEM		MCT	PPE	

CODE	SUBJECT	FACULTY
FEM	Finite Element Methods	Dr. S. Jaya Krishna
CAD/CAM	CAD/CAM	Mr.M.Venkaiah
MCT	Mechatronics	Mr.CH.Sekhar
IEM	Industrial Engineering and Management	Dr. T.R.Santosh Kumar
PPE	Power Plant Engineering	Mr.M.Sreenivasa Rao
LSCM	Logistics & Supply Chain Manegement	Dr.M.Aravind
MCT&S LAB	Mechatronics & Simulation LAB	Mr.K.Kiran Chand/Mr.N.Arun Kumar

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DEPARTMENT OF MCA
I MCA (2022 BATCH) I SEMESTER TIME TABLE

W.e.f:31-10-2022

DAY	9:10 TO 10:00	10:00 TO 10:50	10:50 TO 11:00	11:00 TO 11:50	11:50 TO 12:40	12:40 TO 01:30	01:30 TO 02:20	02:20 TO 03:10	03:10 TO 04:00
MON	C&DS	C&DS	BREAK	CO	CO	LUNCH	OS	OS	MSF
TUE	DBMS	DBMS		MSF	LUNCH	C&DS LAB			
WED	CO	CO		C&DS	C&DS	LUNCH	OS	MSF	MSF
THU	CO	CO		C&DS	C&DS		DBMS	DBMS	MSF
FRI	DBMS	DBMS		MSF	LUNCH	OS & LINUX LAB			
SAT	OS	OS		OS		DBMS LAB			

S.NO	FACULTY NAME	SUBJECT NAME
1	V.MAHESH BABU	C PROGRAMMING AND DATA STRUTURES
2	M.MAMATHA	COMPUTER ORGANIZATION
3	G.SAMBASIVA RAO	DATA BASE MANAGEMENT SYSTEMS
4	M.SAI YASWANTH	OPERATING SYSTEMS
5	A.APARNA	MATHEMATICAL AND STATISTICAL FOUNDATIONS
6	M.MAMATHA	C PROGRAMMING AND DATA STRUTURES LAB
7	G.SAMBASIVA RAO	DATA BASE MANAGEMENT SYSTEMS LAB
8	M.SAI YASWANTH	OPERATING SYSTEMS & LINUX LAB

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DEPARTMENT OF MCA
II MCA (2021 BATCH) III SEMESTER TIME TABLE

W.e.f:13-10-2022

DAY	9:10 TO 10:00	10:00 TO 10:50	10:50 TO 11:00	11:00 TO 11:50	11:50 TO 12:40	12:40 TO 01:30	01:30 TO 02:20	02:20 TO 03:10	03:10 TO 04:00
MON	ML	ML	BREAK	WT	WT	LUNCH	NS&C	NS&C	HRM
TUE	UNIFIED MODELING LANGUAGE LAB						UML	HRM	HRM
WED	WEB TECHNOLOGIES LAB						UML	UML	HRM
THU	MACHINE LEARNING WITH PYTHON LAB						NS&C	NS&C	WT
FRI	ML	ML	BREAK	WT	NS&C		UML	UML	I/M
SAT	ML	ML	BREAK	WT	WT		UML	ES-2	HRM

S.NO	FACULTY NAME	SUBJECT NAME
1	M.MAMATHA	MACHINE LEARNING WITH PYTHON
2	V.MAHESH BABU	WEB TECHNOLOGIES
3	G.SAMBASIVA RAO	NETWORK SECURITY AND CRYPTOGRAPHY
4	B.SIVA PRASAD	UNIFIED MODELING LANGUAGE
5	SD.SALMA	HUMAN RESOURCE MANAGEMENT
6	M.SY & M.M	MACHINE LEARNING WITH PYTHON LAB
7	G.S.R & M.SY	WEB TECHNOLOGIES LAB
8	B.SIVA PRASAD	NETWORK SECURITY,CRYPTOGRAPHY& UML LAB
9	B.SIVA PRASAD	EMPLOYABILITY SKILLS-2
10	G.SAMBASIVA RAO	INTERNSHIP/MINI PROJECT

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

COURSE INFORMATION SHEET OF (CSE) AI

Academic year 22-23

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
R20CC1101	TECHNICAL & COMMUNICATIVE ENGLISH-I	Basic English Grammar Ability to speak effortlessly in English	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. .**(Applying-K3)**
CO2	Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie charts and bar diagrams.**(Creating-K6)**
CO3	Build grammatically correct sentences using a variety of sentence structure. **(Applying-K3)**
CO4	Enhance word power and usage of lexicons. **(Applying-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 & Vocabula** : 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.

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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 & Vocabular** : 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.

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	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	GATE VOCABULARY	10

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/

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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	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
C2103	-	-	-	-	-	-	-	-	1	3	-	1	-	-

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

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Course Instructor 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.

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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 1		
1	What could be the reason for the drawer remaining locked for close to twenty five years?	K3	CO1
2	How does the writer support her statement that the 1990's had a 'fine balancing act'?	K3	CO1
3	What could be the justification for the contrasting behaviors of mothers from different generations towards their young? Which generation mother would you prefer?	K3	CO1
4	Skimming and Scanning	K3	CO1
5	GRE and Technical Vocabulary	K3	CO4
6	Paragraph Writing	K3	CO3
	UNIT 2		
1	What suggestions did Nehru give to Indira in his letter?	K3	CO1
2	According to Nehru, how does a great leader help?	K3	CO1
3	During the freedom movement, what did Gandhiji focus on?	K3	CO1
4	GRE and Technical Vocabulary	K3	CO4
5	Articles and Prepositions	K3	CO3
6	Summarizing and Paraphrasing	K3	CO2

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	UNIT 3		
1	What have you admired most about Prof . Hawking's life?	K3	CO1
2	What are Prof. Hawking's greatest contributions to the field of science?	K3	CO1
3	How does Hawking change the perceptions of people with disabilities?	K3	CO1
4	GRE and Technical Vocabulary	K3	CO4
5	Concord	K3	CO3
6	E-Mail, Resume	K5	CO2
	UNIT 4		
1	Mention any three qualities in Wangari Mathai that impressed you?	K3	CO1
2	Do you think that the Green Belt Movement can be encouraged in India? Justify your answer	K3	CO1
3	What are two similarities and two differences between the GBM and India's Chipko Movement?	K3	CO1
4	GRE and Technical Vocabulary	K3	CO4
5	Degrees of Comparision	K3	CO3
	UNIT 5		
1	Why do we want to stay hungry, stay foolish? When we can 'stay full, stay smart'?	K3	CO1
2	What are some don'ts Steve Jobs mentions for progress?	K3	CO1
3	Do you agree that death is very likely the single best invention of life? Why?	K3	CO1
4	GRE and Technical Vocabulary	K3	CO4
5	Reported Speech, Correction of Sentences	K3	CO3
6	Academic Proposals	K5	CO2

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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-K6)**

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)**

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***

Model Paper-I

I B.Tech I Semester Examinations,

Sub Code: 20CC2201 **Technical & Communicative English-I**
Time: 3 hours **Max. Marks: 70M**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks **(5 X 12 = 60M)**

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	i)What does the author suggest by saying the current decade has 'An excess of many things'?	3	1	8M
		ii)Write ***antonyms*** for the following words. I. Ensue IV. Vanish II. Lauded V. Obscure III. Inane VI. Adequate	3	4	6M
		OR			
	b	i) How does the writer support her statement that the 1990's had a 'Fine Balancing Act'?	3	1	8M
		ii) **Arrange the following *jumbled sentences*** to make a meaningful paragraph. i. Sri Krishna college of arts and science that re-opened in the second week for the ii. Students, along with parents, spent to the whole day in college familiarising themselves. iii. There were a few colleges that decided to go about it differently. iv. There were even some small memories to remember their entry into college life. v. The customary welcome with chocolates and roses was made , besides a few cultural events.	3	2	6M
		Unit-II			
2	a	i) What suggestions did Nehru give to Indira in his letter?	3	1	8M

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		ii) Fill in the blanks with suitable ***prepositions***. i. You will see her …….the reception. ii. They have been living here …….2000. iii. The cat jumped ……. the rat. iv. She held her pen ……. her fingers. v. There is no exception ……the rule. vi. He distributed chocolates on his birthday …….the children.	3	3	6M
		OR			
	b	i) During the freedom moment, What did Gandhiji focus on? Answer with reference to the text	3	2	8M
		ii) Fill in the blanks with appropriate articles: a. It is--------- interesting novel. b. I want ---------piece of chalk. c. Ganges is a holy river. d. Reena is ---------- university student. e. I have ---------- white car. f. For Brutus is ----------honourable man.	3	3	6M
3		**Unit-III**			
	a	i) What are the eight lessons that one can learn from Prof. Hawking's life?	3	1	8M
		ii) ***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.	3	2	6M
		OR			
	b	i) What have you admired most about Prof.Hawking?	3	1	8M
		ii) ***Write an E-mail cover letter and resume*** applying for the post of Software developers in Infosys, Somajiguda, Hyderabad.	3	2	6M
4		**Unit-IV**			
	a	i) What philosophy does Maathai propagate?	3	1	8M
		ii) ***Transform the following sentences*** as directed. i. Chennai is one of the biggest cities in India. (Change into positive degree) ii. Greenland is larger than many other islands in the world.(Change into superlative)	3	3	6M

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		iii. The Japanese are the most courteous people in the world (Change into comparative degree)			
		OR			
		i) Mention any three qualities in Wangari Mathai that impressed you?	3	1	8M
	b	ii) Match the following ***Technical words*** with their meanings. **A** — **B** i. Radiation — a. a fibre-optic instrument inserted through the abdominal wall ii. Ampere — b. a particle representing a quantum of light iii. Feedback — c. substance which does not readily allow the passage of heat or sound iv. Angiography — d. typically represented by values of a physical quantity v. Generator — e. information about reactions to a product vi. Photon — f. a roughly circular line, route	3	4	6M
		Unit-V			
5	a	i) What is Steve job's philosophy of his life?	3	1	8M
		ii) Change the following sentences into ***reported speech.*** i. She said, "I have completed my homework". (Change into Reported speech) ii. 'Please, help me from starvation',said the beggar.(Change into Reported) iii. "Is it really time to get up?" said John.	3	3	6M
		OR			
	b	i) "The only way to do great work is to love what to do".Explain Steve job's statement.	3	1	8M
		ii) Match the following ***GRE words*** with their meanings.	3	4	6M

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		i. satiate ii. vexation iii. simultaneous iv. supplant v. transient vi. whimsical vii. volatile viii. tractable ix. unadorned x. undermine xi. candid xii. benign	a. to overtake or replace b. fanciful c. to completely satisfy d. state of being frustrated e. easily changeable f. occurring at the same time g. can be easily influenced or managed h. plain i. to weaken or compromise j. passes quickly k. gentle l. open			

KL: Knowledge Level CO: Course Outcome M:Marks

***

Model Paper-II

I B.Tech I Semester Examinations,

Sub Code: 20CC2201 **Technical & Communicative English-I**
Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal **Marks (5 X 12 = 60M)**

Q.No		Questions	KL	CO	M
1		**Unit-I**			
	a	i) How does the narrator relate her past memories about the dressing table to thepresent time?	3	1	8M
		ii) Write a paragraph on Advantages of Technology.	6	2	6M
		OR			
	b	i) Explain the significance of the contents discovered by the narrator in the drawer ofthe dressing table. Why are the children very enthusiastic about them?	3	1	8M
		ii) Write a paragraph on the topic Books are the Best friends.	6	2	6M
2		**Unit-II**			

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	a	i) Explain the views expressed by Nehru in his letter to his daughter on her birthday.	3	1	8M
		ii) Fill in the blanks with suitable ***prepositions***. i. You will see her .....the reception. ii. They have been living here .....2000. (i) The snake crawled ------ the road. (ii) The arrow fell----------the river. (iii) There is a roof ------- the ground. (iv) There is a temple ----------the hill.	3	3	6M
		OR			
	b	i) During the freedom moment, What did Gandhiji focus on? Answer with reference to the text	3	1	8M
		ii) Fill in the blanks with appropriate articles: g. It is--------- interesting novel. h. I want --------- piece of chalk. i. Ganges is a holy river. j. Reena is ---------- university student. k. I have ---------- white car. l. For Brutus is ----------honourable man.	3	3	6M
3		**Unit-III**			
	a	i) What are the eight lessons that one can learn from Prof. Hawking's life?	3	1	8M
		ii) Write a letter to the District Collector on steps to be taken to develop plastic freezone in your Smart City.	6	2	6M
		OR			
	b	i) Write about Hawking's childhood and education.	3	1	8M
		ii) Write an e-mail to your team manager on the development of new project in thecompany.	6	2	6M
4		**Unit-IV**			
	a	i) What philosophy does Maathai propagate ?	3	1	8M

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		b) ii)Rewrite as directed: (i) The Pacific is bigger than any other ocean in the world.[Write the superlative degree form] (ii) The king as well as his soldiers are celebrating the victory.[Correct the sentence] (iii) He----------coffee every morning.[drink] [Fill in the blank] (iv) Gopal said to the attendant' Bring the register here'.[Change into indirect speech] (v) He said will you come tomorrow? [Change into indirect speech] (vi)He exclaimed sadly that he was ruined. (Change into direct speech)	3	3	6M
		OR			
	b	i) What are the awards and honors won by Wangari Mathai?	3	1	8M
	b	ii)Rewrite as directed: (i) Ram said' I am going to the market'. [Change to indirect speech] (ii) Ravi is the tallest boy in the school [Change into positive degree of comparison] (iii) Pulses are more nutritious than meat. [Change to positive degree of comparison] (iv)One must love his country. [Correct the sentences] (v) She has been sleeping since four hours. [Correct the sentence]. (vi)The stranger said to me, "Where do you live?" [Change to indirect speech]	3	3	6M
5		**Unit-V**			
	a	i) What is Steve job's philosophy of his life?	3	1	8M
	a	b)Give the antonyms: (i)Elevate (ii) Candid (iii) Vulnerable (iv) Orthodox (v) muttered (vi) guile	3	4	6M
		OR			
	b	i)"The only way to do great work is to love what to do ".Explain Steve job's statement.	3	1	8M
	b	ii) Give the synonyms: (i)Capricious (ii) Deftness (iii) Reverence (iv) Loquacious. (v) burgeon (vi) biased	3	4	6M

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I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code:	**SOFT SKILLS & COMMUNICATION SKILLS LAB (Common to All Branches)**						

COURSE COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication skills to enable them to interact with the people in various social situations.
- To enable the learners improve pronunciation with the knowledge of phonetics.
- To provide exposure to students to soft skills like Goal Setting, Time Management, Interpersonal Skills, and Intra Personal Skills.

COURSE OUTCOMES:

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

CO1: Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.
CO 2: Listen and comprehend several accents of English Language
CO 3: Take part in various conversations/discourses using formal and informal expressions.
CO 4: Adapt soft skills successfully in personal and professional life.

UNIT– I

a. Introduction to Phonetics.
b. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
c. Self-Introduction

UNIT–II

a. Pronunciation Rules & Common Errors in Pronunciation.
b. Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
c. Role Play

UNIT–III

a. Situational Dialogues (Inviting, Accepting and Declining Invitations)
b. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
c. JAM

UNIT-IV

a. Situational Dialogues (Commands, Instructions and Requests)
b. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)
c. Telephonic Etiquette.

UNIT-V

a. Time Management.
b. Goal Setting.

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c. Interpersonal Skills & Intra personal skills.

TEXT BOOKS:

"Strengthen Your Communication Skills", Maruthi Publications, 2013.

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2015
2. J.D.O Conner, *Better English Pronunciation,* Cambridge University Press 1980.
3. T.Balasubramanian, *"A Text Book of English Phonetics for Indian Students"*, Macmillan,1981
4. Penny ur *Grammar Practice Activities,* Cambridge University Press, 2010.
5. Mark Hancock, *Pronunciation in Use,* Oxford University Press 2007.
6. K. R Lakshmi Narayanan, T. Murugavan, *Managing Soft Skills,* Scitech Publications, 2010.
7. K V S G Murali Krishna, K V K K Prasad, *Placement and Personality Development,* Second Edition, Reem Publications Pvt. Limited, 2012
8. Shiv Khera, *You can Win,* Bloomsbury Publication, 2014
9. Stephen R. Covey, *The 7 Havits of Highly Effective People,* Free Press, 1989

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

Technical and Communicative English –I

Lesson Plan

Course Code	Course Title	Sem	Branch	Periods per week	Sections
R20CC1101	Technical and Communicative English -I	I - I	Common to all Branches(CE,EEE,MECH, ECE,CSE,IT&AI)	5	

COURSE OUTCOMES:

S No	Course Outcomes
CO1	Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. .**(Applying-K3)**
CO2	Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie charts and bar diagrams.**(Creating-K6)**
CO3	Build grammatically correct sentences using a variety of sentence structures.**(Applying-K3)**
CO4	Enhance word power and usage of lexicons.**(Applying-K3)**

S.No.	Unit No.	COS	Topic	No.of Periods	Teaching Methodology
1	1	CO-1 (Applying)	**A Drawer full of Happiness**	3	Chalk & Talk Blended Learning Activity based PPT Cooperative Learning
2		CO-4 (Applying)	a. Vocabulary -GRE	2	
3		CO-4 (Applying)	b.Synonyms, Antonyms	1	
4		CO-3 (Applying)	c.Grammar: Word forms, Nouns	1	
5		CO-3 (Applying)	d.Basic Sentence Structure and	1	
6		CO-3 (Applying)	Word order and Questions	1	
7		CO-2 (Applying)	Reading: Skimming and Scanning	2	
8		CO-2 (Creating)	Writing :Paragraph Writing	2	
ASSIGNMENT-I					
9	2	CO-1 (Applying)	**Nehru's Letter to Daughter Indira on her Birthday**	2	
10		CO-4 (Creating)	a. Vocabulary :GRE, Technical and analogies	3	
11		CO-3 (Creating)	b.Grammar Articles, Prepositions	2	
12		CO-2 (Creating)	c.Reading: Identifying Sequence of Ideas	1	Chalk & Talk Blended Learning

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13		CO-2 (Creating)	d.Writing:Summarising	1	Activity based PPT Cooperative Learning
14		CO-2 (Creating)	e.Paraphrasing	1	
15		CO-2 (Applying)	f.Note making	1	
16		CO-2 (Applying)	g.Note Taking	1	
17	3	CO-1 (Applying)	**Stephen Hawking- Positivity - Benchmark**	3	Chalk & Talk Blended Learning Activity based PPT Cooperative Learning
		MID-I EXAMINATION			
18		CO- 4 (Applying)	a.Vocab: GRE,Technical	3	
19		CO-3 (Applying)	b.Grammar:Verbs, Tenses,	3	
20		CO-3 (Applying)	c.Cocord: Subject-Verb Agreement	1	
21		CO-3 (Applying)	d.Reading :Reading between the lines.	1	
22		CO-2 (Creating)	e.mail Etiquette and Resume Writing.	1	
23		CO-2 (Creating)	f. Letter writing.	1	
24	4	CO-1 (Applying)	**Like a Tree, Unbowed:Wangari Maathai-Biography**	5	Chalk & Talk Blended Learning Activity based PPT Cooperative Learning
		ASSIGNMENT-II			
25		CO-4 (Applying)	a. Vocabulary :GRE, Technical and analogies	2	
26		CO-4 (Applying)	b.Cloze Encounter- Analogies	1	
27		CO-3 (Applying)	c.Qunantifying Expressions.- Adjectives and Adverbs	1	
28		CO-3 (Applying)	d. Degress of Comparison	2	
29		CO-2 (Creating)	e. Statement of Purpose	1	
32	5	CO-1 (Applying)	**Stay Hungry, Stay Foolish.**	4	Chalk & Talk Blended Learning Activity based PPT Cooperative Learning
33		CO-4 (Applying)	a. Vocabulary :GRE.	2	
34		CO-3 (Applying)	b.Reproted Speech	1	
35		CO-2 (Applying)	c. Editing Text	1	
36		CO-3 (Applying)	d.Correction of Sentences	1	
37		CO-2 (Applying)	e.Reading Comprehension	1	
38		CO-2 (Applying)	f. Intensive Reading and Extensive Reading	2	
		MID-II EXAMINATION			

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END SEMESTER EXAMINATIONS

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

Signature of the Faculty

Signature of the HoD

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

Technical and Communicative English –I

Lesson Plan AY. 2022-23

Course Code	Course Title	Sem	Branch	Periods per week	Section
R20CC1101	Technical and Communicative English -I	I - I	Common to all Branches(CE,EEE,MECH, ECE,CSE,IT,AI,DS,CS& AI-ML)	**5**	**CSE-AI**

COURSE OUTCOMES:

S No	Course Outcomes
CO1	Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. .**(Applying-K3)**
CO2	Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie charts and bar diagrams.**(Creating-K6)**
CO3	Build grammatically correct sentences using a variety of sentence structures.**(Applying-K3)**
CO4	Enhance word power and usage of lexicons.**(Applying-K3)**

S.No.	Unit No.	COS	Topic	No.of Periods	Teaching Methodology
1	1	CO-1 (Applying)	**A Drawer full of Happiness**	3	Chalk & Talk
2		CO-4 (Applying)	a. Vocabulary -GRE	2	Activity based Learning
3		CO-4 (Applying)	b.Synonyms, Antonyms	1	Chalk & Talk
4		CO-3 (Applying)	c.Grammar: Word forms, Nouns	1	PPT
5		CO-3 (Applying)	d.Basic Sentence Structure and	1	PPT
6		CO-3 (Applying)	Word order and Questions	1	PPT
7		CO-2 (Applying)	Reading: Skimming and Scanning	2	Chalk & Talk
8		CO-2 (Creating)	Writing :Paragraph Writing	2	Chalk & Talk
ASSIGNMENT-I					
9	2	CO-1 (Applying)	**Nehru's Letter to Daughter Indira on her Birthday**	2	Chalk & Talk

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10		CO-4 (Creating)	a. Vocabulary :GRE, Technical and analogies	3	Activity based Learning
11		CO-3 (Creating)	b.Grammar Articles, Prepositions	2	Flipped class
12		CO-2 (Creating)	c.Reading: Identifying Sequence of Ideas	1	Chalk & Talk
13		CO-2 (Creating)	d.Writing:Summarising	1	Chalk & Talk
14		CO-2 (Creating)	e.Paraphrasing	1	PPT
15		CO-2 (Applying)	f.Note making	1	PPT
16		CO-2 (Applying)	g.Note Taking	1	PPT
17	3	CO-1 (Applying)	**Stephen Hawking- Positivity - Benchmark**	3	
		MID-I EXAMINATION			
18		CO- 4 (Applying)	a.Vocab: GRE,Technical	3	Activity Based learning
19		CO-3 (Applying)	b.Grammar:Verbs, Tenses,	3	Flipped class
20		CO-3 (Applying)	c.Cocord: Subject-Verb Agreement	1	PPT
21		CO-3 (Applying)	d.Reading :Reading between the lines.	1	Chalk & Talk
22		CO-2 (Creating)	e.mail Etiquette and Resume Writing.	1	Chalk & Talk
23		CO-2 (Creating)	f. Letter writing.	1	Chalk & Talk
24	4	CO-1 (Applying)	**Like a Tree, Unbowed:Wangari Maathai-Biography**	5	Chalk & Talk
		ASSIGNMENT-II			
25		CO-4 (Applying)	a. Vocabulary :GRE, Technical and analogies	2	
26		CO-4 (Applying)	b.Cloze Encounter- Analogies	1	Chalk & Talk
27		CO-3 (Applying)	c.Qunantifying Expressions.- Adjectives and Adverbs	1	Flipped Class
28		CO-3 (Applying)	d. Degress of Comparison	2	PPT
29		CO-2 (Creating)	e. Statement of Purpose	1	Role-play
32	5	CO-1 (Applying)	**Stay Hungry, Stay Foolish**	2	Chalk & Talk
33		CO-4 (Applying)	Vocab: GRE,Technical	2	Chalk & Talk
34		CO-3 (Applying)	b.Reproted Speech	1	PPT

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35		CO-2 (Applying)	c. Editing Text	1	Cooperative Learning
36		CO-3 (Applying)	d.Correction of Sentences	1	PPT
37		CO-2 (Applying)	e.Reading Comprehension	1	Chalk & Talk
38		CO-2 (Applying)	f. Intensive Reading and Extensive Reading	2	Chalk & Talk
MID-II EXAMINATION					
END SEMESTER EXAMINATIONS					

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

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COURSE INFORMATION SHEET OF CSE, IT, AI & CS

PROGRAMME: I B.Tech	**A.Y: 2022-23**
COURSE: **ENGINEERING CHEMISTRY**	Semester : **I/II** CREDITS: **3**
COURSE CODE: **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.

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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

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		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
C2103	2.75	2.5	3	3	3	-	-	-	1	3	-	-

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Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks:Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

1) 2) 3)

(Dr. J. Srinivasa Rao)

4) T. Anusha 5).

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

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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

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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

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

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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

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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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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Year - Semester	Branch	Contact Periods/Week	Sections
R20EC2103	SIGNALS & SYSTEMS (R20)	II - I	ECE	6	A, B, C, D

COURSE OUTCOMES:
After completion of this course, the students would be able to
CO1 : Analyze basic signals and its operations.(K4).
CO2 : Apply Trigonometric and Exponential Fourier Series functions in signals.(K3)
CO3 : Develop Fourier Transforms for various signals.(K3)
CO4 : Solve Laplace Transform and z-Transform for various signals.(K3)
CO5 : Compare LTI system responses for different inputs and illustrate sampling concepts.(K4)

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1 Analyse basic signals and its operations. (K4)		**Unit-1: SIGNAL ANALYSIS & SAMPLING:**			
		1.1	Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals...	T1, R1,R3	2	Chalk & Talk, PPT
		1.2	Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition	T1, R1,R3	2	Chalk & Talk, Tutorial
		1.3	Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function.	T1, R1,R3	3	Chalk & Talk, Tutorial
		1.4	Correlation, Auto correlation, Relation between Cross & Auto correlation.	T1, R1,R3	1	Chalk & Talk, PPT
		1.5	Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling	T1, R1,R3	3	Chalk & Talk, PPT
		1.6	Reconstruction of signal from its samples, Effect of under sampling – Aliasing	T1, R1,R3	1	Chalk & Talk, PPT
2	CO2 Apply Trigonometric and Exponential Fourier Series functions in signals.(K3)		**Unit-2: ORTHOGONAL FUNCTIONS & FOURIER SERIES:**			
		2.1	**Orthogonal Functions:** Signal approximation using orthogonal functions, Mean square error, Orthogonality in complex functions.	T1, R1,R3	3	Chalk & Talk, PPT
		2.2	**FOURIER SERIES** : Representation of Fourier series , Continuous time periodic signals, Properties of Fourier Series	T1, R1,R3	2	Chalk & Talk, Tutorial
		2.3	Dirichlet's conditions	T1, R1,R3	1	Chalk & Talk, Tutorial
		2.4	Trigonometric Fourier Series and Exponential Fourier Series	T1, R1,R3	3	Chalk & Talk, PPT
		2.5	Conversion of Exponential Fourier Series from Trigonometric Fourier series & vice versa	T1, R1,R3	3	Chalk & Talk, PPT

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3	CO3 Develop Fourier Transforms for various signals.(K3)	**Unit-3: FOURIER TRANSFORMS**				
		3.1	Deriving Fourier Transform from Fourier series	T1, R1,R3	2	Chalk & Talk, PPT
		3.2	Fourier Transform of arbitrary signal	T1, R1,R3	2	Chalk & Talk, Tutorial
		3.3	Fourier Transform of standard and periodic signals	T1, R1,R3	3	Chalk & Talk, Tutorial
		MID I EXAMINATIONS				
		3.4	Properties of Fourier Transform	T1, R1,R3	2	Chalk & Talk, PPT
		3.5	Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform	T1, R1,R3	3	Chalk & Talk, PPT
4	CO 4 Solve Laplace Transform and z-Transform for various signals. (K3)	**Unit-4: LAPLACE TRANSFORMS AND Z- TRANSFORMS**				
		4.1	Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals	T1, R1,R3	3	Chalk & Talk, PPT, & Tutorial
		4.2	Properties of Laplace transforms, Relation between Laplace transform and Fourier transform	T1, R1,R3	2	Chalk & Talk, Tutorial
		4.3	**Z-Transforms:** Concept of Z-transform of a discrete sequence, Region of convergence in Z- Transform,	T1, R1,R3	3	Chalk & Talk, Tutorial
		4.4	Constraints on ROC for various classes of signals, inverse Z-transform.	T1, R1,R3	2	Chalk & Talk, PPT
		4.5	Properties of Z-Transforms	T1, R1,R3	2	Chalk & Talk, PPT
5	CO 5 Compare LTI system responses for different inputs and illustrate sampling concepts. (K4)	**Unit-5. SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS**				
		5.1	System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable.	T1, R1,R3	4	Chalk & Talk, PPT, & Tutorial
		5.2	Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems	T1, R1,R3	4	Chalk & Talk, PPT, & Tutorial
		5.3	Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time.	T1, R1,R3	4	Chalk & Talk, PPT, & Tutorial
				Total		**60**
MID II EXAMINATIONS						
END EXAMINATIONS						

Text Books:

T1 Signals, Systems & communications – B.P.Lathi, BS Publications, 2003.

T2 Signals & Systems – Simon Haykin and Van Veen , Wiley, 2nd Edition.

Reference Books:

R1 Signals & Systems - P. Ramesh Babu, R Ananda Natarajan, 3rd Edition.

R2 Signals & Systems - A.V Oppenheim, A. S. Willsky and S. H. Nawab, PHI, 2nd Edition.

R3 Signals & Systems - A. Anand Kumar, PHI Publications, Third Edition, 2013.

Faculty

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Department of Electronics & Communication Engineering

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics & Communication Engineering	
COURSE: **SIGNALS & SYSTEMS**	Semester : **III** CREDITS: **3**
COURSE CODE: **R20EC2103** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Signal Processing	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20EC2103	**Engineering Mathematics**	Knowledge of integration and differentiation	**I**

COURSE OUTCOMES:

S.NO.	Course Outcome Statement
CO1	Analyse basic signals and its operations.(K4)
CO2	Apply Trigonometric and Exponential Fourier Series functions in signals.(K3)
CO3	Develop Fourier Transforms for various signals.(K3)
CO4	Solve Laplace Transform and z-Transform for various signals.(K3)
CO5	Compare LTI system responses for different inputs and illustrate sampling concepts.(K4)

SYLLABUS:

UNIT	DETAILS
I	**SIGNAL ANALYSIS & SAMPLING:** Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function. Correlation, Auto correlation, Relation between Cross & Auto correlation. **Sampling:** Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing
II	**ORTHOGONAL FUNCTIONS & FOURIER SERIES:** **Orthogonal Functions:** Signal approximation using orthogonal functions, Mean square error, Orthogonality in complex functions. **Fourier series:** Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series.
III	**FOURIER TRANSFORMS:** Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

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IV	**LAPLACE TRANSFORMS AND Z- TRANSFORMS:** **Laplace Transforms:** Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms, Relation between Laplace transform and Fourier transform. **Z-Transforms:** Concept of Z-transform of a discrete sequence, Region of convergence in Z-Transform, constraints on ROC for various classes of signals, inverse Z-transform, properties of Z-Transforms.
V	**SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:** **Signal transmission through linear systems:** System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable. Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	B.P.Lathi, "Signals, Systems & communications", BS Publications, 2008.
T2	Simon Haykin and Van Veen, Signals & Systems,Wiley, 2nd Edition, 2003.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	P. Ramesh Babu and R Ananda Natarajan, Signals & Systems, 4th Edition.
R2	A.V Oppenheim, A.S.Willsky and S.H.Nawab, Signals & Systems-, PHI Publications, 2nd Edition, 2013.
R3	A. Anand Kumar, Signals and Systems, PHI Publications, 4th Edition, 2013.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Discrete Fourier Series	

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc19_ee07
2	https://freevideolectures.com/subject/signals-systems

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
☐ Collaborative learning	☐ Problem based learning	☐ Co-operative learning

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MAPPING COs WITH POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C213.1	3	3	2	-	-	-	-	-	-	-	-	2	1	1	1
C213.2	3	3	2	-	-	-	-	-	-	-	-	2	1	1	1
C213.3	2	2	3	-	-	-	-	-	-	-	-	2	1	1	1
C213.4	2	2	3	-	-	-	-	-	-	-	-	2	1	1	1
Average	2.5	2.5	2.5	-	-	-	-	-	-	-	-	2	1	1	1

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2103	2.5	2.5	2.5	-	-	-	-	-	-	-	-	2	1	1	1

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

1.
2.

Course Instructor | Course Coordinator | Module Coordinator | Head of the Department

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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: 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.
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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Unit wise Sample Assessment Questions

COURSE OUTCOMES: Students are able to

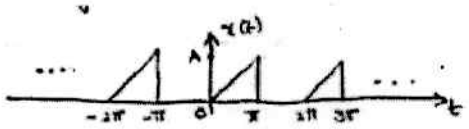
CO1: Analyse basic signals and its operations.(K4)

CO2: Apply Trigonometric and Exponential Fourier Series functions in signals.(K3)

CO3: Develop Fourier Transforms for various signals.(K3)

CO4: Solve Laplace Transform and z-Transform for various signals.(K3)

CO5: Compare LTI system responses for different inputs and illustrate sampling concepts.(K4)

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**List** various signals and its operations.	K4	CO1
2	**Compare** Periodic and Aperiodic signals and check whether the signal $x(t) = sin10\pi t + cos20\pi t$ is a Periodic or not, if Periodic find fundamental period.	K4	CO1
3	**List** different types of Sampling	K3	CO1
	UNIT 2		
1	**Apply** orthogonality concept between two signals.	K3	CO2
1	**Develop** the trigonometric Fourier series representation of the following waveform. 	K3	CO2
2	**List** any four properties of Fourier series.	K4	CO2
3	**Construct** trigonometric Fourier series from exponential Fourier series and vice versa.	K3	CO2
	UNIT 3		
1	**Classify** the Frequency shifting, Differentiation in time domain, Convolution and Conjugate properties of Fourier transform.	K4	CO3
2	A signal x(t) has the Fourier transform X(w) = (3-jw)/(3+jw). (i) **Model** the magnitude spectrum of the signal. (ii) **Model** the phase spectrum of the signal. (iii) **Evaluate** the signal x(t) by using properties of Fourier transform.	K3 & K5	CO3
3	**Construct** the Fourier transform of a gate pulse of unit height, unit width and centered at t=0.	K5	CO3
	UNIT 4		
1	**Model** Region of Convergence and find Laplace Transform of the signal $x(t) = e^{-\|t\|}$ and **find** its ROC.	K3	CO4
2	**Evaluate** the Laplace Transform and ROC of following signals. (a) $x(t) = e^t \sin 2t$, for $t \leq 0$ (b) $x(t) = e^{-t}u(t) + e^{-4t}u(t)$	K5	CO4
3	**List** different properties of z-transform	K3	CO4
	UNIT 5		
1	**List** different Systems and explain about them	K3	CO5

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NARASARAOPETA ENGINEERING COLLEGE
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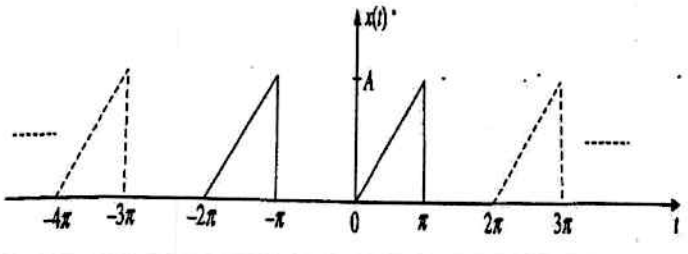
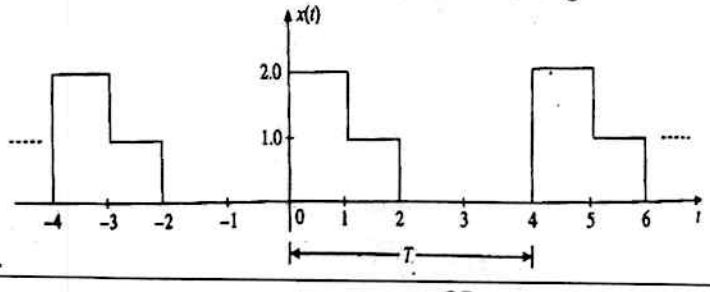
II B.Tech I Semester Regular/Supple. Examinations, Month/Year

Sub Code:R20EC2103 **SIGNALS AND SYSTEMS**

Time: 3 hours (ECE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	i) Examine whether the given signal is periodic or aperiodic $x(t) = 3sin100\pi t + 5cos200\pi t$. if periodic, find fundamental period	4	1	7M
		ii) Determine whether the following signal is Energy or Power signal. $x(t) = \begin{cases} t-2 & for -2 \le t \le 0 \\ 2-t & for\ 0 \le t \le 2 \\ 0 & otherwise \end{cases}$	5	1	7M
		OR			
	b	i) Develop sampling theorem for band limited signals.	3	1	7M
		ii) Develop orthogonal signal space and bring out clearly its application in representing a signal.	3	1	7M
		Unit-II			
2	a	Evaluate the trigonometric Fourier series for the following waveform. 	5	2	7M
		ii) Evaluate the exponential Fourier series for the following waveform. 	5	2	7M
		OR			
	b	i) Develop the Complex Fourier series and derive the relation between trigonomertic F.S and E.F.S	3	2	7M
		ii) List and prove any three properties of Fourier series	4	2	7M
		Unit-III			
3	a	i) Build the Fourier transform of the signal x(t) applying differentiation in time property of Fourier transform 	3	3	7M
		ii) List and prove any three properties of Fourier Transform	4	3	7M
		OR			

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	b	i)List and prove the time and frequency differentiation property of Fourier Transform	3	3	7M
		ii) Evaluate the Fourier transform of the signal $x(t) = e^{-at}$	4	3	7M
4		**Unit-IV**			
	a	i) A system is described by $\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 12y(t) = x(t)$. Solve the response for u(t) using Laplace Transform	3	4	7M
		ii) List and prove the following properties of Z Transform (i) Time shifting (ii)Final value theorem	4	4	7M
		OR			
	b	A signal has $X(s) = \frac{s+2}{s^2+4s+5}$ Evaluate $L[tx(t)]$	5	4	7M
		List and prove the following properties of Z transform. (i) Differentiation (ii) convolution (iii) (iii)Integration	4	4	7M
5		**Unit-V**			
	a	i)Analyze whether the following system is Static or dynamic Linear or Nonlinear Causal or Non causal Time invariant or time variant and the system is given as y(t)=tx(t)+x(-t).	4	5	14 M
		OR			
	b	i) Analyze the given system is causal and stable $h(n)=2^n u(-n)$	4	5	7M
		ii) Analyze whether the following system is Linear or Nonlinear Time invariant or time variant and the system is given as y(t)=tx(t)+x(-t).	4	5	7M

KL: Knowledge Level CO: Course Outcome M: Marks

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NARASARAOPETA ENGINEERING COLLEGE
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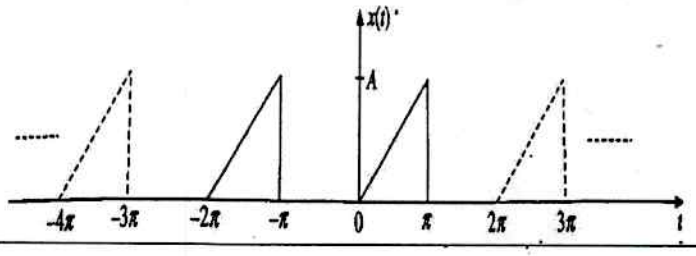
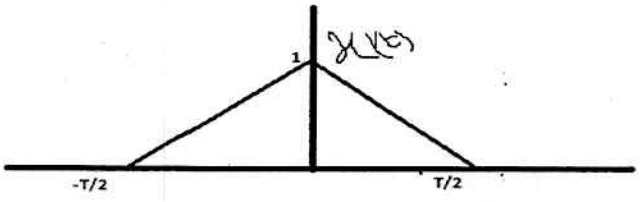
II B.Tech I Semester Regular/Supple. Examinations, Month/Year

Sub Code: R20EC2103 **SIGNALS AND SYSTEMS**

Time: 3 hours (ECE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	C	M
1		**Unit-I**			
	a	i) List signals and describe the classification of signals with an example	4	1	7M
		ii) Evaluate whether the following signal is Energy or Power signal. $x(t) = \begin{cases} t-2 \ for -2 \le t \le 0 \\ 2-t for\ 0 \le t \le 2 \\ 0 \quad otherwise \end{cases}$	5	1	7M
		OR			
		Ii) List Correlation techniques and Compare the classification	4	1	14M
2		**Unit-II**			
	a	i) Evaluate the trigonometric Fourier series for the following waveform. 	5	2	7M
		ii) Evaluate exponential Fourier series expression and evaluate c_n	5	2	7M
		OR			
	b	i) Develop trigonometric Fourier series expression and evaluate a_0, a_n & b_n.	3	2	7M
		ii) List and prove any three properties of Fourier series	4	2	7M
3		**Unit-III**			
	a	iii) Evaluate the Fourier transform of the signal x(t) applying differentiation in time property of Fourier transform 	5	3	7M
		ii) List and prove any three properties of Fourier Transform	4	3	7M
		OR			
	b	i) Develop the time and frequency differentiation property of Fourier Transform	3	3	7M
		ii) Evaluate the Fourier Transform of Cos(w0t)	5	3	7M

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		Unit-IV			
4	a	i) A system is described by $\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 12y(t) = x(t)$. Determine the response for u(t) using Laplace Transform	5	4	7M
		ii)Evaluate the following properties of Z Transform (i)Initial value theorem (ii)Final value theorem	5	4	7M
		OR			
	b	b) A signal has $X(s) = \frac{s+2}{s^2+4s+5}$ Determine $L[tx(t)]$	5	4	7M
		List and prove the following properties of Z transform. (iv)Time shifting (v) Time reversal (vi)Time derivation	4	4	7M
		Unit-V			
5		i) Interprete whether the following system is Static or dynamic Linear or Nonlinear Causal or Non causal Time invariant or time variant and the system is given as y(t)=tx(t)+x(-t).	5	5	7M
		OR			
	b	i) Interprete the given system is causal and stable $h(n)=2^n u(-n)$	5	5	7M
		ii) Interprete whether the following system is Linear or Nonlinear Time invariant or time variant and the system is given as y(t)=tx(t)+x(-t).	5	5	7M

KL: Knowledge Level CO: Course Outcome M:Marks

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

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics & Communication Engineering	
COURSE: **DIGITAL SIGNAL PROCESSING**	YEAR: **III** SEMESTER: **I** SECTION: ECE CREDITS: **4**
COURSE CODE: R20EC3103 REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Signal Processing	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20	**Engineering Mathematics&**	Knowledge of integration and differentiation.	**I**
	Signals and Systems	Concepts in signals and systemscourse, Fourier series and transforms.	**III**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Analyze the signals and system in Time and Frequency domain through transformations. [K4]
CO2	Solve DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. [K3]
CO3	Examine the significance of various filter structures and responses. [K3]
CO4	Construct the digital filter circuits for generating desired signal wave shapes. [K4]
CO5	Inspect the performance of a variety of windowing techniques. [K3]

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION:** Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems, and Classification of Discrete-Time Systems Interconnection of Discrete-Time Systems. Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT
II	**DISCRETE FOURIER SERIES:** Properties of Discrete Fourier Series, DFS representation of periodic sequences. **DISCRETE FOURIER TRANSFORMS:** Properties of DFT, Circular & Linear Convolution of Sequences using DFT, and Computation of DFT: Direct evaluation of the DFT. **FAST FOURIER TRANSFORMS:** Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT and Inverse FFT: IDFT-FFT.
III	**REALIZATION OF IIR FILTERS:** Block DiagramRepresentation of Linear Constant Coefficient Difference Equations, Basic structures ofIIR systems:Direct form-I realization, Direct form-II realization, transposed, cascade form, parallel form. Latticestructures of IIR systems, Conversion from Lattice structure to direct form, Conversion from directfrom to Lattice structure, Lattice-ladder structure.

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	REALIZATION OF FIR FILTERS: Basic structures of FIR systems: Transversal structure, Linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure.
IV	**IIR DIGITAL FILTERS:** Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Lowpass to Lowpass filter, Lowpass to Highpass filter, Lowpass to Bandpass filter, and Lowpass to Bandstop filter. Frequency Transformations in digital domain: Lowpass to Lowpass filter, Lowpass to Highpass filter, Lowpass to Bandpass filter, and Lowpass to Bandstop filter.
V	**FIR DIGITAL FILTERS:** Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications", Pearson Education/PHI, 4th Edition, 2007.
T2	A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 2nd Edition, PHI
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Ramesh Babu, "Digital Signal Processing", Scitech Publications, 2011.
R2	Andreas Antoniou, "Digital signal processing", TATA McGraw Hill, 2006.
R3	R S Kaler, M Kulkarni,, Umesh Gupta, "A Text book on Digital Signal processing", I K International Publishing House Pvt. Ltd.
R4	M H Hayes, "Schaum's outlines, Digital signal processing", TATA Mc-Graw Hill, 2007.

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/117102060/
2	https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/
3	https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/study-materials/
4	https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/video-lectures/
5	https://nptel.ac.in/courses/108105055/

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

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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	3	1	1	-	-	-	-	-	-	-	2	2	3	2
C311.2	3	3	2	2	-	-	-	-	-	-	-	2	2	3	3
C311.3	3	3	2	2	1	-	-	-	-	-	-	2	3	3	3
C311.4	3	3	2	2	-	-	-	-	-	-	-	2	3	3	3
Average	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	2.50	3.00	2.75

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311	3.00	3.00	1.75	1.75	1.00	-	-	-	-	-	-	2.00	2.50	3.00	2.75

<table>
<tr><th colspan="3">Course Outcome Assessment Methods</th><th>Weightages</th><th rowspan="4">Final Course Outcome (100%)</th></tr>
<tr><td rowspan="3">Direct Assessment</td><td rowspan="3">Cumulative Internal Examinations (CIE)</td><td>Descriptive Test</td><td rowspan="3">30%</td><td rowspan="2">90%</td></tr>
<tr><td>Objective Test</td></tr>
<tr><td>Assignment Test</td></tr>
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</table>

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

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ANNEXURE I:

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1. Engineering knowledge: Apply the knowledge of mathematics, science, engineeringfundamentals, 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.

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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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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 theengineering 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 and develop IoT applications using raspberry pi, Arduino and other advanced processors.
2. Design and synthesize various circuits using latest hardware and EDA Tools.
3. Design and analyze 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.
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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Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1	Analyze the signals and system in Time and Frequency domain through transformations. [K4]
CO2	Solve DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. [K3]
CO3	Examine the significance of various filter structures and responses. [K3]
CO4	Construct the digital filter circuits for generating desired signal wave shapes. [K4]
CO5	Inspect the performance of a variety of windowing techniques. [K3]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Define and classify the discrete time signals and systems.	K1	CO1
2	Whatis discrete time fourier transforms(DTFT) and explain its properties.	K2	CO1
3	Show that the following systems are nonlinear and time invariant. $y(n+2) + 2y(n) = x(n+1) + 2.$	K2	CO1
4	What is discrete time fourier series and explain its properties.	K2	CO1
	UNIT 2		
1	Explain the properties of discrete fourier transform (DFT)	K2	CO2
2	Explain the use of Fast Fourier Transform algorithm in computing DFT?	K2	CO2
3	Compute the DFT of the following sequence using FFT decimation in frequency (DIF) algorithm.$X(k) = \{1,2,3,5,5,3,2,1\}$.	K2	CO2
	UNIT 3		
1	Discuss the properties of Z-transforms	K2	CO3
2	With respect to Z transforms define the properties of ROC.	K2	CO3
3	Realize the following IIR system functions in the direct form I and II and also parallel form. $H(z) = \frac{1}{(1-az^{-1})^2} + \frac{1}{(1-bz^{-1})^2}$.	K2	CO3
4	Given the three stage lattice filter with coefficients K_1=0.25, K_2=0.5 and K_3=1/3, **compute** the FIR filter coefficients for the direct-form structure.	K2	CO3
	UNIT 4		
1	**Derive** the expression for Bilinear Transform.	K3	CO4
2	Use bilinear transformation method to obtain H(z) if T= 1 sec and H(s) is 1/(s+1)(S+2) , 1/(s2+√2 s +1).	K3	CO4
3	**Compute** the impulse response of digital filter to correspond to an analog filter with impulse response $h_a(t) = 0.5\ e^{-2t}$ and with a sampling rate of 1.0kHz using impulse invariant method.	K3	CO4
	UNIT 5		
1	Comparison of FIR and IIR filters.	K2	CO5
2	**Design** a HPF of length 7 with cut off frequency of 2 rad/sec using Hamming window.	K3	CO5
3	**Compute** the coefficients of linear-phase FIR filter of length M=15 using frequency sampling method. The filter has a symmetric unit sample response and frequency response that satisfies the conditions $H_r\left(\frac{2\pi k}{15}\right) = \begin{cases} 1, & k = 0,1,2,3 \\ 0.4, & k = 4 \\ 0, & k = 5,6,7. \end{cases}$	K3	CO5

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MODEL PAPER – I

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

Sub Code: R20EC3103 **DIGITAL SIGNAL PROCESSING**

Time: 3 hours (ECE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	Knowledge Level	CO	Marks
		Unit-I			
1	a	i) Classify and demonstrate the discrete time signals and systems.	IV	1	7M
		ii) List and prove the properties discrete time Fourier transforms (DTFT).	IV	1	7M
		OR			
	b	i) Solve and show that the following systems are nonlinear and time invariant. $y(n+2) + 2y(n) = x(n+1) + 2.$	III	1	7M
		ii) Solve the following signals are either periodic or non-periodic. I. $x(n) = \cos((\pi/4)n + \cos(2n)$ II. $x(n)=[\cos(\pi/3)n+\sin(\pi/5)n]$	III	1	7M
		Unit-II			
2	a	Make use of DIT algorithm Compute the FFT for the sequence x(n) = 1 ; where N =8.	III	2	14M
		OR			
	b	Make use of DIF-FFT find the DFT for the sequence {2,2,2,2,1,1,1,1}.	III	2	14M
		Unit-III			
3	a	i) Construct the Direct Form-II realization for the IIR system described by difference equation. $y(n) = 0.5y(n-1) - 0.25y(n-2) + x(n) + 0.4x(n-1)$	III	3	7M
		ii) Build a Cascaded Form realization for the IIR system described by difference equation. $y(n) = -0.2y(n-1) + 0.24y(n-2) + x(n) + 0.4x(n-1)$	III	3	7M
		OR			
	b	Explain Polyphase structure with one example	III	3	14M

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		Unit-IV			
4	a	i) Demonstrate the design procedure for IIR filters using Butterworth approximations.	II	4	7M
		ii) Design a digital Butterworth filter that satisfies the following constraint using bilinear transformation. Assume T=1sec. $0.9 \le \lvert H(e^{jw}) \rvert \le 1 \qquad 0 \le w \le \frac{\pi}{2}$ $\lvert H(e^{jw}) \rvert \le 2 \qquad \frac{3\pi}{4} \le w \le \pi$	III	4	7M
		OR			
	b	Use bilinear transformation method to obtain H(Z) if T= 1 sec and H(s) is $1/(s+1)(S+2)$, $1/(s2+\sqrt{2}\, s+1)$	III	4	14M
		Unit-V			
5	a	Design an ideal high pass filter with a frequency response Hd (ejw) = 1 for $\pi/4 \le \lvert w \rvert \le \pi$ = 0 for $\lvert w \rvert \le \pi/4$ Find the values of h(n) for N = 11 using Hamming window. Find H (z) and determine the magnitude response.	VI	5	14M
		OR			
	b	i) What are the effects of windowing? Comparing various windowing techniques	I	5	7M
		ii) What is a Kaiser window? In what way is it superior to other window functions?.	I	5	7M

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MODEL PAPER – II

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

Sub Code: R20EC3103 **DIGITAL SIGNAL PROCESSING**

Time: 3 hours (ECE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	Knowledge Level	CO	Marks
		Unit-I			
1	a	i) Define the terms: linearity, time invariance, stability and causality for a discrete time system.	I	1	7M
		ii) Classify discrete time signals and explain.	IV	1	7M
		OR			
	b	i) List and explain elementary discrete time signals.	IV	1	7M
		ii) Solve the function and find the periodicity of the following discrete signals. a)$x(n)=\cos 4\pi n + 2\sin 6n$ b) $x(n) = (\sin 4\pi n)^2$	III	1	7M
		Unit-II			
2	a	Make use of DFT find the linear convolution of the sequences $x(n) = \{1,2,3,1\}$ and $h(n) = \{1,1,1,1\}$.	III	2	14M
		OR			
	b	Make use of DIT-FFT find the IDFT for the sequence $\{12,0,0,0,4,0,0,0\}$.	III	2	14M
		Unit-III			
3	a	i) Construct the following IIR system functions in the direct form I and II and also parallel form. $y(n)= -0.1y(n-1)+0.72y(n-2)+0.7x(n)-0.252x(n-2)$	III	3	14M
		OR			
	b	Construct the direct form-I and direct form-II realizations for the transfer function of FIR systems : $H(z) = 0.0034 + 0.0106z^{-2} + 0.0025z^{-4} + 0.0149z^{-6}$	III	3	14M
		Unit-IV			

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4	a	Design a digital Butterworth filter that satisfies the following constraint using bilinear transformation. Assume T=1sec. $0.9 \le \lvert H(e^{jw}) \rvert \le 1 \qquad 0 \le w \le \frac{\pi}{2}$ $\lvert H(e^{jw}) \rvert \le 2 \qquad \frac{3\pi}{4} \le w \le \pi$	VI	4 4	14M
		OR			
	b	Explain the impulse invariance method of IIR filter design.	II	4	14M
		Unit-V			
5	a	The desired frequency response of a low pass filter is $H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & \frac{-3\pi}{4} \le \omega \le \frac{3\pi}{4} \\ 0, & elsewhere. \end{cases}$ Solve $H(e^{j\omega})$ for M=7 using rectangular window.	III	5	14M
		OR			
	b	Explain in detail about Frequency sampling method.	II	5	14M

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Yallmanda(Post), Narasaraopet- 522601

DEPARTMENT OFELECTRONICS AND COMMUNICATION ENGINEERING
LESSON PLAN
ACADEMIC YEAR -2022-23

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20EC3103	Digital Signal Processing	V	Electronics and Communication Engineering	6	A, B, C, D

COURSE OUTCOMES: Students are able to

CO1: **Analyze** the signals and system in Time and Frequency domain through transformations. **[K4]**
CO2: **Solve** DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. **[K3]**
CO3: **Examine** the significance of various filter structures and responses. **[K3]**
CO4: **Construct** the digital filter circuits for generating desired signal wave shapes. **[K4]**
CO5: **Inspect** the performance of a variety of windowing techniques. **[K3]**

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1. **Analyze** the signal and System in Time and Frequency domain through transformations **[K4]**		**Unit-1. INTRODUCTION**			
		1.1	Introduction	T1, R1	13	Chalk & Talk, PPT
		1.2	Review of Discrete Time Signals	T1, R1		Chalk & Talk
		1.3	Some Elementary Discrete-Time Signals	T1, R1		Chalk & Talk
		1.4	Classification of Discrete–Time Signals	T2, R1		Chalk & Talk
		1.5	Simple Manipulations of Discrete–Time Signals	T1, R1		Chalk & Talk
		1.6	Discrete Time Systems: Input-Output Description of Systems	T1, R1		Chalk & Talk
		1.7	Block Diagram Representation of Discrete-Time Systems and Classification of Discrete-Time Systems	T2, R1		Chalk & Talk
		1.8	Frequency domain representation of Discrete Time Signals and Systems	T1, R1		Chalk & Talk
		1.9	Discrete-Time Fourier Transform (DTFT):	T1, R1		Chalk & Talk
		1.10	Existence of DTFT; properties of DTFT.	T2, R1		Chalk & Talk
2	CO2. **Solve** DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. **[K3]**		**Unit-2. DISCRETE FOURIER SERIES & DISCRETE FOURIER TRANSFORMS**			
		2.1	Discrete Fourier series	T1, R1	13	Chalk & Talk, PPT
		2.2	Properties of Discrete Fourier Series	T1, R1		Chalk & Talk, PPT

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		2.3	DFS representation of periodic sequences.	T1, R1		Chalk & Talk, PPT
		2.4	DFT: Properties of DFT, Computation of DFT	T1, R1		Chalk & Talk, PPT
		2.5	Circular & Linear Convolution of Sequences using DFT	T1, R1		Chalk & Talk, PPT
		2.6	FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT)	T1, R1		Chalk & Talk, PPT
		2.7	Decimation in Time FFT Algorithms	T1, R1		Chalk & Talk, PPT
		2.8	Decimation in Frequency FFT Algorithms	T1, R1,		Chalk & Talk, PPT
		2.9	Inverse FFT	T1, R1		Chalk & Talk, PPT
		2.10	Additional Problems	R1		Chalk & Talk, PPT
		2.11	Review of Z-Transforms	T1, R1		Chalk & Talk, PPT
		2.12	Problems.	R1		Chalk & Talk, PPT
3	CO3. **Examine** the significance of various filter structures and responses. **[K3]**	**Unit-3. REALIZATION OF IIR & FIR FILTERS**				
		3.1	Block Diagram Representation of Linear Constant Coefficient Difference Equations	T1, R1		Chalk & Talk, PPT
		3.2	Basic structures of IIR systems: Direct form-I realization	T1, R1		Chalk & Talk, PPT
		3.3	Direct form-II realization, transposed	T1, R1		Chalk & Talk, PPT
		3.4	cascade form, parallel form	T1, R1		Chalk & Talk, PPT
		MID I EXAMINATION				
		3.4	Lattice structures of IIR systems, Conversion from Lattice structure to direct form and vice-versa	T1, R1		Chalk & Talk, PPT

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		3.5	Basic structures of FIR systems: Transversal structure, Linear phase	T1, R1		Chalk & Talk, PPT
		3.6	Lattice structure, Polyphase Lattice structures of FIR systems	T1, R1		Chalk & Talk, PPT
		3.7	Conversion from Lattice structure to direct form and vice-versa.	T1, R1		Chalk & Talk, PPT
4	CO4. **Construct** the digital filter circuits for generating desired signal wave shapes. **[K4]**	**Unit-4. IIR DIGITAL FILTERS**				
		4.1	Analog filters approximations: Butterworth.	T2, R1	14	Chalk & Talk, PPT
		4.2	Analog filters approximations Chebyshev.	T2, R1		Chalk & Talk, PPT
		4.3	Design of IIR digital filters from analog filters, Design examples	T2, R1		Chalk & Talk, PPT
		4.4	Frequency Transformations in Analog Domain: Low pass to Low pass filter, Low pass to High pass filter,	T2, R1		Chalk & Talk, PPT
		4.5	Low pass to Band pass filter, and Low pass to Band stop filter.	T2, R1		Chalk & Talk, PPT
		4.6	Frequency Transformations in digital domain: Low pass to Low pass filter.	T2, R1		Chalk & Talk, PPT
		4.7	Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.	T2, R1		Chalk & Talk, PPT
5	CO5. **Inspect** the performance of a variety of windowing techniques. **[K3]**	**Unit 5.FIR DIGITAL FILTERS**				
		5.1	Characteristics of FIR Digital Filters	T2, R1	14	Chalk & Talk, PPT,
		5.2	Frequency Response	T2, R1		Chalk & Talk, PPT
		5.3	Design of FIR Digital Filters Using Window Techniques	T2, R1		Chalk & Talk, PPT
		5.4	Rectangular Window	T2, R1		Chalk & Talk, PPT
		5.5	Triangular or Bartlett Window	T2, R1		Chalk & Talk, PPT
		5.6	Raised Cosine Window Hanning Window	T2, R1		Chalk & Talk, PPT
		5.7	Blackman Window	T2, R1		Chalk & Talk, PPT
		5.8	Kaiser Window	T2, R1		Chalk & Talk, PPT

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		5.9	Frequency Sampling Technique: Frequency Sampling Realization	T2, R1		Chalk & Talk, PPT
		5.10	Frequency Response, Design, Comparison of IIR and FIR filter	T2, R1		Chalk & Talk, PPT
					Total Classes: 68	
			MID II EXAMINATION			
			END EXAMINATIONS			

Text Books:

T1 1. John G. Proakis, Dimitris G. Manolakis, —Digital signal processing, principles, Algorithms and applications, 4th Edition, Pearson Education/PHI, 2007.

T2 2. A.V. Oppenheim and R.W. Schaffer, —Discrete Time Signal Processingl, 2nd Edition, PHI, 2008.

Reference Books:

R1 1. Ramesh Babu, —Digital Signal Processingl, SciTech Publications, 2011.

R2 2. Andreas Antoniou, —Digital signal processingl, TATA McGraw Hill, 20063.

R3 3. R S Kaler, M Kulkarni,, Umesh Gupta, —A Text book on Digital Signal processingl, I K International Publishing House Pvt. Ltd, 2010..

Signature of the Faculty **Signature of the HOD** **Signature of the Principal**

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

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electronics and Communication Engineering	
COURSE: **MICROWAVE ENGINEERING**	Year: **IV** Semester : **I** CREDITS: **3**
COURSE CODE: **19BEC7TH01** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: COMUNICATION	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEMESTER
19BEC4TH05	**EMWTL**	Knowledge of Signal propagation in free space and Maxwell equations	**II/II**
19BCC1TH03	**ENGINEERING MATHEMATICS**	An ability to solve ordinary and partial differential equations	**I/I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Explain** about transmission lines and waveguide structures **[K5]**.
CO2	**Analyze** how waveguides are used as elements in impedance matching and filter circuits **[K4]**.
CO3	**Apply** analysis methods to determine circuit properties of passive or active microwavedevices **[K3]**.
CO4	**Distinguish** between M-type and O-type tubes **[K4]**.
CO5	**Analyze** and measure various microwave parameters using a Microwave test bench **[K4]**.

SYLLABUS:

UNIT	DETAILS
I	**MICROWAVE TRANSMISSION LINES:** Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Mode Characteristics – Phase and Group Velocities, Impossibility of TEM mode Related Problems. **CIRCULAR WAVEGUIDES**: Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes.
II	**WAVEGUIDE COMPONENTS AND APPLICATIONS - I:** Coupling Mechanisms- Probe, Loop, Aperture types. Waveguide Discontinuities –Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators -Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2 Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.
III	**MICROWAVE TUBES:** Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram,

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	Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Related Problems.
IV	**HELIX TWTS:** Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants. **M- Type Tubes:** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.
V	**MICROWAVE SOLID STATE DEVICES:** Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory **MICROWAVE MEASUREMENTS:** Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Samuel Y. Liao, "Microwave Devices and Circuits", PHI, 3rd Edition, 1994.
T2	Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBSPublishers and Distributors, New Delhi, 2004.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	R.E. Collin, "Foundations for Microwave Engineering", IEEE Press, John Wiley, 2 nd Edition, 2002.
R2	Microwave Circuits and Passive Devices – M.L. Sisodia and G. S. Raghuvanshi, Wiley EasternLtd., New Age International Publishers Ltd., 1995.
R3	Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
R4	Microwave Engineering – G S N Raju , I K International.
R5	Microwave and Radar Engineering – G Sasibhushana Rao Pearson.
R6	Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	RF Components for Wireless Systems	PO5, PSO2

WEB SOURCE REFERENCES:

1	https://ece.vt.edu/grad/courses/5104G
2	https://freevideolectures.com/subject/microwave

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
☑Collaborative Learning	☑Problem based Learning	☑Co-operative Learning

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MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C411.1	3	3	3	3	3	-	-	-	-	-	-	3	1	1	3
C411.2	3	3	3	3	3	-	-	-	-	-	-	2	1	1	3
C411.3	3	3	3	3	3	-	-	-	-	-	-	2	1	1	3
C411.4	3	3	3	3	3	-	-	-	-	-	-	3	1	1	3
C411.5	3	3	3	2	2	-	-	-	-	-	-	3	1	1	3
Average	3.00	3.00	3.00	2.80	2.80	-	-	-	-	-	-	2.60	1.00	1.00	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C411	3.00	3.00	3.00	2.80	2.80	-	-	-	-	-	-	2.60	1.00	1.00	3.00

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

1. B.Sai
2.

Course Instructor | Course Coordinator | Module Coordinator | Head of the Department

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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 and develop IoT applications using Rasberry PI, Arduino and other advance processors.
2. Design synthesis various circuits using latest hardware and EDA tools.
3. Design and analyse modern communication systems to meet the present and future needs of industry with cost of 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.
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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UNIT WISE SAMPLE ASSESSMENT QUESTIONS

COURSE OUTCOMES: Students are able to

CO1: **Explain** about transmission lines and waveguide structures **[K5]**.
CO2: **Analyze** how waveguides are used as elements in impedance matching and filter circuits **[K4]**.
CO3: **Apply** analysis methods to determine circuit properties of passive or active microwave devices **[K3]**.
CO4: **Distinguish** between M-type and O-type tubes **[K4]**.
CO5: **Analyze** and measure various microwave parameters using a Microwave test bench **[K4]**.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Classify** the Microwave band based on the frequencies.	K4	CO1
2	**List** Microwave advantages.	K4	CO1
3	**Solve** the general relationship of field components in rectangular waveguide.	K3	CO1
4	**Analyze** the field components when TM wave propagating in rectangular waveguide.	K4	CO1
5	**Analyze** the field components when TE wave propagating in rectangular waveguide.	K4	CO1
6	**Explain** the advantages of microwaves.	K5	CO1
	UNIT 2		
1	**Identify** the waveguide discontinues for microwave applications.	K3	CO2
2	**Examine** the operation of Resistive card type attenuator.	K4	CO2
3	**Analyze** the operation of Rotary vane type attenuator.	K4	CO2
4	**Identify** the properties of S- matrix and solve S-Matrix for E-Plane Tee.	K3	CO2
5	**Analyze** the operation of Gyrator and Circulator.	K4	CO2
	UNIT 3		
1	**Identify** the classification of microwave tubes.	K3	CO3
2	**Solve** the efficiency of two cavity klystron.	K3	CO3
3	**Interpret** the applegate diagram and working principle of two cavity reflex klystron with neat sketch.	K5	CO3
4	**Identify** and solve the output power of two cavity reflex klystron.	K3	CO3
5	**Analyse** the working principle of reflex klystron with neat sketch.	K4	CO3
6	**Analyse** the velocity modulation process of two cavity reflex klystron.	K4	CO3

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	UNIT 4		
1	**Analyze** the Characteristics of Slow Wave Structures.	**K4**	**CO4**
2	**Classify** M-type tubes.	**K4**	**CO4**
3	**Analyze** the working principle of Helix Travelling Wave Tube with neat sketch.	**K4**	**CO4**
4	**Explain** the operation of 8 cavity cylindrical Magnetron with neat sketch.	**K5**	**CO4**
5	**Analyze** the PI-Mode Operation of Magnetron.	**K4**	**CO4**
	UNIT 5		
1	**Analyze** Gunn effect using two valley theory.	**K4**	**CO5**
2	**Classify** microwave solid state devices.	**K4**	**CO5**
3	**Analyze** different blocks and their features of microwave bench.	**K4**	**CO5**
4	**Utilize** Bolometer method to measure microwave power.	**K3**	**CO5**
5	**Analyze** the measurement of attenuation and frequency.	**K4**	**CO5**

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Model Question Paper-1

Code: 19BEC7TH01 **R19**

NARASARAOPETA ENGINEERING COLLEGE
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
B. Tech VII Semester Regular Examinations
MICROWAVE ENGINEERING
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 field components in rectangular waveguide while propagating TM wave.	K4	1	6
	b	**Examine** the Dominant and Degenerate modes in circular waveguides.	K4	1	6
		OR			
2	a	**Analyze** the Phase & Group velocities and derive their expressions in rectangular waveguides.	K4	1	6
	b	**Examine** the applications of microwaves.	K4	1	6
3	a	**Identify** the waveguide discontinues for microwave applications.	K3	2	6
	b	**Analyze** the operation of Rotary vane type attenuator.	K4	2	6
		OR			
4	a	**Determine** S-Matrix for Magic Tee.	K5	2	6
	b	**Inspect** the operation principle of isolator.	K4	2	6
5	a	**Conclude** the limitations and losses of conventional tubes at microwave frequencies.	K5	3	6
	b	**Interpret** the applegate diagram and working principle of reflex klystron with neat sketch.	K5	3	6
		OR			
6	a	**Solve** the efficiency of two cavity klystron.	K3	3	6
	b	**Identify** the classification of microwave tubes	K3	3	6
7	a	**Experiment with** nature of four propagation constants	K3	4	6
	b	**Determine** the Hull cutoff voltage equation.	K5	4	6
		OR			
8	a	**Survey** about the types and characteristics of slow wave	K4	4	6

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		structures			
	b	**Explain** the magnetron Pi-mode operation.	**K5**	**4**	**6**
9	**a**	**Inspect** the procedure to measure VSWR.	**K4**	**5**	**6**
	b	**Utilize** different microwave components to explain microwave bench.	**K3**	**5**	**6**
		OR			
10	**a**	**Explain** the Ridley-Watkins-Hilsum theory of Gunn diode.	**K5**	**5**	**6**
	b	**Make use of** any one method to measure attenuation.	**K3**	**5**	**6**

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Model Question Paper-2

Code: 19BEC7TH01 **R19**

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Yallmanda(Post), Narasaraopet- 522601
B. Tech VII Semester Regular Examinations
MICROWAVE ENGINEERING
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 field components in rectangular waveguide while propagating TE wave.	K4	1	6
	b	**Examine** the Dominant and Degenerate modes in rectangular waveguides.	K4	1	6
		OR			
2	a	**Analyze** the cutoff frequency & wavelength, derive their expressions in rectangular waveguides.	K4	1	6
	b	**Examine** the advantages of microwaves.	K4	1	6
3	a	**Identify** the coupling mechanisms for matching transmission line with waveguide.	K3	2	6
	b	**Analyze** the operation of Resistive card type attenuator.	K4	2	6
		OR			
4	a	**Determine** S-Matrix for H-Plane Tee.	K5	2	6
	b	**Inspect** the operation principle of circulator.	K4	2	6
5	a	**Categorize** different microwave tubes.	K4	3	6
	b	**Interpret** the applegate diagram and working principle of two cavity klystron with neat sketch.	K5	3	6
		OR			
6	a	**Solve** the efficiency of reflex klystron.	K3	3	6
	b	**Identify** the output power of reflex klystron	K3	3	6
7	a	**Experiment with** Helix traveling wave tube and suppression of oscillation	K3	4	6
	b	**Determine** the Hartree voltage condition.	K5	4	6
		OR			

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8	a	**Survey** about the modes of resonance	K4	4	6
	b	**Explain** the 8-cavity cylindrical traveling wave magnetron.	K5	4	6
9	a	**Inspect** the procedure to measure power using bolometer.	K4	5	6
	b	**Categorize** different microwave solid state devices	K4	5	6
		OR			
10	a	**Explain** double minimum method to measure VSWR.	K5	5	6
	b	**Make use of** any one method to measure impedance.	K3	5	6

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

LESSON PLAN

Course Code	Course Title (Regulation)	Year - Semester	Branch	Contact Periods/ Week	Sections
19BEC7TH01	MICROWAVE ENGINEERING (R19)	IV - I	ECE	6	A, B, C & D

COURSE OUTCOMES:

CO1: **Explain** about transmission lines and waveguide structures **[K5]**.
CO2: **Analyze** how waveguides are used as elements in impedance matching and filter circuits **[K4]**.
CO3: **Apply** analysis methods to determine circuit properties of passive or active microwave devices **[K3]**.
CO4: **Distinguish** between M-type and O-type tubes **[K4]**.
CO5: **Analyze** and measure various microwave parameters using a Microwave test bench **[K4]**.

Unit No.	Outcome		Topics/Activity	Ref Text Book	Total Periods	Delivery Method(s)
1	CO1: **Explain** about transmission lines and waveguide structures **[K5]**		**UNIT–I: MICROWAVE TRANSMISSION LINES**			
		1.1	Introduction, Microwave Spectrum and Bands	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.2	Applications of Microwaves	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Blended Learning
		1.3	Rectangular Waveguides – TE/TM mode analysis	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.4	Expressions for Fields, Characteristic Equation	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Blended Learning
		1.5	Cut-off Frequencies, Filter Characteristics.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.6	Dominant and Degenerate Modes.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.7	Mode Characteristics – Phase and Group Velocities	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		1.8	Impossibility of TEM mode and Related Problems.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Problem based Learning
		1.9	**CIRCULAR WAVEGUIDES:** Introduction	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.10	Nature of Fields	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.11	Characteristic Equation	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources

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		1.12	Dominant and Degenerate Modes	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		1.13	Problems	T1	1	Chalk & Talk, Problem based Learning
2	**CO2: Analyze** how waveguides are used as elements in impedance matching and filter circuits **[K4]**	**UNIT–II: WAVEGUIDE COMPONENTS AND APPLICATIONS**				
		2.1	Coupling Mechanisms- Probe, Loop, Aperture types	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.2	Waveguide Discontinuities – Waveguide irises	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Web Resources
		2.3	Tuning Screws and Posts, Matched Loads.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Web Resources
		2.4	Waveguide Attenuators -Resistive Card type	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.5	Rotary Vane types	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.6	Waveguide Phase Shifters – Dielectric type	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.7	Rotary Vane types.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.8	Scattering Matrix– Significance, Formulation and Properties.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		2.9	S-Matrix Calculations for – 2 port Junction	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		2.10	E-plane Tee and H-plane Tees	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		2.11	Magic Tee, Hybrid Ring.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		2.12	Directional Couplers – 2 Hole, Bethe Hole types	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		2.13	Ferrite Components– Faraday Rotation	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		2.14	S-Matrix Calculations for Gyrator, Isolator and Circulator .	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Cooperative Learning
		2.15	Problems.	T1, T2, R3	1	Chalk & Talk, Problem based Learning
3	**CO3: Apply** analysis methods to determine circuit properties of passive or active microwave devices **[K3]**	**UNIT–III: MICROWAVE TUBES**				
		3.1	Limitations and Losses of conventional tubes at microwave frequencies.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		3.2	Microwave tubes – O type and M type classifications	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.3	O-type tubes: 2 Cavity Klystrons – Structure	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.4	Reentrant Cavities, Velocity Modulation Process and Applegate Diagram	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.5	Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Collaborative Learning
		MID-I EXAMINATION DURING NINTH WEEK				

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		3.6	Reflex Klystrons – Structure	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.7	Applegate Diagram and Principle of working	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.8	Mathematical Theory of Bunching	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.9	Power Output	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.10	Efficiency	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.11	Electronic Admittance.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.12	Problems	T1, R3	1	Chalk & Talk, Problem based Learning
		UNIT–IV: HELIX TWTS				
4	**CO4: Distinguish** between M-type and O-type tubes **[K4]**	4.1	Significance of Travelling Wave Tubes	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.2	Types and Characteristics of Slow Wave Structures	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Collaborative Learning
		4.3	Structure of TWT and Suppression of Oscillations	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.4	Nature of the four Propagation Constants	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.5	**M- Type Tubes:** Introduction, Cross-field effects	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Web Resources
		4.6	Magnetrons – Different Types	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.7	8-Cavity Cylindrical Travelling Wave.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		4.8	Magnetron – Hull Cut-off and Hartree Conditions	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.9	Modes of Resonance and PI-Mode Operation	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.10	Separation of PI-Mode	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.11	Output characteristics.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.12	Problems	T1, R3	1	Chalk & Talk, Problem based Learning
		UNIT–V: MICROWAVE SOLID STATE DEVICES & MEASUREMENTS				
5	**CO5 Analyze** and measure various microwave parameters using a Microwave test bench **[K4]**	5.1	**MICROWAVE SOLID STATE DEVICES:** Introduction	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		5.2	Classification and Applications	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		5.3	TEDs- Introduction	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		5.4	Gunn Diode – Principle	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		5.5	RWH Theory	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Cooperative Learning

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		5.6	**MICROWAVE MEASUREMENTS:** Description of Microwave Bench – Different Blocks and their Features, Precautions.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Student Seminars
		5.7	Microwave Power Measurement – Bolometer Method.	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		5.8	Measurement of Attenuation	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		5.9	Frequency Measurement	T1, T2, R1	1	Chalk & Talk, PPT, Quiz,
		5.10	VSWR Measurement	T1, T2, R1	1	Chalk & Talk, PPT, Quiz,
		5.11	Cavity Q Measurement of Resonator	T1, T2, R1	1	Chalk & Talk, PPT, Quiz,
		5.12	Impedance Measurements	T1, T2, R1	1	Chalk & Talk, PPT, Quiz,
		5.13	Problems	T1, R1	1	Chalk & Talk, Problem based Learning
				Total Classes	**65**	
MID-II EXAMINATION DURING EIGTHEENTH WEEK						
END SEMESTER EXAMINATION						

TEXT BOOKS

T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Samuel Y. Liao, "Microwave Devices and Circuits", PHI, 3rd Edition, 1994.
T2	Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBSPublishers and Distributors, New Delhi, 2004.

REFERENCE BOOKS

R	BOOK TITLE/AUTHORS/PUBLISHER
R1	R.E. Collin, "Foundations for Microwave Engineering", IEEE Press, John Wiley, 2 nd Edition, 2002.
R2	Microwave Circuits and Passive Devices – M.L. Sisodia and G. S. Raghuvanshi, Wiley EasternLtd., New Age International Publishers Ltd., 1995.
R3	Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
R4	Microwave Engineering – G S N Raju , I K International.
R5	Microwave and Radar Engineering – G Sasibhushana Rao Pearson.
R6	Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.

WEB SOURCE REFERENCES:

1	https://ece.vt.edu/grad/courses/5104G
2	https://freevideolectures.com/subject/microwave

1. B. Sri
2.

Faculty Member

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Head of the Department

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Principal

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Dept. of Civil Engineering
COURSE INFORMATION SHEET

PROGRAMME: B.Tech Civil Engineering	
COURSE **FLUID MECHANICS**	Semester : II-I CREDITS: **3**
COURSE CODE: **R20CE2102** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: **FLUID MECHANICS**	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CC1107	**ENGINEERING MECHANICS**	An ability to understand about mechanics applied in Engineering concepts.	**I-I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Understand the various properties of fluids and their influence on fluid motion and calculate the forces that act on submerged planes and curves. K2&K3
CO2	Identify and analyse various types of fluid flows and variety of problems in fluid statics. K2&K3
CO3	Analyse a variety of problems in fluid dynamics and measure the quantities of fluid flowing in pipes K2&K3
CO4	Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces. K2&K3
CO5	Measure the quantities of fluid flowing in tanks and channels. K2&K3

SYLLABUS:

UNIT	DETAILS
I	Properties of Fluid: Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, capillarity. Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers. Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Centre of pressure.
II	**Fluid Kinematics**: Methods of describing fluid motion; Classification of flows; Steady, unsteady, uniform and no uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Path line; Streak line; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flow net.

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III	**Fluid Dynamics:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend. **Flow Measurement in Pipes:** Discharge through venturimeter; Discharge through orifice meter; Measurement of velocity by Pitot tube.
IV	**Flow Through Orifices and Mouthpieces:** Flow through orifices; Determination of coefficients for an orifice; Flow through large rectangular orifice; Flow through submerged orifice; Classification of mouthpieces; Flow through external and internal cylindrical mouthpiece. **Flow over Notches & Weirs** Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Broad crested weir.
V	**Analysis of Closed Conduit Flow:** Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula. **Laminar Flow and Turbulent Flows:** Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
T2	A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Fluid Mechanics by A. K Jain, Khanna Publishers.
R2	Fluid Mechanics, Hydraulics& Hydraulic Machines by K R Arora, Standard Publishers

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

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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
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	PO10	PO 11	PO 12	PSO 1	PSO 2
R20CE2102	2.6			2.4	0.8	0.8	0.6	1					1.6	1.4

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Coordinator

Module Coordinator

Head of the Department

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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 apply fundamental concepts of structural, geotechnical, water resources and environmental engineering to make best projects in civil engineering.

PSO2. The students will develop skills to design sustainable solutions for real time problems of civil engineering by adopting modern technologies and designing tools.

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,

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		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 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	**K1 & K3**	**CO1**
2	Define Surface tension. How do you estimate the pressure inside a liquid drop, soap bubble and liquid jet What is capillarity? Derive the expression for capillary rise and Capillary fall	**K2 & K3**	**CO1**
3	What do you understand about micro manometer & pressure gauge and discuss any of the pressure gauge.	**K1**	**CO1**
4	Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane submerged in the liquid	**K1 & K2**	**CO1**
5	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.	**K2**	**CO1**
	UNIT 2		
1	Define continuity equation. Obtain an expression for continuity equation for a three-dimensional flow.	**K2**	**CO2**
2	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).	**K3**	**CO2**
3	Classify the different types of flows. Explain in brief (i) laminar and turbulent flows (ii) rotational and irrotational flows (iii)Uniform and non-Uniform flows	**K2 & K3**	**CO2**
4	Explain about velocity potential function and steam function and their characteristics.	**K2 & K3**	**CO2**
5	Discuss about Flownet.	**K2**	**CO2**
	UNIT 3		
1	State and explain about Bernoulli's theorem and write down the assumptions for it	**K1 & K2**	**CO3**
2	What are the surface and body forces associated with fluid flow? How are they incorporated in Euler's equation?	**K1 & K2**	**CO3**
3	Define momentum equation and derive an expression for force exerted by a flowing fluid on a pipe bend?	**K1 & K2**	**CO3**
4	What are the various flow measuring devices? Derive the expression for measuring discharge through various measuring devices.	**K3**	**CO3**
	UNIT 4		
1	Derive an expression for discharge over a triangular notch or weir?	**K1 & K2**	**CO4**
2	Water flows over a rectangular weir 1m wide at a depth of 150mm and	**K1 & K2**	**CO4**

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	afterwards passes through a triangular right-angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth Over the triangular weir.		
3	Derive an expression for discharge over a rectangular notch or weir?	**K1 & K2**	**CO4**
4	Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.5 m at the bottom and is 0.4 m in height. The head of water on the notch is 0.3 m. Assume C_d for rectangular portion =0.62,while for triangular portion 0.60	**K1 & K2**	**CO4**
	UNIT 5		
1	Determine the loss of head due to friction in pipes by using Darcy formula	**K1 & K2**	**CO5**
2	Find the head lost due to friction in a pipe of diameter 300mm and length 50m,through which water is flowing at a velocity of 3m/s using Darcy formula	**K2**	**CO5**
3	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.	**K3**	**CO5**
4	Explain how the following flow problems are analyzed. i) Series pipe connection (ii) parallel pipe connection and iii) Equivalent pipe connection.	**K2**	**CO5**

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Subject Code: R20CE2102

II B.Tech. - I Semester Examinations,

FLUID MECHANICS (Civil Engineering)

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 =70M)

Q.No.		Questions	KL	CO	Marks
		Unit-I			
1	a	i. Define a) mass density b) specific weight c) specific volume d) specific gravity e) viscosity	K1	1	[7M]
		ii. . If 5 m^3 of oil weighs 40 KN. Estimate i) specific weight ii) Mass density iii) specific gravity	K3	1	[7M]
		OR			
	b	i 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	K3	1	[7M]
		ii Explain about U-tube differential manometer and inverted U-tube differential manometer?	K5	1	[7M]
		Unit-II			
2	a	Define the equation of continuity. Obtain the expression for continuity equation in three dimensions?	K5	2	[14M]
		OR			
	b	Explain about velocity potential function and steam function and their characteristics.	K5	2	[14M]
		Unit-III			
3	a	i. State Bernoulli's equation? Write the assumptions for such a derivation?	K2	3	[7M]
		ii. Define momentum equation and derive an expression for force exerted by a flowing fluid on a pipe bend?	K5	3	[7M]
		OR			
	b	A horizontal venture meter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of sp.gr.0.8. The discharge of oil through venturi meter is 60lit/s. Find the reading of oil-mercury differential manometer. Take C_d=0.98.	K3	3	[14M]
		Unit-IV			
4	a	i. Derive an expression for discharge over a triangular notch or weir?	K5	4	[7M]
		ii. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right-angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth Over the triangular weir.	K3	4	[7M]
		OR			
	b	i. Derive an expression for discharge over a rectangular notch or weir?	K5	4	[7M]
		ii. Find the discharge of water flowing over a rectangular notch of 2m length when the constant head over the notch is 300mm. Take Cd=0.60.	K3	4	[7 M]
		Unit-V			
5	a	i. Determine the loss of head due to friction in pipes by using Darcy formula	K2	5	[7M]
		ii. Find the head lost due to friction in a pipe of diameter 300mm and length 50m through which water is flowing at a velocity of 3m/s	K3	5	[7M]

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		using Darcy formula			
		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.	K3	5	[14M]

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II B.Tech. - I Semester Examinations,

FLUID MECHANICS (Civil Engineering)

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

Q.No.		Questions	KL	CO	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	K3	1	[7M]
		ii. What is capillarity? Derive the expression for capillary rise	K5	1	[7M]
		OR			
	b	Derive the expression for depth of center of pressure on submerged vertical plane.	K5	1	[7M]
		ii) Explain the Pascal's law. Prove that pressure acting on wedge submerged in fluid is equal in all directions	K2	1	[7M]
		Unit-II			
2	a	Classify the different types of flows. Explain in brief (i) laminar and turbulent flows (ii) rotational and irrotational flows (iii)Uniform and non-Uniform flows	K4	2	[14M]
		OR			
	b	The following given stream function represents a two-dimensional steady state flow $=4(x^2-y^2)$ Check whether the flow is irrotational or not?.If it is irrotational, then find out the corresponding velocity potential function.	K4	2	[14M]
		Unit-III			
3	a	What are the surface and body forces associated with fluid flow? How are they incorporated in Euler's equation?	K1	3	[14M]
		OR			
	b	A horizontal venturimeter with inlet and throat diameters 160 mm and 60 mm respectively is used to measure the flow of an oil of specific gravity 0.8.If the discharge of oil is 0.005 m^3/s, find the deflection of oil mercury gauge. Take venturimeter constant =1	K3	3	[14M]
		Unit-IV			
4	a	Deduce an expression for discharge over a triangular Notch	K5	3	[14M]
		OR			
	b	Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.5 m at the bottom and is 0.4 m in height. The head of water on the notch is 0.3 m. Assume C_d for rectangular portion =0.62,while for triangular portion 0.60	K3	4	[14M]
		Unit-V			
5	a	Explain how the following flow problems are analyzed. i) Series pipe connection (ii) parallel pipe connection and iii) Equivalent pipe connection.	K2	5	[14M]
		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.	K3	5	[14M]

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CE2102	FLUID MECHANICS (R20)	II-I	Civil Engineering	6	A

COURSE OUTCOMES:
At the end of the course, the student will be able to:

SNO	Course Outcome Statement
CO1	Understand the various properties of fluids and their influence on fluid motion and calculate the forces that act on submerged planes and curves. K2&K3
CO2	Identify and analyse various types of fluid flows and variety of problems in fluid statics.K2&K3
CO3	Analyse a variety of problems in fluid dynamics and measure the quantities of fluid flowing in pipes K2&K3
CO4	Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces. K2&K3
CO5	Measure the quantities of fluid flowing in tanks and channels. K2&K3

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
		UNIT – I				
I	**CO1:** Understand the various properties of fluids and their influence on fluid motion and calculate the forces that act on submerged planes and curves. K2&K3	1.1	Properties of Fluid: Physical properties of fluids - specific gravity, viscosity, surface tension,	T1, T2, R1	3	Chalk& Talk, & Active Learning Tutorial
		1.2	vapour pressure and their influences on fluid motion, capillarity.	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		1.3	Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressures	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		1.4	Measurement of pressure Pressure gauges, Manometers: Differential and Micro Manometers.	T1, T2, R1	3	Chalk& Talk,

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						Active Learning & PPT
		1.5	Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Centre of pressure.	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
2	**CO2** Understand the Various methods in-situ densification of cohesive soils and to know the ability to design of reinforced earth walls K1&K2	**UNIT – II**				
		2.1	**Fluid Kinematics**: Methods of describing fluid motion; Classification of flows; Steady, unsteady, uniform and no uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; and	T1, T2, R1	5	Chalk& Talk, Active Learning & Tutorial
		2.2	Streamline; Path line; Streak line; Equation for acceleration; Convective acceleration; Local acceleration;	T1, T2, R1	5	Chalk& Talk, Active Learning & Tutorial
		2.3	Continuity equation; Velocity potential	T1, T2, R1	5	Chalk& Talk, Active Learning & Tutorial
		2.4	Stream function; Flow net.	T1, T2, R1	5	Chalk& Talk, Active Learning & PPT
3	**CO3:** Analyse a variety of problems in fluid dynamics and measure the quantities of fluid flowing in pipes K2&K3	**UNIT – III**				
		3.1	**Fluid Dynamics:** Surface and body forces – Euler's equation -	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		3.2	Bernoulli's equations for flow along a stream line	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		3.3	Momentum equation and its application – forces on pipe bend.	T1, T2, R1	3	Chalk& Talk,

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						Active Learning & Tutorial
		3.4	**Flow Measurement in Pipes:** Discharge through venturimeter;	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		3.5	Discharge through orifice meter; Measurement of velocity by Pitot tube.	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
4	CO4: Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces. K2&K3 .	**UNIT – IV**				
		4.1	**Flow Through Orifices and Mouthpieces:** Flow through orifices; Determination of coefficients for an orifice; Flow through large rectangular orifice;	T1, T2, R1	3	Chalk& Talk, Active Learning & Tutorial
		4.2	Flow through submerged orifice; Classification of mouthpieces; Flow through external and internal cylindrical mouthpiece.	T1, T2, R1	3	Chalk& Talk, Active Learning
		4.3	**Flow over Notches & Weirs** Flow through rectangular, triangular and trapezoidal notches	T1, T2, R1	2	& Tutorial
		4.4	Flow through weirs; End contractions; Velocity of approach; Broad crested weir.	T1, T2, R1	2	Chalk& Talk, Active Learning
5	**CO5:** Measure the quantities of fluid flowing in tanks and channels. K2&K3	**UNIT – V**				
		5.1	**Analysis of Closed Conduit Flow:** Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with	T1, T2, R1	4	Chalk& Talk, Active Learning & Tutorial
		5.2	Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula.	T1, T2, R1	4	Chalk& Talk, Active Learning& Tutorial

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		5.3	**Laminar Flow and Turbulent Flows**: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction	T1, T2, R1	4	Chalk& Talk, Active Learning& Tutorial
		5.4	Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.	T1, T2, R1	3	Chalk& Talk, Active Learning& Tutorial
				Total	75	

TEXT BOOKS:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1 Fluid Mechanics by A. K Jain, Khanna Publishers.

2. Fluid Mechanics, Hydraulics& Hydraulic Machines by K R Arora, Standard Publishers

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NARASARAOPETA ENGINEERING COLLEGE
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DEPT. OF CIVIL ENGINEERING

COURSE INFORMATION SHEET : 2022-2023

PROGRAMME: **B.TECH CIVIL ENGINEERING**	
COURSE: **ADVANCED STRUCTURAL ANALYSIS**	SEMESTER : **III-I** CREDITS: **3**
COURSE CODE: **R20CE3104** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **ELECTIVE**
COURSE AREA/DOMAIN: **STRUCTURES**	PERIODS: **5 PER WEEK.**

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CE2203	STRUCTURAL ANALYSIS	To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.	II-II

COURSE OUTCOMES:

S.NO	COURSE OUTCOME STATEMENT
CO1	Analyze structures using various methods - Energy theorems, Moment Distribution method.K2&K4
CO2	Analyze continuous beams and portal frames using Kani's Method.K2&K4
CO3	Analyze Two Hinged and Three Hinged Arches.K4
CO4	Apply approximate methods and determine the structural response of building frames subjected to gravity loads and lateral loads respectively.K2&K3
CO5	Analyze Cable and Suspension Bridge structures.K4

SYLLABUS:

UNIT	DETAILS
I	**ENERGY THEOREMS:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams. **MOMENT DISTRIBUTION METHOD**: Degrees of freedom, Member flexural stiffness and carry over factors, Distribution factors, Analysis of Portal frames with Sway. Shear force and bending moment diagrams - Elastic curve.

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WEB SOURCE REFERENCES:

1	Structural Analysis-II, IIT Kharagpur – NPTEL (web course) https://nptel.ac.in/courses/105/105/105105109/#
2	https://nptel.ac.in/courses/105105166
3	https://nptel.ac.in/courses/105101085
4	https://nptel.ac.in/courses/105101086
5	https://nptel.ac.in/courses/105105180

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
☐Evidence based learning	☐Collaborative learning	☐Problem based learning
☐ Cooperative learning	☐Activity based learning	☐Student centric learning

MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3								2	-		2	1
CO2	2	3								2	-		2	1
CO3	2	3								2	-		2	1
CO4	1	3								2	-		2	1
CO5	2	3								1			1	1
Average	1.8	3								1.8			1.8	1

MAPPING COURSE WITH POs & PSOs

COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
R20CE3104	1.8	3								1.8			1.8	1

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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 and environmental engineering to make best projects in civil engineering able to apply fundamental concepts of structural, geotechnical, water resources.

PSO2.the students will be develop skills to design sustainable solutions for real time problems of civil engineering by adopting modern technologies and designing tools.

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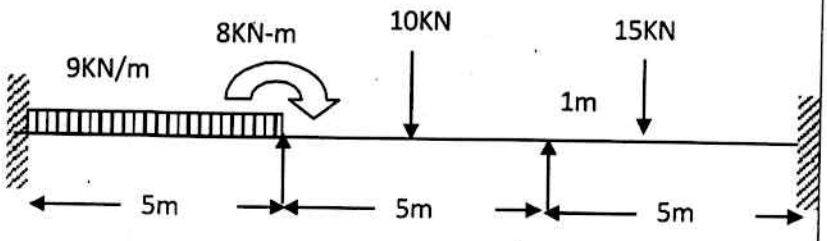
	AB and CD of 6m height, Beam BC of span 10m, with EI constant. The column CD carries an udl of 30 kN/m. The supports at A and D are fixed.		
4	Using Kani's method, determine the support moments for the three-span continuous beam with fixed end supports, having spans AB, BC and CD. Span AB carries an eccentric point load of 80kN, 4m span and a load at 1m from point A. Span BC carries an udl of 20 kN/m of 6m span and span CD carries a concentric point load of 60 kN having a span of 4m (EI constant). Sketch the B.M. and S.F.D	K3	CO2
5	Analyze continuous beam in figure by Kani"s method. 	K4	CO2
	UNIT 3		
1	State and prove Eddy's theorem?	K2 & K3	CO3
2	A three-hinged parabolic arch has a span of 24 m and a rise to the central hinge of 4 m. The arch is loaded with two vertical 20 kN loads symmetrically situated on either side of the central hinge at 3 m horizontally from the hinge. Calculate the support reactions. Find the position and magnitude of maximum positive bending moments occurs in the arch.	K3	CO3
3	A 3-hinged arch is circular, 25 m in span with a central rise of 5m. It is loaded with a concentrated load of 10 KN at 7.5m from the left hand hinge. Find the a. Horizontal thrust b. Reaction at each end hinge c. Bending moment under the load	K3	CO3
4	Derive the expression for normal thrust, radial shear and horizontal thrust for a two hinged circular arch.	K3	CO3
5	A steel two-hinged circular arch rib has a span of 30 m and a rise of 3 m. The rib section is uniform throughout with an overall depth of 0.7 m, neglecting all effects except those due to bending, find, from first principles, the bending stress at the crown due to a temperature change of 3^{00} K. Take E= 2×1^{05} N/m^{m2} and $\alpha = 11\times1^{0-6}$ per 1K. Find the max change in bending stress due to rise in temperature.	K3	CO3
	UNIT 4		
1	Explain analysis of a frame subjected to lateral load by adopting Cantilever method.	K2	CO4

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	State position of maximum and minimum tension in a cable with calculations.		
3	A cable is used to support six equal and equidistant loads over span of 14 m. The central dip of cable is 1.2 m and loads are 25 KN each. Find the length of the cable required and its sectional area if the safe tensile stress is 150 N/mm^2.	K3	CO5
4	A suspension bridge of 50 m span and 3.5 m wide platform is subjected to a load of 50 $KN/^{m2}$. The bridge is supported by a pair of cables having central dip of 4.5 m. Find the necessary cross sectional area of the cable, if the maximum permissible stress in the cable not to exceed 150 N/mm^2.	K3	CO5
	The horizontal of suspension cable is 60 m. The right hand support B is lower than the left hand support A by 8 m. The dip of the lowest point C below B is 2 m. If a platform load of 5 kN per horizontal meter of span is transmitted to the cable, calculate the maximum pull in the cable if the permissible tensile in the cables is 120 MN/mm^2, calculate sectional area required. The weight of the cable may be neglected.	K3	CO5

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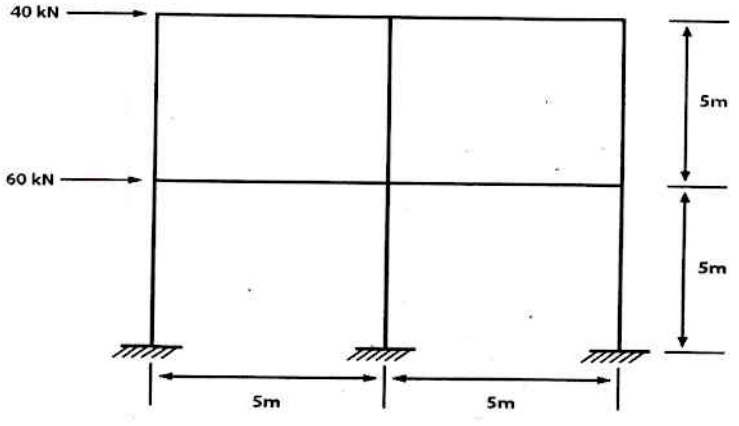
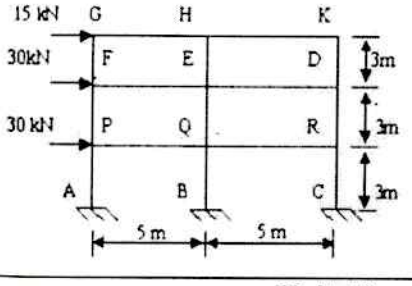
		OR			
	b	A three hinged parabolic arch hinged at the crown and springing has a horizontal span of 12m and a central rise of 2.5m. it carries a udl of 30 kN/m run over the left hand half of the span. Calculate the resultant at the end hinges.	**K3**	**CO3**	**14M**
4		**Unit-IV**			
	a	Analyse the frame using Portal Method  	**K4**	**CO4**	**14M**
		OR			
	b	Explain along with the assumptions, the Portal method for analyzing a building frame subjected to horizontal forces by taking an example	**K2**	**CO4**	**7M**
		Analyze the frame shown in figure, for forces in *top storey* by Cantilever method. Assume that all the columns have equal area of cross-section for the purpose of analysis.  	**K4**	**C04**	**7M**
5		**Unit-V**			
	a	Deduce an expression for general cable theorem?	**K3**	**CO5**	**10M**
		What are stiffening girders? Discuss.	**K1**	**CO5**	**4M**
		OR			
	b	A three hinged suspension girder bridge has a span of 300m over the supports at same level. It has a central dip of 30m.The girder carries three point loads of 20kN, 30kN and 40kN acting at 45m, 90m and 160m respectively from the left end. Draw the B.M.D.	**K3**	**CO5**	**14M**

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

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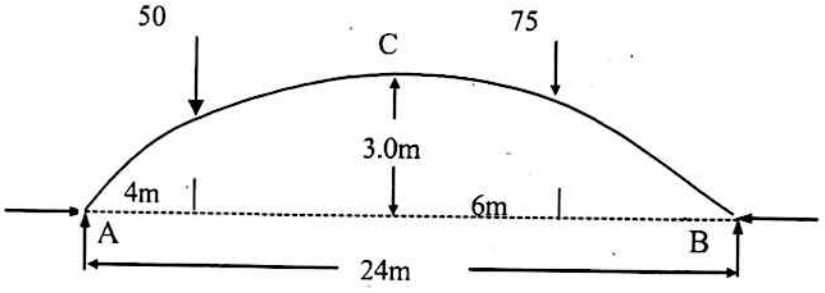
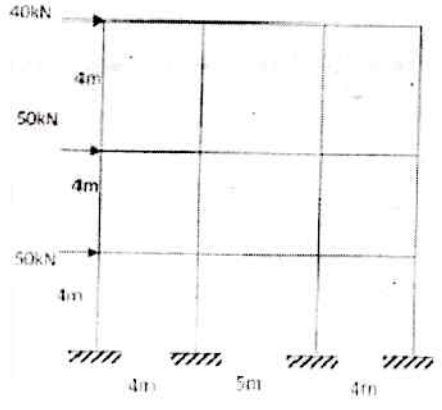
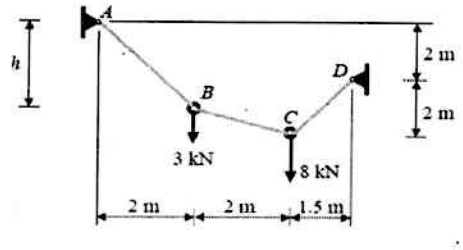
		Calculate Horizontal thrust, Reactions at supports and Maximum bending moment on a parabolic three-hinged arch is loaded as shown in figure.  	K3	CO3	8M
		Unit-IV			
4	a	Explain analysis of a frame subjected to lateral load by adopting Cantilever method.	K3	CO4	14M
		OR			
	b	Analyze the Portal frame shown in figure by Portal Method.  	K4	CO4	14M
		Unit-V			
5	a	Determine the tension in each segment of the cable shown in the figure below. Also, what is the dimension *h* ?  	K2	CO5	7M
		A cable ABC of uniform cross section is used to span a distance of 40m. The cable is subjected to uniformly distributed load of 10 kN/m run. The left support 'A' is below the right support 'B' by 2 m and the lowest point on the cable 'C' is located below left support 'A' by 1 m. Evaluate the reactions and the maximum and minimum values of tension in the cable.	K4	CO5	7M
		OR			
	b	A suspension bridge of 50 m span and 3.5 m wide platform is subjected to a load of 50 KN/m^2. The bridge is supported by a pair of cables having central dip of 4.5 m. Find the necessary cross sectional area of the cable, if the maximum permissible stress in the cable not to exceed 150 N/mm^2.	K3	CO5	14M

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DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN: 2022-2023

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CE3104	Advanced Structural Analysis (R20)	III-I	Civil Engineering	5	A & B

COURSE OUTCOMES:

CO1: Analyze structures using various methods - Energy theorems, Moment Distribution method.K2&K4
CO2: Analyze continuous beams and portal frames using Kani's Method.K2&K4
CO3: Analyze Two Hinged and Three Hinged Arches.K4
CO4: Apply approximate methods and determine the structural response of building frames subjected to gravity loads and lateral loads respectively.K2&K3
CO5: Analyze Cable and Suspension Bridge structures.K4

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
I	**CO1:** Analyze structures using various methods - Energy theorems, Moment Distribution method.K2&K4		**UNIT–I ENERGY THEOREMS AND MOMENT DISTRIBUTION METHOD:**			
		1.1	Definition for Strain Energy, Expression of Strain Energy due to Axial Load, Expression of Strain Energy due to S.F, Expression of Strain Energy due to B.M.	T1, T3, R1, R3.	4	Chalk & Talk, PPT.
		1.2	Castigliano's First Theorem, Deflections of Simple Beams Using Energy Theorem.	T1, T3, R2.	2	Chalk & Talk.
		1.3	Practice Problems.	T1, T3, R2.	2	Chalk & Talk.
		1.4	Introduction: Degrees of freedom, Member flexural stiffness and carry over factors, Distribution factors.	T1, T3, R2.	2	Chalk & Talk, Active Learning.
		1.5	Analysis of portal frames: Analysis of single bay-single storey portal frame with sway subjected to UDL and / point loads.	T1, T3, R2.	4	Chalk & Talk.

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IV	**CO4:** Apply approximate methods and determine the structural response of building frames subjected to gravity loads and lateral loads respectively.K2&K3	**UNIT – IV GRAVITY LOAD AND LATERAL LOAD ANALYSIS USING APPROXIMATE METHODS:**				
		4.1	**Gravity load analysis :** Analysis by assumption of Inflection points- Analysis of three-span continuous beam subjected to UDL and / point loads, Analysis of single bay- two storey portal frames subjected to UDL on beams.	T1, T3, R2.	4	Chalk & Talk, PPT.
		4.2	Substitute Frame Method: Analysis of two bays – two storey portal frame subjected to UDL on beams.	T1, T3, R3.	2	Chalk & Talk
		4.3	**Lateral load analysis:** Portal method- Analysis of two bay – two storey Portal frame. Cantilever method- Analysis of two bays – two storey portal frame.	T1, T2, R3	8	Chalk & Talk
V	**CO5:** Analyze Cable and Suspension Bridge structures. K4	**UNIT – V CABLE STRUCTURES AND SUSPENSION BRIDGES:**				
		5.1	**Cables:** Analysis of cable- Cable subjected to concentrated loads, Cable subjected to UDL, Cables subjected to UDL with supports at different levels.	T1, T3, R2.	2	Students Seminars.
		5.2	Effect of temperature on internal force of cable subjected to UDL with supports at same level.	T1, T3, R2.	2	Web Resources
		5.3	Analysis of anchor cable and pylon with pulley and saddle on roller supports.	T1, T3, R2.	4	Chalk & Talk
		5.4	**Suspension Bridges:** analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.	T1, T3, R2.	6	Chalk & Talk, PPT.
				Total	74	

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NARASARAOPETA ENGINEERING COLLEGE
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Dept. of Civil Engineering

COURSE INFORMATION SHEET: 2022-23

PROGRAMME: B.Tech Civil Engineering	
COURSE: **ESTIMATION SPECIFICATIONS AND COSTING**	Semester : **IV-I** CREDITS: **3**
COURSE CODE: 19BCE7TH01 REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: ESTIMATION SPECIFICATIONS AND COSTING	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCE4TH03	BUILDING PLANNING, SERVICE DESIGN AND DRAWING	An ability to understand the basic concepts of the planning of buildings like residential, commercial etc.	**II-II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Understand the procedure of estimating and differentiate between detailed and abstract estimating. K1&K2
CO2	Apply different methods of building estimates to given plan and section. K2&K3

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TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Estimating & Costing in Civil Engineering by B.N. Dutta, UBS Publishers & Distributors, 2010.
T2	Estimation, Costing and Specifications by M. Chakraborthi, Laxmi Publications
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Standard Scheduled Of Rates and Standard Data Book By Public Work Department.
R2	IS 1200 (Part 1to XXV-1974) Methods of Measurement of Building And Civil Engineering Works-B.I.S
R3	1.Valuation of Real properties by S. C. Rangwala, 8th Edition, Charotar Publishing House, 2011.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Automation estimating	PO1, PO2, PO5, PO6 ,PO7& PSO1&PSO2

WEB SOURCE REFERENCES:

1	https://nptel.ac.in
2	https://www.coursera.org
3	https://onlinecourses.swayam2.ac.in
4	www.slideshare.net
5	www.constructionplacements.com

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Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Instructor **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.

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PSO2. Participate in critical thinking and problem solving of civil engineering field that requires analytical and design requirements.

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

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2. Calculate the quantity of earth work for 200m length for a portion of a road in a uniform ground, the heights of banks at the two ends being 1m and 1.60m. The formation width is 1.0m and side slopes 2H: 1V. Assume that there is no transverse slope. Adopt

(i) Mid sectional area method

(ii) Prismoidal formula method

3. a) Write clear note on the following in case estimating the quantities of road work.

i) Prismoidal rule ii) Trapezoidal rule iii) Mid ordinate method

b) What is meant by the economic depth of digging? Derive an expression to calculate it with the help of a neat sketch.

4. The following width of road embankment is 7.5m. The side slopes are 2.5:1. The depth along the centre line road at 50m intervals are obtained as 1.59, 1.20, 1.76, 1.24, 1.37, 1.10, 1.42, 1.05m. Calculate the Quantity of earthwork by Prismoidal method and Trapezoidal method.

5. Estimate the Quantity of earthwork for a portion of road from the following data. The formation level at Chainage '0' is 9 and having falling gradient of 1 in 100. The top width is 17.5m and side slopes 1½ horizontal to 1 vertical. Assuming the transverse direction is in level, calculate the quantity of earthwork Take 1 chain = 20m by using Trapezoidal and Prismoidal formula. Chainage 0 1 2 3 4 5 6 7 8 9 RL 7.50 8.27 7.93 7.25 7.0 6.85 6.90 6.55 6.25 6.0

6. a) For an embankment 90m long of uniform gradient when the height of bank is 3.45m at one end and 2.25m at the other end. The width of embankment at top is 8.3m and its side slopes 2 vertical to 1 Horizontal. Calculate the quantity of earthwork by i) Mid Sectional area method ii) Mean sectional area method.

b) Define the terms Lead and Lift and also state how they have to be estimated.

7. Find the volume of earth work in embankment of length 12m. Top width is 5.5m and depth is 2.5m the side slopes are 1½:1 using mid sectional Area and Mean sectional method.

b) Estimate the quantity of earthwork for an embankment 120m long, 8m wide at crest and whose side slopes are 2:1. The central height of 0 to at every 30m intervals are 0.60m, 1.2m, 1.6m, 2.0m, and 1.3m calculate the earthwork using mid-section formula and trapezoidal formula.

8. The reduced level of the ground along the centre line of a proposed road is given below for chainage from 0 to 6. The formation level at '0' chainage is 9.00 and the road is in downward gradient of 1in 100 formation width of road is 10m and side slopes are 2:1 for both banking and cutting. Length of chain is 25m. Calculate the quantity of earthwork required by i) Trapezoidal rule ii) Prismoidal rule. Chainage 0 1 2 3 4 5 6 RL 8.0 7.4 7.55 7.23 6.95 6.35 6.75

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9. Explain the general specification for First-, Second- and Third-class buildings for different items of building construction

10. Write short notes on Detailed specifications of DPC, R. C. C and R. B work, mosaic flooring.

UNIT-5

1. Describe the procedure for the calculation of rate for the following
a) C.C 1:5:10 in foundation with brick ballast 40 mm thick unit 1 cum
b) R.C.C. brick work on slab (1:2:4)-unit 1cum

2. Find the cost of one cubic metre for the given item as per the rate analysis

a) 1st class brick work in foundation and plinth with 1:6 cement motor

b) 1st class brick work in Superstructure with 1:6 cement motor

3 Find the rate of one cubic metre for the following as per the rate analysis

a) Cement concrete (1:2:4) b) Plastering 1:6

c) 2.5cm C. C. floor 1:2:4 - unit 1sq.m.

4. How do you estimate unit quantities required for the (i) brickwork with standard bricks and (ii) Cement Mortar for the rate analysis purposes?

5. a) Define the term rate analysis and mention its purposes.

b) Explain the steps needed for carrying out rate analysis for any typical item in civil work.

6. What do you mean by construction contract? Discuss its various elements

7. What are the requirements of contract? Explain.

8. a) List out the various conditions of contract.

b) Write types of tenders and requirements of tendering.

9. Differentiate between security money and Eamest money.

10. a) Discuss about the general principles of contracts documents.

b) Explain the procedure to be followed for opening construction tenders.

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2. Prepare quantities for the following items of work by using any one method from the drawing shown the figures 1. (a) and (b),

.(i) Earthwork in excavation in foundation (ii) Lime concrete in foundation (iii) First class brick work in cement mortar.(1:6) for foundation and plinth (iv) DPC (v) First class brickwork in superstructure.

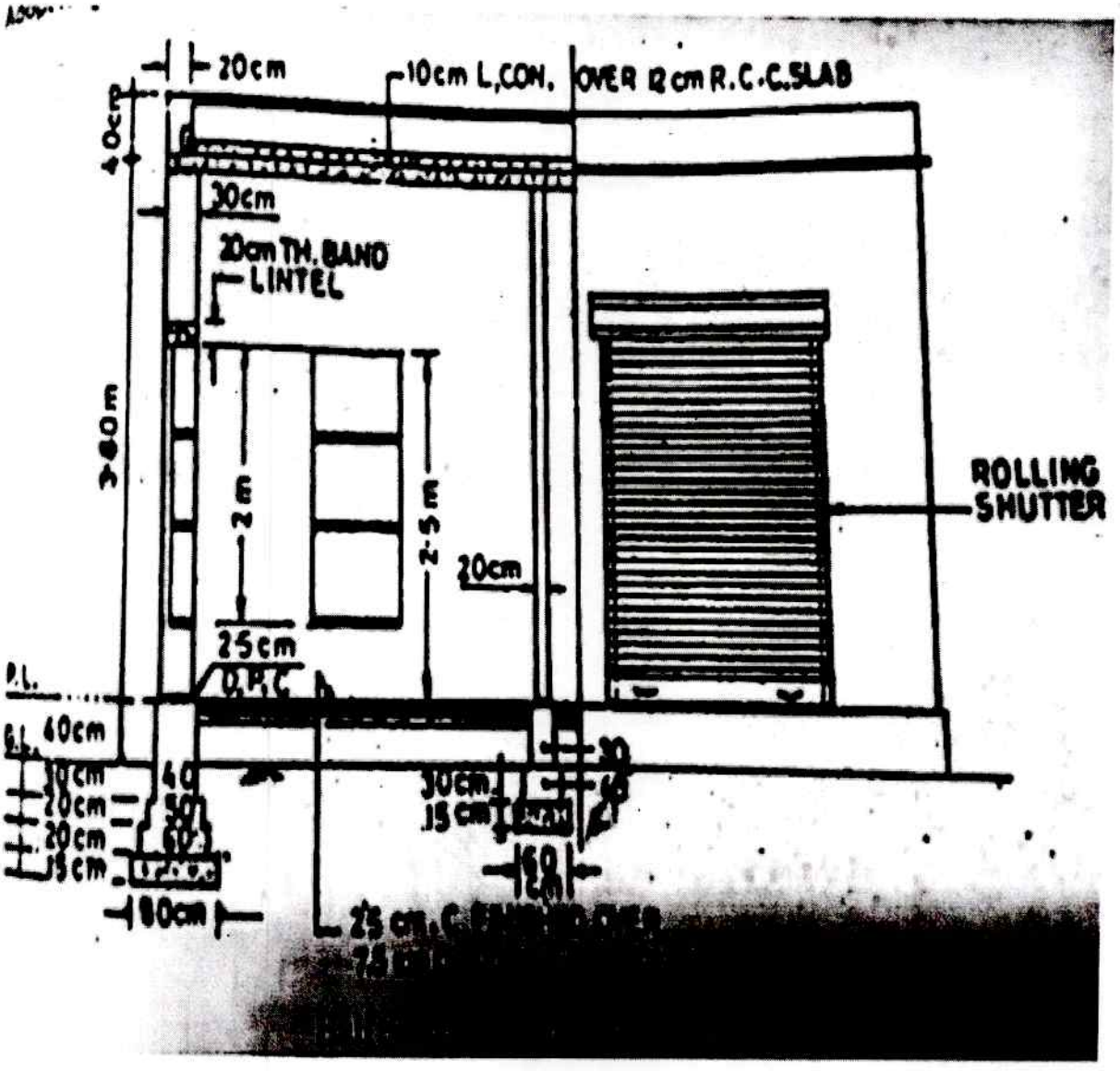

Figure 1.(a)

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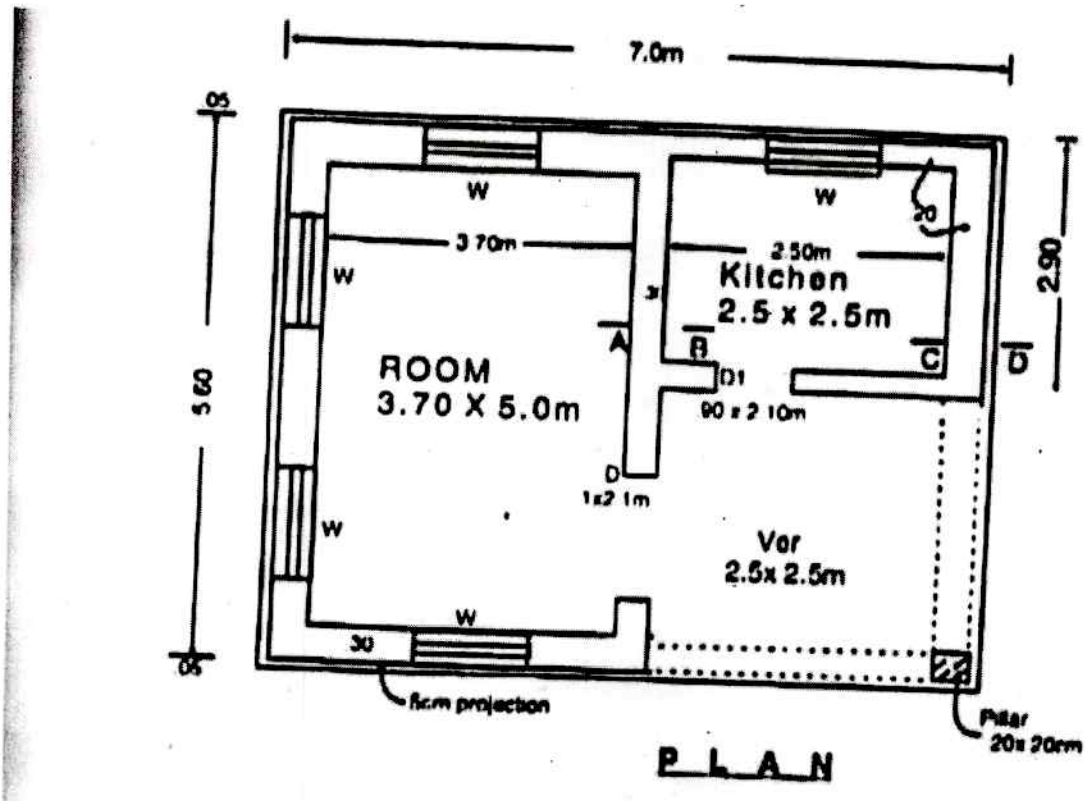
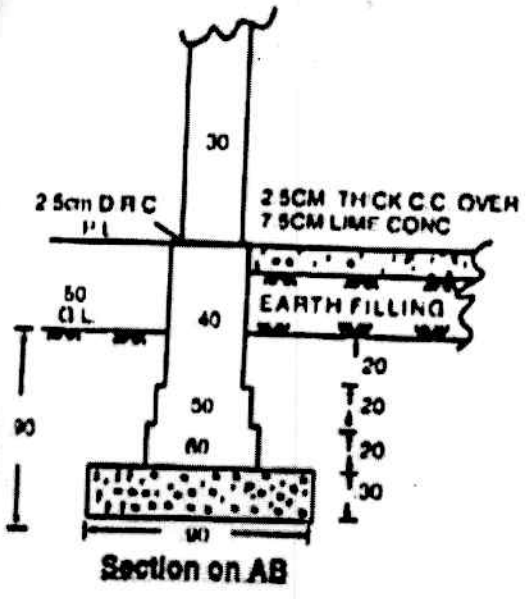
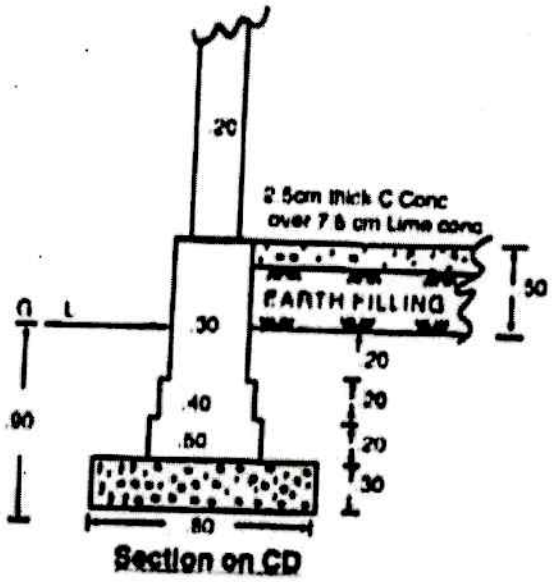


PLAN



Section on AB



Section on CD

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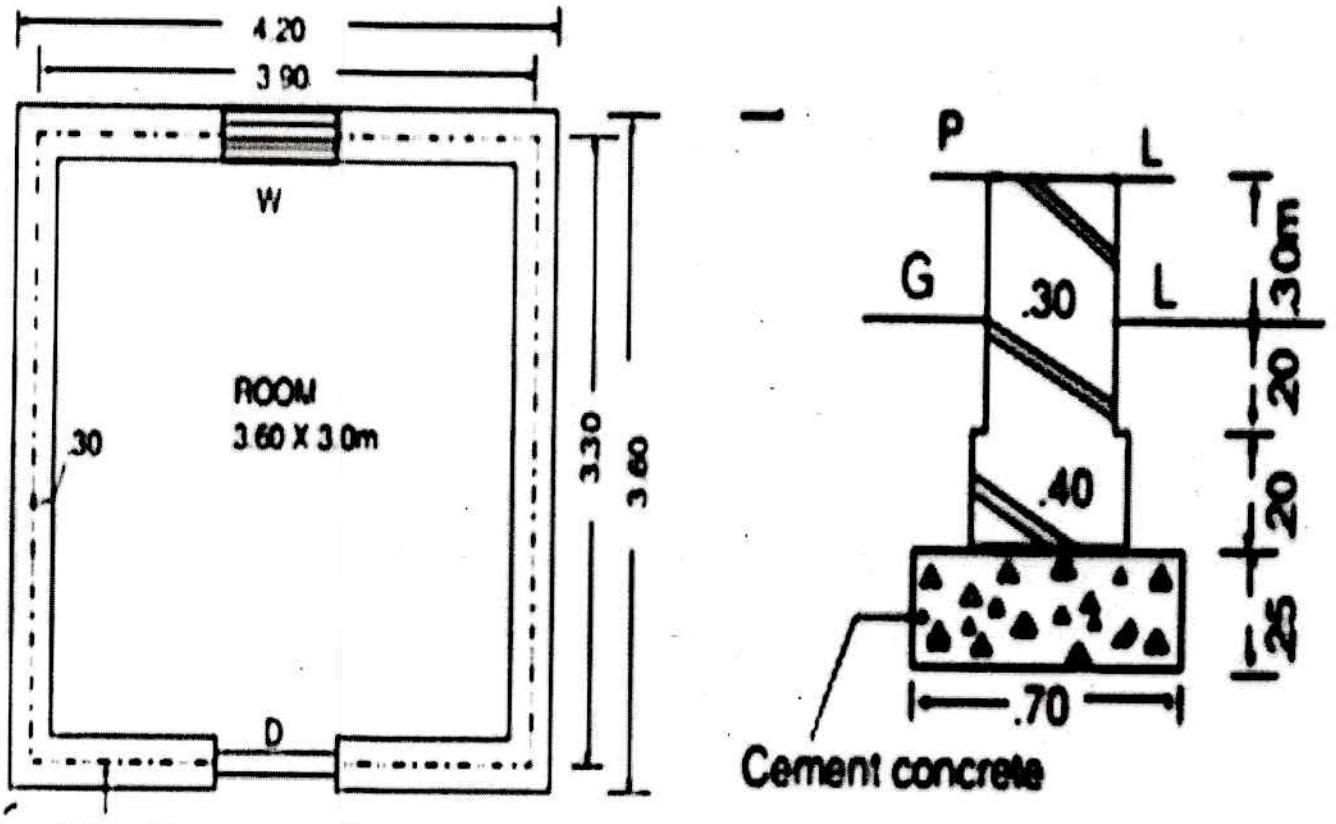
5. Estimate the quantities of (i) Earthwork in excavation in foundation (ii) Concrete in foundation (iii) Brickwork in foundation and plinth using the following two methods:(a) Individual wall method and (b) Centre line method



PlanCross-section

All units are in meters.

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		ii)Calculate the quantity of earth work for 200m length for a portion of a road in a uniform ground, the heights of banks at the two ends being 1m and 1.60m. The formation width is 1.0m and side slopes 2H: 1V. Assume that there is no transverse slope. Adopt (i) Mid sectional area method (ii) Prismoidal formula method.	K3	C03	6M
		OR			
	b	i) Explain how earthwork is estimated in canals.	K2	C03	12M
3		Unit-IV			
	a	Explain the general specification for First-, Second- and Third-class buildings for different items of building construction.	K2	C04	12M
		OR			
	b	i) What is depreciation? Explain the different methods of depreciation.	K2	C04	6M
		ii) Explain the different methods used for the valuation. Explain any three.	K2	C04	6M
4		Unit-V			
	a	i) Describe the procedure for the calculation of rate for the following a) C.C 1:5:10 in foundation with brick ballast 40 mm thick unit 1 cum b) R.C.C. brick work on slab (1:2:4)-unit 1cum	K4	C05	12M
		OR			
	b	i) Differentiate between security money and Earnest money.	K2	C05	6M
		ii) Discuss about the general principles of contracts documents.	K2	C05	6M
5		Unit-VI			
	a	Prepare quantities for the following items of work by using any one method from the drawing shown the figures 1. (a) and (b), .(i) Earthwork in excavation in foundation (ii) Lime concrete in foundation (iii) First class brick work in cement mortar.(1:6) for foundation and plinth (iv) DPC (v) First class brickwork in superstructure	K3	CO2	12M

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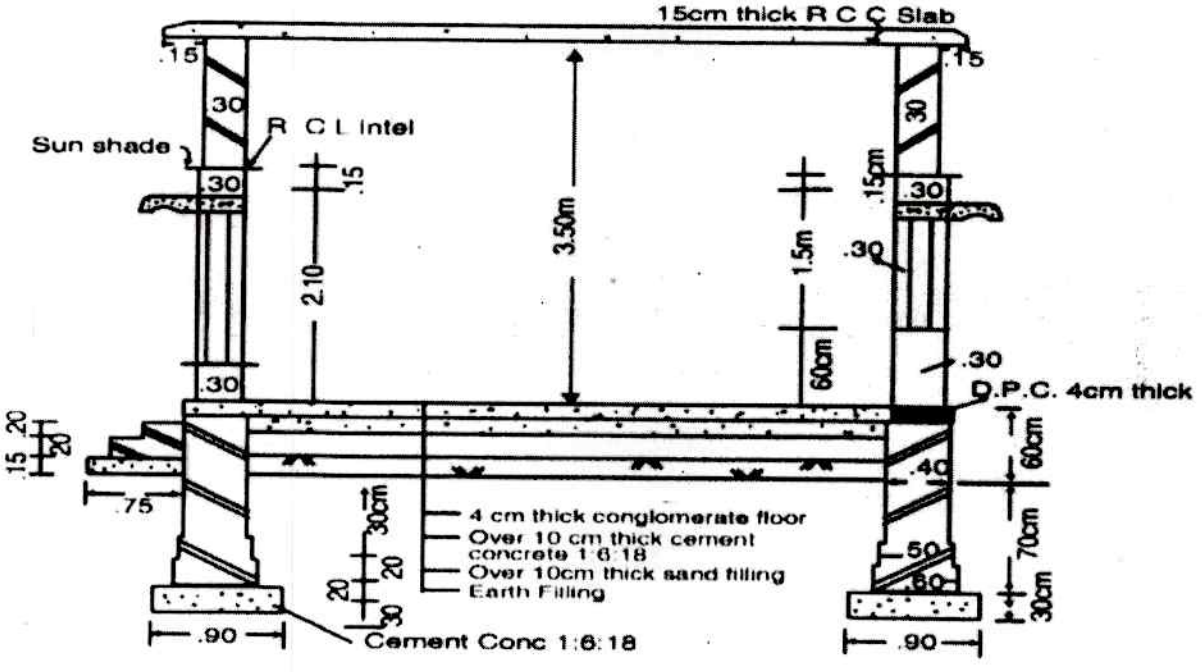
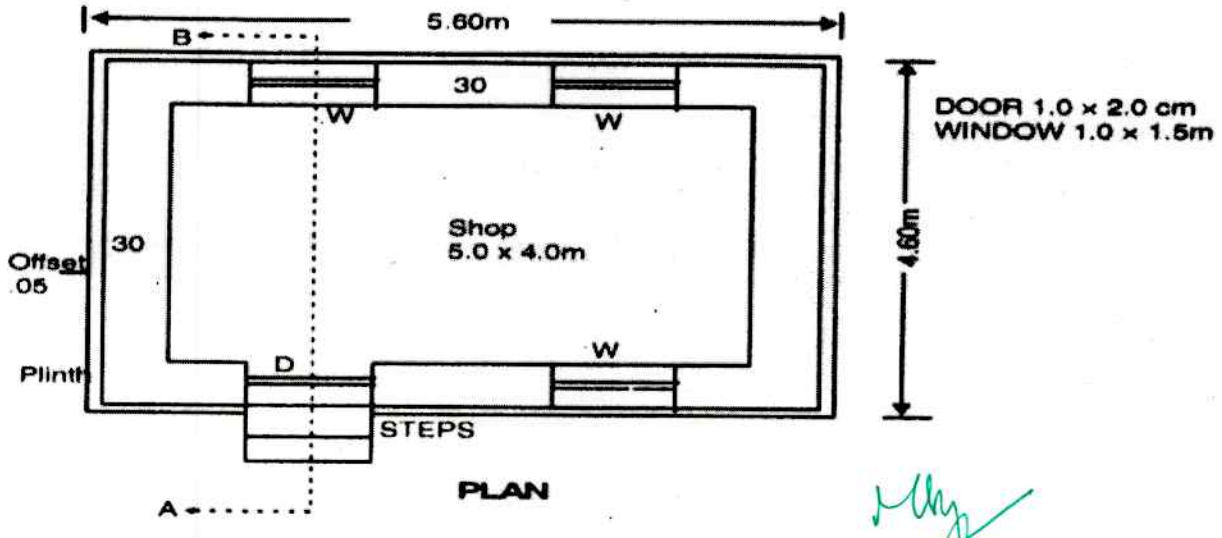
		OR			
5	b	. Estimate the following quantities using Centre line method by using the given diagram .(i) Earthwork in excavation in foundation (ii) Lime concrete in foundation (iii) First class brick work in cement mortar.(1:6) for foundation and plinth (iv) DPC (v) First class brickwork in superstructure.	K3	CO2	12M



SECTION ON AB



PLAN

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following data:

Chainage	0	15	30	45	60	75	90	105
RL	25.1	25.8	26.5	27.2	27.6	26.2	28.3	28.5

		Unit-IV			
3	a	i) Write the specification for the following: a) Brickwork 1st class b) Plastering cement mortar or lime mortar	K2	CO4	12 M
		OR			
	b	i) Define valuation Explain the need of valuation and write about sinking funds.	K1	CO4	6M
		ii) What are outgoings? Explain the different types of outgoings.		CO4	6M
		Unit-V			
4	a	Find the cost of one cubic metre for the given item as per the rate analysis a) 1st class brick work in foundation and plinth with 1:6 cement motor b) 1st class brick work in Superstructure with 1:6 cement motor	K4	CO5	12 M
		OR			
	b	i) What are the requirements of contract? Explain.	K1	CO5	6M
		ii) Explain the procedure to be followed for opening construction tenders.	K2	CO5	6M
5	a	Estimate the following quantities using long wall & short wall method by using the given diagram .(i) Earthwork in excavation in foundation (ii) Lime concrete in foundation (iii) First class brick work in cement mortar.(1:6) for foundation and plinth (iv) DPC (v) First class brickwork in superstructure	K3	CO2	12 M

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		OR			
5	b	Estimate the quantities for the given steps. .(i) Earthwork in excavation in foundation (ii) Lime concrete in foundation (iii) First class brick work in cement mortar.(1:6) for foundation and plinth (iv) DPC (v) First class brickwork in superstructure	K3	CO2	12M

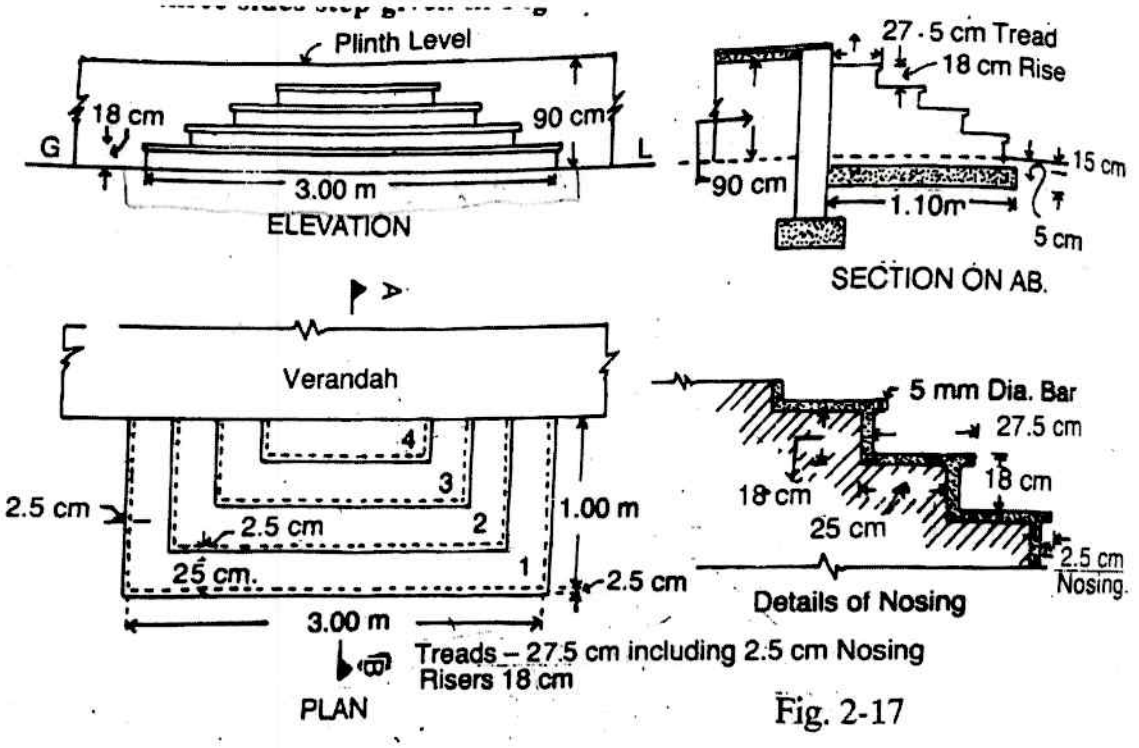

Fig. 2-17

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN: 2022-2023

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19BCE7TH02	**ENVIRONMENTAL ENGINEERING**	IV-I	Civil Engineering	6	A & B

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Plan and design the water and distribution networks and sewerage systems. K2&K3
CO2	Identify the water source and select proper intake structure, Characterization of water. K2&K3
CO3	Characterisation of water. K1,K2
CO4	Select the appropriate appurtenances in the water supply. K1&K2
CO5	Selection of suitable treatment flow for raw water treatments. K1&K2

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
UNIT – I : Introduction: Water Demand and Quantity Estimation:						
1	**CO1**: Plan and design the water and distribution networks and sewerage systems. K2&K3	1.1	Importance and Necessity of Protected Water Supply systems	T1, T2, R1	1	Chalk ,Talk & Web resources
		1.2	Water borne diseases- Flow chart of public water supply system	T1, T2, R1	1	PPT, Active Learning & NPTEL
		1.3	Role of Environmental Engineer- Agency activities.	T1, T2, R1	1	PPT, Active Learning
		1.4	Estimation of water demand for a town or city- Per capita Demand and factors influencing it	T1, T2, R1	2	case study & Tutorial
		1.5	Types of water demands and its variations- factors affecting water demand	T1, T2, R1	2	Chalk ,Talk & Model Demonstration
		1.6	Design Period- Factors affecting the Design period	T1, T2, R1	2	PPT, Active Learning
		1.7	Population Forecasting.	T1, T2, R1	3	Chalk , Talk & Virtual labs
2		**UNIT – II : Sources of Water: Collection and Conveyance of Water:**				

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	CO4: Select the appropriate appurtenances in the water supply. K1&K2	4.2	Treatment methods: Theory and Design of Sedimentation- Flash mixers	T1, T2, R3	2	PPT, Active Learning & Student seminars
		4.3	Flocculators Coagulation- Sedimentation with Coagulation	T1, T2, R3	2	PPT, Active Learning
		4.4	Filtration– Sedimentation – Theory on filtration – Slow and Rapid sand filters, Pressures Sand Filters	T1, T2, R3	2	case study & Tutorial
		4.5	Theory of disinfection- Chlorination and other Disinfection methods like UV and Ozonation	T1, T2, R3	2	Chalk , Talk & PPT
		4.6	Softening of Water	T1, T2, R3	2	PPT, Active Learning
		4.7	Design- operation and maintenance of Reverse Osmosis units.	T1, T2, R3	2	Chalk ,Talk & Model demonstration
		4.8	Disinfection, Miscellaneous methods	T1, T2, R3	2	Chalk & Talk, PPT, Tutorial
5	**CO5:** Selection of suitable treatment flow for raw water treatments. K1&K2	**UNIT – VI: WATER DISTRIBUTION AND SUPPLY TO BUILDINGS:**				
		5.1	Requirements- Methods of Distribution system	T1, T2, R3	3	Chalk ,Talk & Tutorial
		5.2	Layouts of Distribution networks- Pressures in the distribution layouts	T1, T2, R3	3	PPT, Quiz & Active Learning
		5.3	Analysis of Distribution networks: Hardy Cross and equivalent pipe methods	T1, T2, R3	4	PPT, Active Learning & Student seminars
		5.4	Components of Distribution system: valves such as sluice valves	T1, T2, R3	3	case study, web resources & Tutorial
		5.5	air valves- scour valves and check valves- hydrants- and water meters.	T1, T2, R3	3	Chalk , Talk & Model demonstration
MID EXAMINATIONS-I						
				Total	70	
END EXAMINATIONS						

Text Books:

T1- Garg- S.K.- "Environmental Engineering"- Vol.1 Khanna Publishers- New Delhi- 2005
T2- Modi- P.N. "Water Supply Engineering"- Vol. I Standard Book House- New Delhi- 2005
T3- Punmia- B.C.- Ashok K Jain and Arun K Jain- "Water Supply Engineering"- Laxmi Publications Pvt. Ltd.- New Delhi- 2005

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NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda (Post), Narasaraopet- 522601 Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAMME: B. TECH MECHANICAL ENGINEERING	
COURSE: **ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**	Semester: V CREDITS: **3**
COURSE CODE: **R20ME3101** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: Problem Solving	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

COURSE NAME	DESCRIPTION	SEM
Problem solving using Python	Basics of Python Programming	**I**
Numerical Methods and Transformations	Knowledge of mathematics with emphasis on probability, statistics and reasoning	**III**

COURSE OUTCOMES:

SNO	Course Outcome Statements
CO1	Summarize the characteristics of AI that make it useful to real-world problems. [K2]
CO2	Analyze different search techniques and predicate logic in artificial Intelligence. [K4]
CO3	Interpret knowledge representation and symbolic reasoning using different rules. [K2]
CO4	Apply the basic knowledge on learning and reinforcement learning. [K3]
CO5	Explore different machine learning algorithms [K3]

SYLLABUS:

UNIT	DETAILS
I	**Introduction to Artificial Intelligence:** AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.
II	**Search Algorithms:** Uninformed(Blind) type- Breadth-first search, Uniform cost search, Depth-first search, Informed Search; Informed type-Greedy Search, A* Search, Graph Search.
III	**Knowledge Representation in AI:** Procedural Vs declarative knowledge, logic programming, forward Vs backward programming. **Python for Machine Learning:** Python data Types, Control Structure, Data manipulation using Numpy, Pandas and Matplotlib. Pre-processing steps of Machine Learning-Data quality assessment, Data cleaning, Data transformation and Data reduction.
IV	**Machine Learning:** Definition, Evaluation, need, types, Applications, Supervised Learning:- Classification, Regression; Un-supervised Learning: - Clustering, Density Estimation, Dimensionality reduction.
V	**Machine Learning Algorithms:** Classification, Regression, KNN, K Means, Logistic, Regression, Support, Vector Machines (SVM), Decision Tree, Naïve Bayes, Ensemble Methods, Random Forest algorithms.

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TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Elaine Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill Publishers
T2	Machine Learning Tom M. Mitchell, Tata McGraw Hill Edition Publishers
T3	Machine Learning with Python, Abhiskek Vijayvargia, BPB Publications
REFERENCE BOOKS	
R	BOOK TITLE/AUTHORS/PUBLISHER
R1	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
R2	Applications of Machine Learning, Chandra Bansal, Kusum Deep, Springer Publications

WEB SOURCE REFERENCES:

1	https://www.coursera.org/learn/machine-learning
2	https://www.simplilearn.com/big-data-and-analytics/machine-learning
3	https://www.appliedaicourse.com/course/applied-ai-course-online
4	https://www.ibm.com/cloud/learn/machine-learning
5	http://nptel.ac.in/courses/106105152

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	3	2		2	-	-	-	-	-	-	-	1		
C311.2	3	3	2		2	-	-	-	-	-	-	-	1		
C311.3	3	3	2		2	-	-	-	-	-	-	-	1		
C311.4	3	3	2		2	-	-	-	-	-	-	-	1		
C311.5															
Average	3.00	3.00	2.00		2.00	-	-	-	-	-	-	-	1.00		

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311	3.00	3.00	2.00		2.00	-	-	-	-	-	-	-	1.00		

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Course Outcome Assessment Methods			Weightage		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	
*Grade Definition: A+: >=90%, A: 80-89%; B: 70-79%; C:60-69%; D:50-59%; E:40-49%; F:<40%;					

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

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

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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. The students will be able to apply knowledge of modern tools in manufacturing enabling to conquer the challenges of Modern Industry.
2. The students will be able to design various thermal engineering systems by applying the principles of thermal sciences.
3. The students will be able to design different mechanisms and machine components of transmission of power and automation in modern 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

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Unit wise Sample assessment questions
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

SNO	Course Outcome Statement
CO1	Summarize the characteristics of AI that make it useful to real-world problems. [K2]
CO2	Analyze different search techniques and predicate logic in artificial Intelligence. [K3]
CO3	Interpret knowledge representation and symbolic reasoning using different rules. [K2]
CO4	Apply the basic knowledge on learning and reinforcement learning. [K3]
CO5	Explore different machine learning algorithms [K3]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	What are the problem characteristics of AI	K2	CO1
2	Write and explain the application fields of AI	K2	CO1
3	Explain the structure of agents and problem solving agents	K2	CO1
	UNIT 2		
1	Explain the concept of problem solving through Search	K3	CO2
2	Explain the BFS algorithm efficiency in problem solving. And Compare with DFS.	K3	CO2
3	Explain A* algorithm with an Example	K3	CO2
	UNIT 3		
1	Illustrate with examples different types of knowledge representation in AI	K2	CO3
2	Clearly differentiate between Procedural knowledge and Declarative knowledge	K3	CO3
3	Explain briefly different data types used in python	K2	CO3
	UNIT 4		
1	What are the different types of Machine Learning	K2	CO4
2	Explain the classification and regression	K2	CO4
3	Discuss the concept of Clustering used in ML	K3	CO4
	UNIT 5		
1	How is KNN different from K-means clustering? Explain	K3	CO5
2	Explain the usage of Logistic Regression, Random Forest, Support Vector Machine methods appropriately to solve predictive models	K3	CO5
3	Discuss how decision tree algorithm is known to work best to detect non-linear interactions	K3	CO5

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NARASARAOPETA ENGINEERING COLLEGE
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II B.Tech II Semester Regular Examinations

Sub Code: R20ME3101

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
MODEL PAPER-I

Time: 3 hours | Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No.		Questions	Marks
1		Unit-I	
	a	Write and explain the application fields of AI	[14M]
		OR	
	b	Explain the structure of agents and problem solving agents	[14M]
2		Unit-II	
	a	Explain the concept of problem solving through Search	[7M]
		Explain the BFS algorithm efficiency in problem solving. And Compare with DFS.	[7M]
		OR	
	b	Explain A* algorithm with an Example and also explain about Graph search	[14M]
3		Unit-III	
	a	Illustrate with examples different types of knowledge representation in AI	[14M]
		OR	
	b	Clearly differentiate between Procedural knowledge and Declarative knowledge	[14M]
4		Unit-IV	
	a	What are the different types of Machine Learning	[7M]
		Explain the classification and regression models	[7M]
		OR	
	b	Discuss the concept of Clustering used in ML	[7M]
		Discuss any four examples of machine learning applications	[7M]
5		Unit-V	
	a	Explain the usage of Logistic Regression, Random Forest, Support Vector Machine methods appropriately to solve predictive models	[14M]
		OR	
	b	KNN different from K-means clustering? Explain	[14M]

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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular Examinations

Sub Code: R20ME3101

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
MODEL PAPER-I

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No.		Questions	Marks
1		Unit-I	
	a	Write different applications of AI. Differentiate between natural intelligence and artificial intelligence	[14M]
		OR	
	b	Explain the structure of agents and explain how to measure the performance of an agent	[14M]
2		Unit-II	
	a	Explain the concept of problem solving through Search	[7M]
		Differentiate between breadth first search and depth first search with examples	[7M]
		OR	
	b	Differentiate clearly between uniformed and informed search techniques	[14M]
3		Unit-III	
	a	Describe the issues of Knowledge Representation in AI	[7M]
		Write the python program for normal data distribution	[7M]
		OR	
	b	List out any four applications of machine learning	[7M]
		Explain the steps in designing a learning system	[7M]
4		Unit-IV	
	a	Distinguish between supervised learning and Reinforcement learning. Illustrate with an example	[7M]
		Discuss any four examples of machine learning applications	[7M]
		OR	
	b	Discuss the concept of Clustering used in ML	[7M]
		Explain feature selection and feature extraction method for dimensionality reduction	[7M]
5		Unit-V	
	a	Explain how Support Vector Machine can be used for classification of linearly separable data	[14M]
		OR	
	b	Demonstrate the derivation of K- Means Algorithm and compare with KNN Method	[14M]

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Narasaraopeta Engineering College
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Yallmanda(Post), Narasaraopet- 522601

DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20ME3101	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	V	Mechanical Engineering	5	A & B

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statements
CO1	Summarize the characteristics of AI that make it useful to real-world problems. [K2]
CO2	Analyze different search techniques and predicate logic in artificial Intelligence. [K3]
CO3	Interpret knowledge representation and symbolic reasoning using different rules. [K2]
CO4	Apply the basic knowledge on learning and reinforcement learning. [K3]
CO5	Explore different machine learning algorithms [K3]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	**CO1: Summarize the characteristics of AI that make it useful to real-world problems. [K2]**		**Unit-1: Introduction to Artificial Intelligence**			
		1.1	AI problems, foundation of AI and history	T1, T2, R1	12	Chalk & Talk, PPT, Active Learning & Tutorial
		1.2	AI intelligent agents	T1, T2, R1		
		1.3	Agents and Environments	T1, T2, R1		
		1.4	concept of rationality, the nature of environments, structure of agents	T1, T2, R1		
		1.5	Problem solving agents, problem formulation.	T1		
2	**CO2: Analyze different search techniques and predicate logic in artificial Intelligence. [K3]**		**Unit-2. Search Algorithms**			
		2.1	Uninformed(Blind) type- Breadth-first search	T1, T2, R2	12	Chalk & Talk, PPT Tutorial, Active Learning & Case Study
		2.2	Uniform cost search, Depth-first search	T1, T2, R2		
		2.3	Informed Search; Informed type-Greedy Search	T1, T2, R2		
		2.4	A* Search	T1, T2, R2		
		2.5	Graph Search.	T1		
MID I EXAMINATION DURING SIXTH WEEK						
3	**CO3: Interpret knowledge representation and symbolic reasoning using**		**Unit-3. Knowledge Representation in AI:**			
		3.1	Procedural Vs declarative knowledge	T1, T2, R1	12	Chalk & Talk, PPT, Tutorial
		3.2	logic programming, forward Vs backward programming	T1, T2, R1		
		3.3	**Python for Machine Learning: :** Python data Types, Control	T1, T2, R1		

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	different rules. [K2]		Structure			Active Learning &Case Study
		3.4	Data manipulation using Numpy, Pandas and Matplotlib.	T1, T2, R1		
		3.5	Pre-processing steps of Machine Learning-Data quality assessment, Data cleaning	T1, T2, R1		
		3.6	Data transformation and Data reduction.	T1		
4	CO4: Apply the basic knowledge on learning and reinforcement learning. [K3]		**Unit-4. Machine Learning**			
		4.1	Definition, Evaluation	T1, T2, R2	10	Chalk & Talk, PPT & Tutorial, , Industrial Visit, Demonstration with models.
		4.2	Need, types, Applications	T1, T2, R2		
		4.3	Supervised Learning, Classification, Regression	T1, T2, R2		
		4.4	Un-supervised Learning, Clustering	T1, T2, R2		
		4.5	Density Estimation, Dimensionality reduction.	T1		
5	CO5: Explore different machine learning algorithms [K3]		**Unit 5. Machine Learning Algorithms:**			
		5.1	Classification, Regression	T1, T2, R2	12	Chalk & Talk, PPT, Virtual labs, Tutorial, & Project based learning
		5.2	KNN, K Means	T1, T2, R1		
		5.3	Logistic, Regression	T1, T2, R2		
		5.4	Support, Vector Machines (SVM),	T1, T2, R1		
		5.5	Decision Tree, Naïve Bayes, Ensemble Methods	T1, T2, R1		
		5.4	Random Forest algorithms.	T1		
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Elaine Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill Publishers
T2	Machine Learning Tom M. Mitchell, Tata McGraw Hill Edition Publishers
T3	Machine Learning with Python, Abhiskek Vijayvargia, BPB Publications
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
R2	Applications of Machine Learning, Chandra Bansal, Kusum Deep, Springer Publications

WEB SOURCE REFERENCES:

1	https://www.coursera.org/learn/machine-learning
2	https://www.simplilearn.com/big-data-and-analytics/machine-learning
3	https://www.appliedaicourse.com/course/applied-ai-course-online
4	https://www.ibm.com/cloud/learn/machine-learning
5	http://nptel.ac.in/courses/106105152

Principal **HOD** **Faculty**

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Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAME: B.Tech Mechanical Engineering	
COURSE: MECHATRONICS	Semester : **VII** CREDITS: **3**
COURSE CODE: **19BME7TH01** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE
COURSE AREA/DOMAIN: **Industrial Engineering/Automation**	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BME6TH04	Dynamics of Machinery	Concepts of springs	III-II
19BCC2TH14	Elements of Electrical & Electronics Engineering	Knowledge of actuators	I-II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Demonstrate** knowledge of various mechatronic system components.[K3]
CO2	**Describe** the basics of microcontrollers used in mechatronics.. [K1]
CO3	**Compare** actuators for different applications.[K4]
CO4	**Analyze** different logics ad logical controls.[K4]
CO5	**Apply** the concepts of mechatronics for various applications.[K3]

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION:** Multi-disciplinary Scenario, Origins, Evolution of Mechatronics, An overview of Mechatronics, Introduction to Manufacturing, Design. **System modelling:** Introduction, system modelling, mechanical system, translational mechanical system with spring, damper and mass, Rotational mechanical system with spring, damper and mass; electrical system, modelling electric motor, fluid system, thermal systems, modeling pneumatic actuator
II	**MICROCONTROLLERS** Basics of microcontrollers, Introduction to Microcontroller Technology, history, applications and challenges cum opportunities.
III	**ACTUATORS** Introduction, actuator types and application areas, mechanical actuation systems, Electrical actuating systems - DC motors, AC motors, stepped motor, solid state switches, solenoids; Fluid power actuators.
IV	**DIGITAL LOGIC & PLC** Digital logic, number systems, logic gates, Boolean algebra, karnaugh maps, application of logic gates, sequential logic, Programmable logic controller (PLC), Digital controllers.
V	**APPLICATIONS IN MECHATRONICS** Sensors for condition monitoring, mechatronic control in automated manufacturing, artificial intelligence in mechatronics, Fuzzy logic applications in mechatronics, micro sensors in

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	mechatronics, and contemporary issues.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering (2010), W. Bolton, Pearson Education.
T2	Mechatronics system design by Devdas Shetty and Richard A. Kolk, PWS publishing company.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Mechatronics: Principles, concepts and applications by Nitaigour Premchand Mahalik, Tata – McGraw Hill Publishing Company Ltd.
R2	Mechatronics: Integrated Mechanical Electronic Systems by K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Willey Publication, 2008

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Microprocessor and sensors	PO3 & PSO3

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/downloads/112101098/
2	https://nptel.ac.in/courses/112101098/download/lecture-1.pdf
3	https://www.youtube.com/watch?v=glUrzUxbepE&t=1026s
4	https://nptel.ac.in/courses/112101098/download/lecture-2.pdf
5	https://nptel.ac.in/courses/112101098/download/lecture-4.pdf
6	https://www.youtube.com/watch?v=zxYeJW9v6OU&list=PLwymdQ84KI-w5DwDzqO_4hWsB2Jc4_eBy
7	https://nptel.ac.in/courses/112101098/download/lecture-5.pdf
8	https://nptel.ac.in/courses/112101098/download/lecture-6.pdf
9	https://nptel.ac.in/courses/112101098/download/lecture-7.pdf
	https://www.youtube.com/watch?v=gXTpOP9AtQ8&list=PLir19lgiavA0EKRRN3xdARy_z44hKhNQc
10	https://nptel.ac.in/courses/112101098/download/lecture-9.pdf
11	https://nptel.ac.in/courses/112101098/download/lecture-10.pdf
12	https://nptel.ac.in/courses/112101098/download/lecture-12.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

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	1	1	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	1	2	-	-	-	-	-	-	-	-	-	-	-	3
CO4	2	2	3	-	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	1	-	-	--		-	-	-	-	-	-	-	3
CO6	2	2	2	-	2	-	-	-	-	-	-	-	-	-	3
Average	2.66	1.5	1.88	-	2	-	-	-	-	-	-	-	-	-	3

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311	2.66	1.5	1.88	-	2	-	-	-	-	-	-	-	-	-	3.00

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

Course Instructor Course Coordinator Module Coordinator Head of the Department

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	UNIT 4		
1	**What** are the number systems in digital logics? **Explain** them with examples.	Evaluating (K5)	**CO4**
2	**What** are the logic gates used in digital logic? **Write** truth table, circuit of Boolean operation for each gate.	Applying (K3)	**CO4**
3	**Prove** that a. $A+(B \cdot C)=(A+B) \cdot (A+C)$ b. $(A+B) \cdot \overline{c}+A \cdot C=A+B \cdot \overline{c}$	Applying (K3)	**CO4**
4	**Explain** the laws of Boolean algebra used in digital logic.	**Evaluate** (K5)	**CO4**
5	**Draw** Ladder diagram for the following; i. AND gate ii. OR gate iii. XOR gate iv. Latching	Applying (K3)	**CO4**
	UNIT 5		
1	**Define** Artificial intelligent and **Explain** its impact on mechatronics.	Applying (K3)	**CO5**
2	**What** are micro sensors & Describe the micro sensors used in mechatronics.	Applying (K3)	**CO5**
3	**Explain** Fuzzy logic applications on mechatronics with suitable examples.	Evaluating (K5)	**CO5**
4	**Explain** about sensor based conditioning monitoring with suitable examples?	**Evaluate** (K5)	**CO5**

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Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	**Demonstrate** knowledge of various mechatronic system components.[K3]
CO2	**Describe** the basics of microcontrollers used in mechatronics.. [K1]
CO3	**Compare** actuators for different applications.[K4]
CO4	**Analyze** different logics ad logical controls.[K4]
CO5	**Apply** the concepts of mechatronics for various applications.[K3]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Derive** mathematical modeling of spring, Damper and Mass for Mechanical Translation System.	Evaluating (K5)	CO1
2	**Explain** Open and closed loop control systems with neat sketch.	Evaluating (K5)	CO1
3	**Derive** mathematical modeling of spring, Damper and Mass for Mechanical Rotational systems.	Applying (K3)	CO1
4	**Explain** the basic components of mechatronics.	Evaluating (K5)	CO1
	UNIT 2		
1	**Explain** the basic components of microcontrollers.	Evaluating (K5)	CO2
2	**Explain** the types of microcontrollers.	Evaluating (K5)	CO2
3	**Explain** the advantages and disadvantages of microcontrollers.	Evaluating (K5)	CO2
4	**List** the applications of microcontrollers.	Evaluating (K5)	CO2
	UNIT 3		
1	**Sketch** and **explain** a hydraulic drive system.	Evaluating (K5)	CO3
2	**Sketch** and **explain** a Pneumatic drive system.	Evaluating (K5)	CO3
3	**Explain** difference between AC and DC motors.	Evaluating (K5)	CO3

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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, 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

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Narasaraopeta Engineering College (Autonomous)

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

Subject Code: 19BME7TH01

IV B.Tech I Semester (Regular/supple) **Examinations,** (Month, Year)

MECHATRONICS

(ME)

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X12=60M)

Q.No		Questions	Marks
1		**Unit - I**	
	a	**Explain** the basic components of mechatronics.	[12M]
		OR	
	b	**Derive** mathematical modeling of spring, Damper and Mass for Mechanical Rotational systems.	[12M]
2		**Unit - II**	
	a	**Explain** the basic components of microcontrollers.	[12M]
		OR	
	b	**Explain** the advantages and disadvantages of microcontrollers.	[12M]
3		**Unit - III**	
	a	**Explain** any two types of Mechanical actuation system	[12M]
		OR	
	b	**Explain** any two types of Electrical actuation system.	[12M]
4		**Unit - IV**	
	a	What is a number system? Explain in detail about types of number systems	[12M]
		OR	
	b	What is PLC? Explain the basic structure of PLC	[12M]
5		**Unit - V**	
	a	What are the applications of Mechatronics in condition monitoring and automated manufacturing industries?	[12M]
		OR	
	b	**Explain** Fuzzy logic applications on mechatronics with suitable examples	[12M]

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

Subject Code: 19BME7TH01

IV B.Tech I Semester Examinations,

MECHATRONICS

(ME)

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5X12=60M)

Q.No		Questions	Marks
1		**Unit - I**	
	a	Define Mechatronics and **Explain** Evaluation of Mechatronics.	[12M]
		OR	
	b	Explain translational and rotational mechanical system.[	[12M]
2		**Unit - II**	
	a	**Explain** the basic components of microcontrollers.	[12M]
		OR	
	b	**Explain** the difference between microprocessor and microcontrollers.	[12M]
3		**Unit - III**	
	a	Differentiate among Hydraulic and Electrical actuation systems	[12M]
		OR	
	b	**Explain** pneumatic actuators with neat sketch.	[12M]
4		**Unit - IV**	
	a	What is a logic gate? Explain in detail about types of logic gates.	[12M]
		OR	
	b	Simplify the following Boolean operations by the use of Karnaugh maps: i) $Q = \bar{A} . \bar{B} . C + \bar{A} . \bar{B} . \bar{C} + \bar{A}.B. \bar{C}$ ii)$Q = \bar{A} .B. \bar{C} . D + A. \bar{B} . \bar{C} . D + \bar{A} . \bar{B} . \bar{C} . D + A .B. \bar{C} .D + A . B. \bar{C} . \bar{D}$ $+ A . B. C. D$	[12M]
5		**Unit - V**	
	a	Explain the applications of artificial intelligence and fuzzy logic in Mechatronics?	[12M]

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		OR	
	b	**Explain** Fuzzy logic applications on mechatronics with suitable examples	[12M]

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DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19BME7TH01	MECHATRONICS	VII	Mechanical Engineering	6	A & B

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	**Demonstrate** knowledge of various mechatronic system components.[K3]
CO2	**Describe** the basics of microcontrollers used in mechatronics.. [K1]
CO3	**Compare** actuators for different applications.[K4]
CO4	**Analyze** different logics ad logical controls.[K4]
CO5	**Apply** the concepts of mechatronics for various applications.[K3]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	**CO1:** Demonstrate knowledge of various mechatronic system components.[K3]		**UNIT– I : INTRODUCTION**			
		1.1	Multi-disciplinary Scenario, Origins, Evolution of Mechatronics	T1, T2, R1	2	Chalk & Talk ,PPT
		1.2	An overview of Mechatronics, Introduction to Manufacturing, Design.	T1, T2, R1	2	Chalk & Talk ,PPT
		1.3	System modelling: Introduction, system modelling, mechanical system, translational mechanical system with spring, damper and mass	T1, T2, R1	3	Chalk & Talk ,PPT, Web Resources
		1.4	Rotational mechanical system with spring, damper and mass; electrical system, modelling electric motor	T1, T2, R1	3	Chalk & Talk ,PPT
		1.5	fluid system, thermal systems, modeling pneumatic actuator	T1, T2, R1	2	Chalk & Talk ,PPT
2	**CO2: Describe** the basics of microcontrollers used in mechatronics.. [K1]		**UNIT-II: MICROCONTROLLERS**			
		2.1	Basics of microcontrollers	T1, T2, R2	2	Chalk & Talk ,PPT
		2.2	Introduction to Microcontroller	T1, T2, R2	3	Chalk & Talk ,PPT
		2.3	Technology, history, applications	T1, T2, R1	3	Chalk & Talk ,PPT
		2.4	challenges cum opportunities	T1, T2, R2	2	Chalk & Talk ,PPT

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3	**CO3** **Compare** actuators for different applications.[K4]		**UNIT-III: ACTUATORS**			
		3.1	Introduction, actuator types and application areas,;	T1,R2	2	Chalk & Talk ,PPT
		3.2	Mechanical actuation systems,	T1,R2	3	Chalk & Talk ,PPT
		3.3	Electrical actuating systems - DC motors, AC motors, stepped motor, solid state switches, solenoids	T1, R2	3	Chalk & Talk ,PPT
		3.4	Fluid power actuators, piezoelectric actuators.	T1, R2	2	Chalk & Talk ,PPT
4	**CO4** **Analyze** different logics ad logical controls.[K4]		**UNIT-IV: DIGITAL LOGIC & PLC**			
		4.1	Digital logic	T1, T2,R2	2	Chalk & Talk ,PPT
		4.2	number systems, logic gates	T1, T2, R2	2	Chalk & Talk ,PPT
		4.3	Boolean algebra, karnaugh maps	T1, T2, R2	2	Chalk & Talk ,PPT
		4.4	application of logic gates, sequential logic	T1, T2, R2	2	Chalk & Talk ,PPT
		4.5	Programmable logic controller (PLC)		2	Chalk & Talk ,PPT
5	**CO5** **Apply** the concepts of mechatronics for various applications.[K3]		**UNIT V: APPLICATIONS IN MECHATRONICS**			
		5.1	Sensors for condition monitoring,	T1, R2	2	Chalk & Talk ,PPT
		5.2	mechatronic control in automated manufacturing	T1, R2	3	Chalk & Talk ,PPT
		5.3	artificial intelligence in mechatronics	T1, R2	3	Chalk & Talk ,PPT
		5.4	fuzzy logic applications in mechatronics, micro sensors in mechatronics	T1, R2	2	Chalk & Talk ,PPT
				Total	50	
END EXAMINATIONS						

Text Books:

T1 Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering (2010), W. Bolton, Pearson Education.

T2 Mechatronics system design by DevdasShetty and Richard A. Kolk, PWS publishing company

Reference Books:

R1 Mechatronics: Principles, concepts and applications by Nitaigour Premchand Mahalik, Tata – McGraw Hill Publishing Company Ltd.

R2 Mechatronics: Integrated Mechanical Electronic Systems by K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Willey Publication, 2008

Faculty HOD Principal

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

COURSE INFORMATION SHEET : AY - 2022-2023

PROGRAMME: B.Tech Computer Science and Engineering	
COURSE: **OOPs Through Java**	Year/Sem : **II/I** CREDITS: **3**
COURSE CODE: **R20CC2103** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH &H): **core**
COURSE AREA/DOMAIN:**CSE**	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
R20CC2103	PYTHON and C PROGRAMMING	Programming knowledge is required for better understanding the Java programming language through oops concepts.	**II/I**

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 Buzzword.., 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,

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	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, Ev[illegible] Classes, The KeyEvent Class, Sources of Events, Event Listener Interfaces, Using The Dele[illegible]n 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 introduction	
2	Java Database connectivity	

WEB SOURCE REFERENCES:

1	https://www.tutorialspoint.com/java/index.html
2	https://www.w3schools.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 [illegible]arning
☐Brain storming	☐Role Play	☑Virtual Labs

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C212	-	-	2	3	2	-	-	-	-	-	-	-
C212	-	-	2	2	2	-	-	-	-	-	-	-
C212	-	-	1	2	2	-	-	-	-	-	-	-
C212	-	1	1	3	3	-	-	-	-	-	-	-
C212	-	-	-	2	-	-	-	-	-	-	-	-
Average	-	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 Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

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

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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.

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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, Theor

COURSE OUTCOMES: Students will 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].

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT 1		
1.	What are the Object Oriented Programming features?	K2	CO1
2.	Illustrate the differences between the OOPs Vs POP.	K2	CO1
3.	Discuss about primitive data types and type conversion with an example program.	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.	Discuss various control structures available in Java with an example program.	K2	CO1
7.	List and explain Java buzzwords briefly	K2	CO1
8.	Explain bit wise operators with example program? Discuss precedence rules and associativity concept.	K2	CO1
9.	Give the program structure of Java.	K2	CO1
10.	Discuss the arrays in java with an example.	K2	CO1
11.	Show the importance of 'this' keyword with an example.	K2	CO1
12.	Explain the garbage collection with an example.	K2	CO1
	UNIT 2		
1.	Differentiate method overloading and method overriding with example program.	K2	CO2
2.	Explain super keyword usage with example program.	K2	CO2
3.	Discuss about Nested and Inner classes with an example.	K2	CO2
4.	What is inheritance? What are the benefits of inheritance? Explain types of inheritance with example programs.	K2	CO2
5.	Demonstrate the multi-level inheritance with an example.	K2	CO2
6.	Illustrate final keyword with inheritance with an example program.	K2	CO2
7.	Explain about the static keyword with example program.	K2	CO2
8.	What is a package? Explain that how to create and use the package.	K2	CO2
9.	Write a Java program to demonstrate the dynamic method dispatch.	K2	CO2
10.	Make use of static methods in the interface, write a program for an interface.	K3	CO2
	UNIT 3		

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1.	List and explain some of the methods of String class in java.	K2	CO3
2.	What is an exception? How to handle an exception, explain with an example.	K2	CO3
3.	Demonstrate about the throw, throws and finally keywords with an example.	K2	CO3
4.	Discuss the multiple catch blocks with an example.	K2	CO3
5.	How to create used defined exceptions, explain this with an example	K2	CO3
6.	What is a thread and how to create a thread using runnable interface?	K2	CO3
7.	Explain briefly about thread priorities.	K2	CO3
8.	Discuss about Synchronization and give examples for synchronized blocks and synchronized methods.	K2	CO3
9.	Explain the usage of stopping, suspending and resuming threads.	K2	CO3
	UNIT 4		
1.	What is a Collection Framework?.Briefly describe about it.	K2	CO4
2.	List down the primary interfaces provided by Java Collections Framework?	K2	CO4
3.	What is the use of the List interface?	K2	CO4
4.	Explain about an ArrayList with an example.	K2	CO4
5.	What is the HashSet class in Java and how does it store elements?		
6.	What is the TreeMap class in Java and how does it store elements?	K2	CO4
7.	Write a program to read and write file contents by using any byte stream classes.	K2	CO4
8.	Write a program to read and write file contents by using any character stream classes.	K2	CO4
	UNIT 5		
1.	What is an applet? Explain the structure of Applet.	K2	CO5
2.	Briefly explain Applet Life Cycle methods.	K2	CO5
3.	Explain the usage of paint(),update() and repaint() methods.	K2	CO5
4.	Briefly explain Event Delegation Model.	K2	CO5
5.	What are different Sources of Events? Explain the purpose of Event Listeners with an example.	K2	CO5
6.	Briefly explain Adapter classes and Inner classes	K2	CO5
7.	Write a program to demonstrate the Button and Label classes of AWT package.	K2	CO5
8.	Write a program to demonstrate the Menu and Scrollbars.	K2	CO5

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Subject Code: R20CC2103

II B.Tech. - I Semester Examinations,

OOPS THROUGH JAVA

(CSE,AI,IT)

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	1. Distinguish procedural oriented and object oriented programming languages	K4	CO1	7M
		2. Explain about Type conversion and casting with an example.	K5	CO1	7M
		OR			
	b	1. List and explain briefly the Java Buzzwords.	K4	CO1	7M
		2. With an example, explain about the finalize() method.	K3	CO1	7M
2		**Unit-II**			
	a	1. Explain method overloading in Java with an example.	K2	CO2	7M
		2. What is an Inheritance and explain multi-level inheritance.	K1	CO2	7M
		OR			
	b	1. Make use of final keyword and explain about it with inheritance.	K3	CO2	7M
		2. Explain default methods in interfaces with an example.	K5	CO2	7M
3		**Unit-III**			
	a	1. Demonstrate any five methods of String class in Java.	K2	CO3	7M
		2. How to handle the exceptions in Java using try and catch blocks?	K1	CO3	7M
		OR			
	b	1. Demonstrate the nested try statement with an example.	K2	CO3	7M
		2. Explain the process to create a thread using runnable interface.	K5	CO3	7M
4		**Unit-IV**			
	a	1. List and explain briefly any five methods of ArrayList class.	K1	CO4	7M
		2. Compare FileInputStream and FileReader classes.	K4	CO4	7M
		OR			
	b	1. Explain the HashSet with an example java program.	K2	CO4	7M
		2. Explain about BufferedInputStream with an example.	K5	CO4	7M
5		**Unit-V**			
	a	1. Define an applet and explain an applet skeleton.	K5	CO5	7M
		2. List out the event classes in Java and briefly explain them.	K4	CO5	7M
		OR			

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	b	1. Explain about the HTML APPLET Tag.	K5	CO5	7M
		2. List out the event listener interfaces in Java and briefly explain them.	K4	CO5	7M

Subject Code: R20CC2103

II B.Tech. - I Semester Examinations,

OOPS THROUGH JAVA

(CSE,AI,IT)

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	1. With an example, explain the Java program structure.	K3	CO1	7M
		2. Explain about One dimensional array with an example.		CO1	7M
		OR			
	b	1. List and explain briefly the Java Buzzwords.	K4	CO1	7M
		2. With an example, explain about 'this' keyword..	K3	CO1	7M
2		**Unit-II**			
	a	1. Explain constructor overloading in Java with an example.	K2	CO2	7M
		2. Discuss about an abstract class and write a java program by using an abstract class.	K6	CO2	7M
		OR			
	b	1. Make use of final keyword and explain about it with inheritance.		CO2	7M
		2. Explain static methods in the interfaces with an example.	K5	CO2	7M
3		**Unit-III**			
	a	1. Demonstrate any five methods of StringBuffer class in Java.	K2	CO3	7M
		2. How to handle the exceptions in Java using multiple catch blocks?	K1	CO3	7M
		OR			
	b	1. Demonstrate the finally block in the exception handling with an example.	K2	CO3	7M
		2. Explain briefly about Thread priorities.		CO3	7M
4		**Unit-IV**			
	a	1. List and explain briefly any five methods of HashMap class.	K1	CO4	7M
		2. Compare BufferedReader and FileReader classes.	K4	CO4	7M
		OR			
	b	1. Explain the TreeSet with an example java program.	K2	CO4	7M
		2. Explain about any Byte stream with an example.	K5	CO4	7M
5		**Unit-V**			

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	a	1. Define an applet and explain an applet skeleton.	K5	CO5	7M
		2. List out the adapter classes in Java and briefly explain them.	K4	CO5	7M
		OR			
	b	1. Explain about the applet display methods with an example.	K5	CO5	7M
		2. List out the event listener interfaces in Java and briefly explain them.	K4	CO5	7M

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DEPARTMENT OF CSE

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CC2103	OOPS THROUGH JAVA	II/I	CSE	6	-

COURSE OUTCOMES: Students are 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 and interfaces to develop programmers using OOPs concepts. [K3]

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

CO4: Develop java programmes using collection framework & I/O. [K3]

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

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2].		**Unit-I**			
		1.1	Oriented Languages (Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP..	T1, R2	2	Chalk & Talk, PPT.
		1.2	The History and Evolution of Java, Java Buzzwords, java program structure	T1, R2	2	Chalk &Talk
		1.3	Data Types, Variables, and Arrays: The primitive types, variables, type conversion and casting, Automatic Type Promotion in Expressions	T1, R2	3	PPT
		1.4	Arrays, Operators, Control statements	T1, R1	3	Chalk & Talk, PPT
		1.5	Introducing Classes : Class fundamentals, Declaring the objects, Assigning Object Reference Variables	T1, R1, R2	2	Chalk & Talk, PPT
		1.6	Introducing Methods, Constructors, The this keyword, Garbage Collection, the finalize() Method.	T1, R1	4	PPT
2	CO2: **Make use of** different predefined classes and packages and interfaces to develop programmes using OOPs concepts. [K3]		**Unit-II**			
		2.1	A Closer Look at Methods and Classes: Overloading Methods, Using objects as Parameters, Returning Objects,	T1, R2	2	Chalk & Talk, PPT
		2.2	Understanding static, Nested and Inner Classes.	T1, R2	2	Chalk & Talk, PPT

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		2.3	Inheritance: Inheritance Basics and types of inheritance, Using super,	T1, T1, R1,R2	3	Web Resources
		2.4	Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, The Object class.	T1, R2	2	Chalk & Talk, PPT
		2.5	Packages and Interfaces: Packages, Access Protection, Importing Packages,	T1, R2	3	Chalk & Talk, PPT
		2.6	Interfaces, Default Interface Methods, Use static Methods in an Interface.	T1, R2	2	Web Resources
MID I EXAMINATION DURING SIXTH WEEK						
3	CO3: **Apply** exception handling and multithreading mechanisms on java programs.[K3]		**Unit-III**			
		3.1	String Handling: String class, StringBuffer class, StringBuilder Class,	T1, R2	3	Chalk & Talk, PPT
		3.2	Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, Using try and catch,	T1, R1	4	Tutorials
		3.3	multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.	T1, R2	3	Chalk & Talk, PPT
		3.4	Multithreaded Programming : The Java Threaded Model, The Main Thread , Creating a Thread, Creating Multiple Threads,	T1, R2	4	Web Resources
		3.5	Using is Alive() and join(), Thread Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming, Stopping Threads.	T1, R1,R2	3	Chalk & Talk, PPT
4	CO4: **Develop** java programmes using collection framework & I/O. [K3]		**Unit-IV**			
		4.1	Collections Framework in Java-Introduction to Java collections, Overview of Java collection frame work	T1, R2	3	Chalk & Talk, PPT
		4.2	Commonly used Collection classes-ArrayList, LinkedList, HashSet, Hash table, HashMap, TreeSet, TreeMap , StringTokenizer	T1, R2	3	Chalk & Talk, PPT
		4.3	Input/Output: reading and writing data - Byte Stream, Console,	T1, R1	2	Chalk & Talk, PPT
		4.4	Character Stream, Buffered Byte Stream, Buffered Character Stream, java.io package.	T1, R2	2	Virtual Labs

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			Unit-V			
5	CO5: **Make use of** AWT, Applets and Event-Handling to develop GUI. [K3]	5.1	The Applet Class: Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, The HTML APPLET Tag, Passing Parameters to Applets	T1, R2	3	Chalk & Talk, PPT
		5.2	Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events,	T1, R2	3	Virtual Labs
		5.3	Event Listener Interfaces, Using The Delegation Event Model, Adapter Classes, Inner Classes.	T1, R2	3 2	Chalk & Talk, PPT
		5.4	Introducing the AWT: java.awt package, Components and Containers, Button, Label, Checkbox, ,	T1, R1, R2	2	Chalk & Talk, PPT
		5.5	Radio buttons, List boxes, Choice boxes, Text field and Text area.	T1,R1	2	Chalk & Talk, PPT
		5.4	Container classes, Layouts, Menu, Scroll bar.	T1, R2	2	Web Resources
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Herbert Schildt, "The Complete Reference Java", 8/e, , TMH, 2011. (UNITS: I, IV, V)
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.

WEB RESOURCES	
1	https://www.tutorialspoint.com/java/index.html

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

COURSE INFORMATION SHEET

A.Y.: 2022-23

PROGRAMME: B.Tech Electrical and Electronics Engineering	
COURSE: ELECTRICAL MACHINES-I	Year: **II** Semester : **I** CREDITS: **3**
COURSE CODE: **R20EE2103** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **ELECTRICAL MACHINES**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CC1205	Applied Physics	Knowledge of fundamentals in physics	I-II

COURSE OUTCOMES: Students will be able to

S.NO.	Course Outcome Statement
CO1	Determine the performance of D.C generator for various operating conditions.**[K2]**
CO2	Analyze the performance characteristics of various types of D.C motors. **[K4]**
CO3	Select suitable speed control and testing methods of D.C motor for various applications. **[K2]**
CO4	Analyze the performance specifications of a single-phase transformer for various loading conditions. **[K4]**
CO5	Interpret the operation of three-phase transformers for various connections and achieve three-phase to two-phase transformation..**[K2]**

SYLLABUS:

UNIT	DETAILS
I	**UNIT-I: DC GENERATOR** Electromechanical energy conversion-Principle-DC Generators-Principle of operation - Constructional Features-EMF Equation-Armature windings-Armature reaction- Commutation Process-Types of DC generators-Losses and efficiency of generator-No load and load characteristics of all types of DC generators and their applications.
II	**UNIT-II: DC MOTOR** Principle of DC Motor-Concept of back EMF-Torque equation-Power stages of DC Motor-Characteristics of DC motors (series, shunt and compound)-Applications-Losses- efficiency of DC motor.
III	**UNIT-III: SPEED CONTROL AND TESTING OF D.C. MOTORS** Speed control – by varying armature resistance, field flux and armature terminal voltage. Necessity of starter in a D.C motor-Three-point starter-Four-point starter -Testing Methods-Direct method- Swinburne's Method and Regenerative method-Losses and efficiency.
IV	**UNIT- IV: SINGLE PHASE TRANSFORMERS** Principle of operation-Constructional features of transformers - EMF equation – no load and load phasor diagrams - equivalent circuit of single-phase transformers-Regulation - losses - efficiency and all-day efficiency-Testing of transformers - OC and SC tests - Sumpner's test -

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	Auto transformers.
V	**UNIT- V: THREE PHASE TRANSFORMERS** Poly Phase Connections - Y/Y- Y/Δ- Δ/Y- Δ/Δ and open delta connection - Scott connection- Tap changing transformers- parallel operation-Methods of cooling.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Electrical machines – P.S. Bhimbra, Khanna Publishers.
T2	Performance and Design of Alternating Current Machines – Clayton and Hancock
T3	Electrical Machines - J.B.Gupta, S.K.Katariaand Sons
T4	Performance and Design of Alternating Current Machines – M.G. Say, John Wiley and Sons Publications, 3rd Edition, 1983.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Problems in Electrical Engineering – Parker Smith, CBS Publishers, 9th edition, 1984.
R2	Electrical machines – S.K. Bhattacharya
R3	Electrical machines –D P. Kothari and I. J. Nagarth, TMH, 4th Edition, 2010
R4	Theory of Alternating Current Machinery- Langsdorf, TMH Electrical Machines – A. Chakrabarti and S. Debnath – Mc Graw - Hill Education, 1st Edition, 2015.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Modelling of Transformer	PO3 & PSO1

WEB SOURCE REFERENCES:

1	https://www.youtube.com/watch?v=ikqXDWrwf4c&list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV&index=2
2	https://www.youtube.com/watch?v=SIblb0uqRds&list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV&index=16
3	https://www.youtube.com/watch?v=ywb9pDgqnUI&list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV&index=20
4	https://www.youtube.com/watch?v=6NC5CyRNGmk
5	https://www.youtube.com/watch?v=mx3J9wdbJ30&list=PL4K9r9dYCOors6MRFwoIe9_iBzSzUp2Zi

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

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2103.1	2	1	1	1	1									
C2103.2	3	3	1	1	1									
C2103.3	3	3	2	1	2									
C2103.4	3	3	2	2	2									
C2103.5	3	2	1	1	2									
Average	2.8	1.8	1	1.2	1.8									

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C2103	2.8	1.8	1	1.2	1.8									

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Coordinator
(P. Nagendra)

Module Coordinator
(Dr. Nagaraju)

Head of the Department
(Dr. P. Lakshmaiah

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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 appropriate techniques and modern tools in the field of electrical and electronics engineering.
2. 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	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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Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO 1:- Determine the performance of D.C generator for various operating conditions.
CO 2:- Analyze the performance characteristics of various types of D.C motors.
CO 3:- Select suitable speed control and testing methods of D.C motor for various applications.
CO 4:- Analyze the performance specifications of a single-phase transformer for various loading conditions.
CO 5:- Interpret the operation of three-phase transformers for various connections and achieve three-phase to two-phase transformation

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Illustrate** the principle of operation of DC generator.	K2	CO1
2	**Explain** the construction of DC machine.	K2	CO1
3	**Show that** the emf generated in a DC generator $E_g = \frac{\Phi ZN}{60} \frac{P}{A}$	K2	CO1
4	**Illustrate** the armature reaction in a D.C.Generator.	K2	CO1
	UNIT 2		
1	Explain about the Losses in a DC Machine.	K2	CO2
2	Derive the Torque Equation for DC Motor	K2	CO2
3	Explain about the back emf in DC motor.	K2	CO2
4	Write some of the application for DC Motor.	K2	CO2
	UNIT 3		
1	Explain with a neat diagram the working of a three point starter used for d.c. shunt motor.	K2	CO3
2	Describe and compare various methods of speed control of dc motors.	K2	CO3
3	Explain Brake test on DC shunt motor.	K2	CO3
4	Explain regenerative test on two DC shunt machines.	K2	CO3
	UNIT 4		
1	Draw the phasor diagram of a transformer with inductive load. Explain.	K2	CO4
2	Draw the circuit for Short Circuit test of Transformer and explain.	K2	CO4

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3	Derive the E.M.F equation of a single phase transformer.	K2	CO4
4	Draw the equivalent circuit of single phase transformer and explain.	K2	CO4
	UNIT 5		
1	Explain the parallel operation of transformers.	K2	CO5
2	Explain star/star, star/delta, delta/star and delta/delta connections of a transformer.	K2	CO5
3	Explain with the help of connection diagrams the operation of off – load and on – load tap changers.	K2	CO5
4	Draw the circuit for Scott connection of transformers and explain.	K2	CO5

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II B.Tech I Semester Examinations,

Sub Code: R20EE2103 **ELECTRICAL MACHINES-I**

Time: 3 hours (EEE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No.		Questions	Cognitive level	CO	Marks
		Unit-I			
1	a	i) Illustrate the principle of operation of DC generator	K2	1	[7M]
		ii) Explain the constructional details of the DC Generator with neat diagram.	K2	1	[7M]
		OR			
	b	i) Derive an expression for the emf generated in a DC generator.	K2	1	[7M]
		ii) A 4 pole D.C.Generator, having wave-wound armature winding has 51 slots, each slot containing 20 conductors. **Find** the voltage generated in the machine when driven at 1500 rpm assuming the flux per pole to be 7 mWb.	K2	1	[7M]
		Unit-II			
2	a	i) Explain about the Losses in a DC Machine.	K2	2	[7M]
		ii) Derive the Torque Equation for DC Motor	K2	2	[7M]
		OR			
	b	i) Explain about the back emf in DC motor.	K2	2	[7M]
		ii) A D.C Motor takes an armature current of 110A at 480V. The armature circuit resistance is 0.2Ω. The machine has 6 poles and the armature is lap-connected with 864 conductors. The flux per pole is 0.05Wb. Determine (i) Speed (ii) Gross Torque developed by the armature.	K2	2	[7M]
		Unit-III			
3	a	Explain with a neat diagram the working of a three point starter used for d.c. shunt motor.	K2	3	[14M]
		OR			
	b	i) Describe and compare various methods of speed control of dc motors.	K2	3	[7M]
		ii) Explain the swinburne's test on a dc machine and hence explain how the test data is useful to calculate the efficiency of the machine at any desired load.	K2	3	[7M]
		Unit-IV			
4	a	i) Draw the no load phasor diagram of a transformer. Explain.	K2	4	[7M]
		ii)Explain the constructional features of Single phase transformer.	K2	4	[7M]
		OR			
	b	i) Draw the equivalent circuit of single phase transformer and explain.	K2	4	[7M]

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		ii) Derive the E.M.F equation of a single phase transformer.	K2	4	[7M]
		Unit-V			
5	a	Explain the parallel operation of transformers.	K2	5	[14M]
		OR			
	b	Draw the circuit for Scott connection of transformers and explain.	K2	5	[14M]

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LESSON PLAN A.Y.: 2022-23

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20EE2103	Electrical Machines-I (R20)	III	Electrical and Electronics Engineering	5	A & B

COURSE OUTCOMES: Students are able to

CO1: Determine the performance of D.C generator for various operating conditions. [K2]
CO2: Analyze the performance characteristics of various types of D.C motors. [K4]
CO3: Select suitable speed control and testing methods of D.C motor for various applications. [K3]
CO4: Analyze the performance specifications of a single-phase transformer for various loading conditions. [K4]
CO5: Interpret the operation of three-phase transformers for various connections and achieve three-phase to two-phase transformation. [K2]

Unit No	Outcome	Topics/Activity		Ref Text book	Total Periods	Delivery Method
1	CO 1. Determine the performance of D.C generator for various operating conditions. [K2]	**Unit-1. DC GENERATOR**				
		1.1	Electromechanical energy conversion-Principle-DC Generators-Principle of operation	T1, T2, R3	14	Chalk & Talk
		1.2	Constructional Features-EMF Equation-Armature windings	T1, T2, R3		Chalk & Talk, PPT
		1.3	Armature reaction- Commutation Process-Types of DC generators-Losses and efficiency of generator	T1, T2, R3		NPTEL
		1.4	No load and load characteristics of all types of DC generators and their applications.	T1, T2, R3		Chalk & Talk, Tutorial
ASSIGNMENT-I EXAMINATIONS						
2	CO2. Analyze the performance characteristics of various types of D.C motors. [K4]	**Unit-2. DC MOTOR**				
		2.1	Principle of DC Motor-Concept of back EMF-Torque equation	T1, T2, T3, R3	12	Chalk & Talk.
		2.2	Power stages of DC Motor	T1, T2, T3, R3		Chalk & Talk, Tutorial
		2.3	Characteristics of DC motors (series, shunt and compound)	T1, T2, T3, R3		Chalk & Talk, PPT
		2.4	Applications-Losses- efficiency of DC motor.	T1, T2, T3, R1		Quiz
	CO 3. Select suitable speed control and testing methods of D.C motor for various applications. [K3].	**Unit-3. SPEED CONTROL AND TESTING OF D.C. MOTORS**				
		3.1	Speed control – by varying armature resistance, field flux and armature terminal voltage.	T1, T3, R2	5	Chalk & Talk, PPT,
		3.2	Necessity of starter in a D.C motor-Three-point starter-Four-point starter	T1, T3, R2		Chalk & Talk, Tutorial
MID-I EXAMINATIONS						

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3	CO 3. Select suitable speed control and testing methods of D.C motor for various applications. [K3].	3.3	Testing Methods-Direct method-Swinburne's Method and Regenerative method	T1, T3, R2	5	Chalk & Talk, PPT
		3.4	Losses and efficiency.	T1, T3, R1		Students Seminars
		Unit-4. SINGLE PHASE TRANSFORMERS				
4	CO 4. Analyze the performance specifications of a single-phase transformer for various loading conditions. [K4].	4.1	Principle of operation-Constructional features of transformers - EMF equation	T1, T4, R3	7	Chalk & Talk, Quiz
		4.2	no load and load phasor diagrams - equivalent circuit of single-phase transformers-	T1, T4, R3		Chalk & Talk, PPT
ASSIGNMENT-II EXAMINATIONS						
4	CO 4. Analyze the performance specifications of a single-phase transformer for various loading conditions. [K4].				7	
		4.3	Regulation - losses - efficiency and all-day efficiency-	T1, T4, R1		Chalk & Talk, Tutorial
		4.4	Testing of transformers - OC and SC tests - Sumpner's test -Auto transformers.	T1, T4, R3		Chalk & Talk, PPT
5	CO 5. Interpret the operation of three-phase transformers for various connections and achieve three-phase to two-phase transformation. [K2]	**Unit 5. THREE PHASE TRANSFORMERS**				
		5.1	Poly Phase Connections - Y/Y- Y/Δ- Δ/Y- Δ/Δ and open delta connection	T1, T4, R3	10	Chalk & Talk, Quiz
		5.2	Scott connection-Tap changing transformers	T1, T4, R3		Chalk & Talk, PPT
		5.3	Parallel operation-Methods of cooling.	T1, T4, R3		Chalk & Talk, Tutorial
				Total	60	
MID II EXAMINATIONS						
END EXAMINATIONS						

Text Books:

T1 Electrical machines – P.S. Bhimbra, Khanna Publishers.
T2 Performance and Design of Alternating Current Machines – Clayton and Hancock
T3 Electrical Machines - J.B.Gupta, S.K.Katariaand Sons
T4 Performance and Design of Alternating Current Machines – M.G. Say, John Wiley and Sons Publications, 3rd Edition, 1983.

Reference Books:

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R2 Electrical machines – S.K. Bhattacharya
R3 Electrical machines –D P. Kothari and I. J. Nagarth, TMH, 4th Edition, 2010
R4 Theory of Alternating Current Machinery- Langsdorf, TMH Electrical Machines – A. Chakrabarti and S. Debnath – Mc Graw - Hill Education, 1st Edition, 2015.

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DEPARTMENT OF INFORMATION TECHNOLOGY
LESSON PLAN
Academic Year 2022-23

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CC3OE11	DIGITAL MARKETING ((R20)	IV/I	INFORMATION TECHNOLOGY	6	A

COURSE OUTCOMES:

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

CO1: Develop insight on Current Trends – Digital and Social Statistics (Infographics) (K6)

CO2: Analyze the Digital Marketing Platforms like Face book, Twitter, YouTube etc.(K4)

CO3: Analyze the basics of Search Engine Optimization (SEO) and Mobile Marketing.(K4)

CO4: Design the various strategies involved in Marketing products and Services Digitally.(k6)

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1. Develop insight on Current Trends – Digital and Social Statistics (Infographics) (K6)		**UNIT-1: Introduction to Digital Marketing**			
		1.1	Evolution of Digital Marketing from traditional	T1, T2, R1,R3	2	Chalk& Talk, PPT
		1.2	Role of Internet, Current trends, Digital landscape	T1, T2, R1,R3	2	Learning & Tutorial
		1.3	Info-graphics, Implications for business & society	T1, T2, R1,R3	1	Chalk& Talk,
		1.4	Emergence of digital marketing as a tool	T1, T2, R1,R3	1	Chalk&Talk, PPT
		1.5	Drivers of the new marketing environment	T1, T2, R1,R3	1	Chal&Talk,
		1.6	Revolutionizing the Traditional Business Network	T1, T2, R1,R3	1	Chalk&Talk, PPT
		1.7	Digital marketing plan, Digital marketing models	T1, T2, R1,R3	2	Learning & Tutorial
		1.8	Digital marketing strategy, P.O.E.M. framework	T1, T2, R1,R3	2	PPT, Flipped
2	CO 2		**UNIT-2: Internet Marketing and Digital Marketing Mix**			

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Unit wise Sample Assessment Questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT 1		
1	What is Digital Marketing? Explain the Evolution of Digital Marketing? (6M)	K2	CO1
2	Differentiate between Traditional marketing vs Digital Marketing. (6M)	K2	CO1
3	Demonstrate the P.O.E.M Framework (6M)	K2	CO1
4	Explain the Digital Marketing Plan with an Example. (6M)	K2	CO1
5	What are the current trends in the Digital Marketing (6M)	K2	CO1
6	Explain the Digital Marketing Plan with an Example	K2	CO1
	UNIT 2		
1	Explain the concept of Digital Marketing Framework. (6M)	K4	CO2
2	Analyze the different Pay for Search Advertisements in search engine marketing? (6M).	K4	CO2
3	Analyze the Impact of digital channels on IMC. (6M)	K4	CO2
4	Classify the different types of Display Ads. (6M)	K2	CO2
5	What is Display Marketing? Explain the concept of YouTube Marketing.	K2	CO2
	UNIT 3		
1	Illustrate the Social media Marketing?. Explain? (6M)	K2	CO3
2	How to Build a successful social media marketing strategy . (6M)	K2	CO3
3	How did the business done by the Facebook Marketing. Explain the Facebook Marketing Tools. 6M)	K2	CO3
4	What is the Importance of LinkedIn Marketing? Explain with an example. (6M)	K2	CO3
5	What is the Framing LinkedIn Strategy? Explain with an example. (6M.	K2	CO3
6	Classify the different types Facebook Marketing Tools. Explain 6M)	K2	CO3
	UNIT 4		
1	What is twitter Marketing ?Explain the different forms of twitter marketing (6M)	K2	CO4
2	What are the Digital Marketing Strategies through Instagram and snapchat (6M)	K2	CO4

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	CO4: Design the various strategies involved in Marketing products and Services digitally.(k6)	4.1	Introduction to Twitter Marketing, how twitter Marketing is framing content strategy.	T1, T2, R1,R3	2	Chalk&Talk
		4.2	Twitter Advertising Campaigns, Instagram and Snapchat.	T1, T2, R1,R3	2	Chalk& Talk, PPT , Web Resources Tutorial
		4.3	Digital Marketing Strategies , Mobile Advertising	T1, T2, R1,R3	2	Chalk& Talk, PPT Tutorial
		4.4	Forms of Mobile Marketing	T1, T2, R1,R3	2	Chalk&Talk
		4.5	Features Mobile Campaign Development	T1, T2, R1,R3	2	Chalk&Talk
		4.6	Mobile Advertising Analytics.	T1, T2, R1,R3	2	Chal&Talk, students collaborative learning
5	CO5: Design the various strategies involved in Marketing products and Services digitally.(k6)	**UNIT – 5:Introduction to SEO**				
		5.1	Web Analytics, Mobile Marketing.	T1, T2, R1,R3	2	Chalk&Talk, PPT , Students Seminars &
		5.2	Trends in Digital Advertising, How to use internet &search engines	T1, T2, R1,R3	2	Chalk&Talk, Tutorial
		5.3	Search engine and its working pattern, On-page and off-page optimization	T1, T2, R1,R3	2	Chalk& Talk, PPT Chalk&Talk,
		5.4	SEO Tactics, Introduction to SEM Web Analytics, Google Analytics & Google AdWords	T1, T2, R1,R3	2	Chalk&Talk, PPT , Students Seminars & Tutorial
		5.5	data collection for web analytics, multichannel attribution	T1, T2, R1,R3	2	Chalk&Talk,
		5.6	Trends in digital advertising.	T1, T2, R1,R3	2	Chalk&Talk, PPT
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

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3	What is Mobile Advertising Analytics? Explain the Features of Mobile marketing. (6M)	K2	CO4
4	Explain theTwitter Advertising Campaigns (6M)	K2	CO4
5	What are the Forms of Mobile Marketing? Explain the Features of Mobile marketing. (6M)	K2	CO4
6	Explain theTwitter Advertising Campaigns (6M)	K2	CO4
	UNIT 5		
1	Explain SEO? Explain the need of SEO on Internet. (6M)	K2	CO5
2	Explain the On-page and off-page optimization. (6M)	K2	CO5
3	What is SEM? Explain the need of SEM in Digital Advertising. (6M)	K2	CO5
4	What are the different trends in the digital advertising. (6M)	K2	CO5
5	How the data collection for web analytics. Explain(6M	K2	CO5

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		ASSIGNMENT EXAM – II				
3	CO3. Interpret data warehousing concepts and operations. [K2]	**UNIT-3. Data Warehouse and OLAP Tech. for Data Mining**				
		3.1	What is a Data Warehouse, -A Multidimensional Data Model	T2, R3	2	Chalk & Talk,
		3.2	: From tables to data cubes, Stars, snowflake, and fact constellations(schemas for multidimensional databases),	T2, R3	2	PPT,
		3.3	Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation),	T2, R3	2	Chalk & Talk
		3.4	Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, -	T2, R3	2	PPT,
		3.5	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, -	T2, R3	2	Chalk & Talk,
		3.6	Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository,	T2, R3	2	Chalk & Talk,
		3.7	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),	T2, R3	2	PPT
		3.8	-From data warehousing to data mining: Data warehouse usage, From online analytical processing to online analytical mining.	T2, R3	2	Chalk & Talk,
		MID I EXAMINATION DURING SIXTH WEEK				
4	CO4. Compare and contrast different dominant Data Mining Algorithms. [K2]	**UNIT-4. Classification**				
		4.1	Classification: Basic Concepts, Decision Trees, and Model Evaluation: - Preliminaries, - General Approach to Solving a Classification Problem,	T1, T2, R1	2	Chalk & Talk,
		4.2	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, -	T1, T2, R1	2	Chalk & Talk,
		4.3	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.	T1, T2, R1	2	PPT
		4.4	Classification: alternative techniques: - Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.	T1, T2, R1	2	Chalk & Talk
		ASSIGNMENT EXAM – III				
5	CO5. Analyze the performance	**UNIT 5. Association Analysis**				
		5.1	Association Analysis: Basic Concepts and Algorithms: -Problem Definition, -Frequent Itemset Generation: The Apriori principle,	T1, T2, R1	2	Chalk & Talk,

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TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Raghuram Krishnan, Johannes Gehrke, "Database Management Systems", TMH, 3/e, 2008.
T2	Silberschatz, Korth, "Database System Concepts", TMH, 6/e, 2010.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", PEA, 6/e, 2011.
R2	C J Date, "Introduction to Database Systems", PEA, 8/e, 2006.
R3	Database System Concepts, Peter ROB, Coronel, Ceneage, 6/2, 2011.

Faculty

HOD

Principal

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

COURSE INFORMATION SHEET

Academic Year 2022-23

PROGRAMME: B. Tech IT	
COURSE: **Digital Marketing**	Year/Sem : **IV /I** CREDITS: **3**
COURSE CODE: **R20CC3OE11** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **Open Elective**
COURSE AREA/DOMAIN:**IT**	PERIODS: 6Per Week.

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Develop insight on Current Trends – Digital and Social Statistics (Infographics) (K6)
CO2	Analyze the Digital Marketing Platforms like Face book, Twitter, YouTube etc.(K4)
CO3	Analyze the basics of Search Engine Optimization (SEO) and Mobile Marketing.(K4)
CO4	Design the various strategies involved in Marketing products and Services Digitally.(k6)

SYLLABUS:

UNIT	DETAILS
I	**Introduction to Digital Marketing** Evolution of Digital Marketing from traditional ,Role of Internet, Current trends, Info-graphics Implications for business & society, Emergence of digital marketing as a tool, Drivers of the new marketing environment, Digital marketing strategy, P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.
II	**Internet Marketing and Digital Marketing Mix** Internet Marketing, Opportunities and challenges, Digital marketing framework, Digital Marketing mix, Search Engine Advertising, Pay for Search Advertisements, Ad Placement, Ad Rank,Creating Ad Campaigns, Types of Display Ads, Buying Models, Programmable Digital Marketing, Analytical Tools and examples, YouTube marketing with examples
III	**Social Media Marketing** Introduction to social media platforms, penetration & characteristics, Building a successful social media marketing strategy, Face book Marketing, Business through Face book Marketing, Creating Advertising Campaigns, Adverts, Face book Marketing Tools LinkedIn Marketing, Introduction and Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting.
IV	**Twitter Marketing** Introduction to Twitter Marketing, how twitter Marketing is, framing content strategy, Twitter Advertising Campaigns, Instagram and Snapchat, Digital Marketing Strategies, Mobile Advertising, Forms of Mobile Marketing, Features Mobile Campaign Development, Mobile Advertising Analytics.

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V	**Introduction to SEO** ,Web Analytics, Mobile Marketing, Trends in Digital Advertising , How to use internet &search engines, Search engine and its working pattern,On-page and off-page optimization, SEO Tactics, Introduction to SEM Web Analytics, Google Analytics & Google AdWords ,data collection for web analytics, multichannel attribution, Universal analytics,Trends in digital advertising.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	1. Seema Gupta, Digital Marketing, Mc-Graw Hill, 1st Edition- 2017
T2	2. Ian Dodson, The Art of Digital Marketing, Wiley Latest Edition
T3	3. Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson, 1st Edition – 2017
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	1. Vandana Ahuja, Digital Marketing, Oxford University Press, Latest Edition
R2	2. Philip Kotler, Marketing 4.0: – Moving from Traditional to Digital, Wiley 2017

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Impacts of Block chain Technology in Marketing	CO4
2	Digital Relationships in the Marketing of Higher Education	CO4

WEB SOURCE REFERENCES:

1	https://learndigital.withgoogle.com/digitalunlocked/
2	https://digitalskills.fb.com/en-in/
3	https://www.hubspot.com/digital-marketing
4	http://www.afaqs.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

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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.

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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.

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.

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2	https://digitalskills.fb.com/en-in/
3	https://www.hubspot.com/digital-marketing
4	http://www.afaqs.com/

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Unit wise Sample Assessment Questions

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT 1		
1	What is Digital Marketing? Explain the Evolution of Digital Marketing? (6M)	K2	CO1
2	Differentiate between Traditional marketing vs Digital Marketing. (6M)	K2	CO1
3	Demonstrate the P.O.E.M Framework (6M)	K2	CO1
4	Explain the Digital Marketing Plan with an Example. (6M)	K2	CO1
5	What are the current trends in the Digital Marketing (6M)	K2	CO1
6	Explain the Digital Marketing Plan with an Example	K2	CO1
	UNIT 2		
1	Explain the concept of Digital Marketing Framework. (6M)	K4	CO2
2	Analyze the different Pay for Search Advertisements in search engine marketing? (6M).	K4	CO2
3	Analyze the Impact of digital channels on IMC. (6M)	K4	CO2
4	Classify the different types of Display Ads. (6M)	K2	CO2
5	What is Display Marketing? Explain the concept of YouTube Marketing.	K2	CO2
	UNIT 3		
1	Illustrate the Social media Marketing?. Explain? (6M)	K2	CO3
2	How to Build a successful social media marketing strategy . (6M)	K2	CO3
3	How did the business done by the Facebook Marketing. Explain the Facebook Marketing Tools. 6M)	K2	CO3
4	What is the Importance of LinkedIn Marketing? Explain with an example. (6M)	K2	CO3
5	What is the Framing LinkedIn Strategy? Explain with an example. (6M.	K2	CO3
6	Classify the different types Facebook Marketing Tools. Explain 6M)	K2	CO3
	UNIT 4		
1	What is twitter Marketing ?Explain the different forms of twitter marketing (6M)	K2	CO4
2	What are the Digital Marketing Strategies through Instagram and snapchat (6M)	K2	CO4

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MAPPING CO'S WITH PO'S

COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C416.1	-	1	-	-	3	1	-	-	-	2	3	-
C416.2	-	2	-	-	3	1	-	-	-	3	3	-
C416.3	-	1	-	-	3	1	-	-	-	2	3	-
C416.4	-	2	-	-	3	1	-	-	-	2	3	-
C416	-	2.5	-	-	3	1	-	-	-	2.5	3	-

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C416	-	2.5	-	-	3	1	-	-	-	2.5	3	-	1.866	1.866	2.05

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

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Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Instructor | Course Coordinator | Module Coordinator | HOD

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IV B. Tech I Semester Model Paper-1

DIGITAL MARKETING

Sub Code: R20CC3OE11 **Time: 3 hrs**

Note: Answer All Five Questions. **Max.Marks:70**

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

(Common to IT/CSE)

Q. NO		QUESTION	KL	CO	MARKS
1		**Unit – I**			
	a	I. What is Digital Marketing? Explain the Evolution of Digital Marketing? (7M) II. Differentiate between Traditional marketing vs Digital Marketing. (7M)	K3	CO1	[14M]
		OR			
	b	I. Demonstrate the P.O.E.M Framework (7M) II. Explain the Digital Marketing Plan with an Example. (7M)	K3	CO1	[14M]
2		**Unit – II**			
	a	I. Discuss the concept of Digital Marketing Mix with example. (7M) II. What are the different Pay for Search Advertisements in search engine marketing? (7M)	K3	CO2	[14M]
		OR			
	b	I. Explain the concept of Digital Marketing Framework. (7M) II.What is Display Marketing? Explain the concept of YouTube Marketing. (7M)	K2	CO2	[14M]
3		**Unit – III**			
	a	I. Illustrate the Social media Marketing?. Explain? (7M) II. How to Build a successful social media marketing strategy . (7M)	K3	CO3	[14M]
		OR			
	b	I. How did the business done by the Facebook Marketing. Explain the Facebook Marketing Tools. (7M) II.What is the Importance of LinkedIn Marketing? Explain with an example. (7M)	K3	CO3	[14M]
4		**Unit – IV**			
	a	I.How twitter Marketing is different than other forms of digital marketing (7M) II. What are the Digital Marketing Strategies through Instagram and snapchat (7M)	K6	CO4	[14M]
		OR			

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IV B. Tech I Semester Model Paper-2

DIGITAL MARKETING

Common to CSE and IT

Sub Code: R20CC3OE11

Time: 3 hrs
Max.Marks:70

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

Q. NO		QUESTION	KL	CO	MARKS
1		**Unit – I**			
	a	I. Differentiate between Traditional marketing vs Digital Marketing (7M) II. Demonstrate the P.O.E.M Framework. (7M)	K3	CO1	[14M]
		OR			
	b	I. What are the current trends in the Digital Marketing (7M) II. Explain the Digital Marketing Plan with an Example. (7M)	K3	CO1	[14M]
2		**Unit – II**			
	a	I. Explain the concept of Digital Marketing Framework. (7M) II.What are the different Pay for Search Advertisements in search engine marketing? (7M)	K3	CO2	[14M]
		OR			
	b	I.Analyze the Impact of digital channels on IMC(7M) II.Classify the different types of Display Ads. (7M)	K2	CO2	[14M]
3		**Unit – III**			
	a	I. What are the characteristics of the social media marketing? (7M) II. How to Build a successful social media marketing strategy. (7M)	K3	CO3	[14M]
		OR			
	b	I. Classify the different types Facebook Marketing Tools. Explain (7M) II.What is the Framing LinkedIn Strategy? Explain with an example. (7M))	K3	CO3	[14M]
4		**Unit – IV**			
	a	I.What is twitter Marketing ?Explain the different forms of twitter marketing (7M) II. What are the Digital Marketing Strategies through Instagram and snapchat (7M)	K6	CO4	[14M]
		OR			
	b	I. What is Mobile Advertising Analytics? Explain the Features of Mobile marketing. (7M) II.Explain theTwitter Advertising Campaigns (7M)	K2	CO4	[14M]
		Unit – V			

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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

Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

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

CO1: Develop insight on Current Trends – Digital and Social Statistics (Infographics) (K6)

CO2: Analyze the Digital Marketing Platforms like Face book, Twitter, YouTube etc.(K4)

CO3: Analyze the basics of Search Engine Optimization (SEO) and Mobile Marketing.(K4)

CO4: Design the various strategies involved in Marketing products and Services digitally.(k6)

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NARASARAOPET - 522 601.
Guntur (Dist.), A.P.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF INFORMATION TECHNOLOGY&CSE(AI)
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CC3103	DESIGN AND ANALYSIS OF ALGORITHMS	III/I	CSE(AI)	5	A

COURSE OUTCOMES: Students are able to

CO 1: Apply asymptotic notations to measure the performance of algorithms [K3].
CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].
CO 3: Identify all feasible solutions to get optimal solutions using greedy method [K3].
CO 4: Apply dynamic-programming approach, to solve real world problems [K3].
CO 5: Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3].
CO 6: Analyze least cost and FIFO branch and bound paradigms [K4].

Unit No	Outcome		Topics/Activity	Ref Text book	Total Hours	Delivery Method
1	CO 1. Apply asymptotic notations to measure the performance of algorithms [K3].	**Unit-1. Introduction to Algorithms**				
		1.1	**Introduction:** Algorithm	T1	2	Chalk & Talk, PPT
		1.2	Algorithm Specification	T1	2	Chalk & Talk, PPT
		1.3	Performance Analysis	T1	1	Chalk & Talk, PPT
		1.4	Space complexity	T1	1	Chalk & Talk, PPT
		1.5	Time complexity	T1	2	Chalk & Talk, PPT
		1.6	Asymptotic Notations	T1	1	Chalk & Talk, PPT
		1.7	Big-oh notation	T1	1	Chalk & Talk, PPT
		1.8	Omega notation	T1	1	Chalk & Talk, PPT
		1.9	Theta notation	T1	1	Chalk & Talk, PPT
I ASSIGNMENT EXAMINATION						
2	CO2. Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].	**Unit-2. Divide and Conquer**				
		2.1	Introduction to Divide and Conquer	T1	2	Chalk & Talk, PPT
		2.2	General method	T1	2	Chalk & Talk, PPT
		2.3	Binary search	T1	2	Chalk & Talk, PPT
		2.4	Merge sort	T1	2	Chalk & Talk, PPT
		2.5	Quick sort	T1	2	Chalk & Talk, PPT
		2.6	Strassen's matrix multiplication	T1	2	Chalk & Talk, PPT
3	CO 3. Identify all feasible solutions to get optimal solutions using greedy method [K3].	**Unit-3. Greedy Method**				
		3.1	Introduction to Greedy method	T1	1	Chalk & Talk, PPT
		3.2	General method	T1	1	Chalk & Talk, PPT
		3.3	Knapsack problem	T1	2	Chalk & Talk, PPT
		3.4	Job sequencing with deadlines	T1	2	Chalk & Talk, PPT
		I MID EXAMINATION				
		3.5	Minimum cost spanning trees	T1	3	Chalk & Talk, PPT, Tutorial
		3.6	Single source shortest paths	T1	2	Chalk & Talk, PPT

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		Unit-4. Dynamic Programming				
4	CO 4. Apply dynamic-programming approach, to solve real world problems [K3].	4.1	Introduction to Dynamic Programming	T1	1	Chalk & Talk, PPT
		4.2	The General method	T1	1	Chalk & Talk, PPT
		4.3	All pairs shortest path problem	T1	2	Chalk & Talk, PPT, Tutorial
		II ASSIGNMENT EXAMINATION				
		4.4	Optimal binary search trees	T1	2	Chalk & Talk, PPT
		4.5	0/1 knapsack, Reliability design	T1	2	Chalk & Talk, PPT
		4.6	The Travelling sales person problem	T1	1	Chalk & Talk, PPT
		4.7	Matrix-chain multiplication.	T1	2	Chalk & Talk, PPT
		Unit 5. Back Tracking, Branch and Bound				
5	CO 5. Summarize the functions of different remote monitoring protocols. [K2]. CO 6. Analyze least cost and FIFO branch and bound paradigms [K4].	5.1	Introduction to Backtracking	T1	1	Chalk & Talk, PPT
		5.2	The General method	T1	1	Chalk & Talk, PPT
		5.3	N-Queen problem	T1	2	Chalk & Talk, PPT
		5.4	Sum of subsets	T1	1	Chalk & Talk, PPT
		5.5	Graph coloring,	T1	1	Chalk & Talk, PPT, Tutorial
		5.6	Hamiltonian cycles.	T1	2	Chalk & Talk, PPT
		5.7	Branch and Bound:	T1	1	Chalk & Talk, PPT
		5.8	The method	T1	1	Chalk & Talk, PPT
		5.9	0/1 knapsack problem	T1	2	Chalk & Talk, PPT, Tutorial
		5.10	Travelling sales person problem	T1	2	Chalk & Talk, PPT
				Total	**60**	
MID II EXAMINATION						
END EXAMINATIONS						

Text Books:

T1 Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Universities Press.

Reference Books:

R1 S. Sridhar, Oxford, Design and Analysis of Algorithms, First Edition –.

R2 T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein , Introduction to Algorithms, second edition, , PHI Pvt.Ltd Dreamtech.Distributed Network Management, Paul, John Wiley.

R3 Parag Himanshu Dave, Himanshu Bhalchandra Dave , Design and Analysis of Algorithms, Second Edition –, Pearson Education.

R4 Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman , Design and Analysis of Computer Algorithms –, Pearson Education.

R5 Anany Levitin , Introduction to the Design and Analysis of Algorithms, Third Edition –, Pearson Education.

Faculty **HOD** **Principal**

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallamanda(Post), Narasaraopet- 522601** **Department of IT&CSE(AI)**

COURSE INFORMATION SHEET

PROGRAMME: B. Tech. CSE(AI)	
COURSE: **Design and Analysis of Algorithms**	Semester : **III/I** CREDITS: **4**
COURSE CODE: **R20CC3103** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Algorithms**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CC2104	**Data Structures**	About Data Structures and Algorithms	**II-I**

COURSE OUTCOMES:

CO	Course Outcome Statement
CO1	Apply asymptotic notations to measure the performance of algorithms [K3]
CO2	Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].
CO3	Identify all feasible solutions to get optimal solutions using greedy method [K3].
CO4	Apply dynamic-programming approach, to solve real world problems [K3].
CO5	Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3].
CO6	Analyze least cost and FIFO branch and bound paradigms [K4].

SYLLABUS:

UNIT	DETAILS
I	**Introduction:** Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation).
II	**Divide and Conquer:** General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.
III	**Greedy method:** General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.
IV	**Dynamic Programming:** The General method, 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, N-Queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles. **Branch and Bound:** The method, 0/1 knapsack problem, Travelling sales person problem.

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TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Universities Press.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	S. Sridhar, Oxford, Design and Analysis of Algorithms, First Edition –.
R2	T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein , Introduction to Algorithms, second edition, , PHI Pvt.Ltd.
R3	Parag Himanshu Dave, Himanshu Bhalchandra Dave , Design and Analysis of Algorithms, Second Edition –, Pearson Education.
R4	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman , Design and Analysis of Computer Algorithms –, Pearson Education.
R5	Anany Levitin , Introduction to the Design and Analysis of Algorithms, Third Edition –, Pearson Education.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Advanced Data Structures	PO1,PO3,PO6,PO11,PO12, PSO3
2	Asymptotic Notations	PO1,PO3,PO4,PO5, PSO3

WEB SOURCE REFERENCES:

1	http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2	https://www.coursera.org/learn/algorithms-divide-conquer
3	http://nptel.ac.in/courses/106101060/
4	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design- and-analysis-of-algorithms-spring-2015/index.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	PSO3
C313.1	2	3	2	2	1	-	-	-	-	-	-	-	2	-	-
C313.2	2	3	3	2	1	-	-	-	-	-	-	-	1	-	3
C313.3	2	2	3	-	3	-	-	-	-	-	2	-	-	-	2
C313.4	3	3	2	-	-	-	-	-	-	-	-	-	1	-	1

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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 mathematical and scientific skills in numerous areas of computer science and Engineering to design and develop software based systems.

PSO2: Acquaint module knowledge on emerging trends of modern era in Computer Science and Engineering.

PSO3: Promote novel applications that meet the needs of entrepreneur, environmental and social issues.

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C313.5	2	2	-	-	3	-	-	-	-	-	-	-	1	-	3
C313.6	1	2	1	1	3	-	-	-	-	-	1	2	-		3
Average	2.00	2.50	1.83	0.83	1.83	-	-	-	-	-	0.5	0.33	0.83	-	2.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C313	2.00	2.50	1.83	0.83	1.83	-	-	-	-	-	0.5	0.33	0.83	-	2.00

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

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

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	example?			
	UNIT 2			
1	Write an algorithm for quick sort by using recursive method.	K2	CO2	15M
2	Explain Strassen's is matrix multiplication algorithm with an example.	K2	CO2	15M
3	Draw the tree of calls of merge for the following set of elements (20, 30, 10, 40, 5, 60, 90, 45, 35, 25, 15, 55)	K2	CO2	15M
4	Derive the time complexity for Quick Sort	K2	CO2	15M
5	Draw the binary decision tree for the following set (3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 47)	K2	CO2	15M
	UNIT 3			
1	Analyze Kruskal's algorithm for Minimum Cost Spanning Tree with an example.	K4	CO3	15M
2	Analyze Prim's algorithm for Minimum Cost Spanning Tree with an example.	K4	CO3	15M
3	Analyze Single source shortest paths with an example.	K4	CO3	15M
4	Analyze a Greedy Algorithm for Sequencing Unit Time Jobs with deadlines and profits.	K4	CO3	15M
5	What is greedy method? Explain with example.	K2	CO3	15M
	UNIT 4			
1	Analyze All Pairs Shortest Path Problem with an example.	K4	CO4	15M
2	What is Dynamic Programming? List out the characteristics & applications of dynamic programming.	K3	CO4	15M
3	Distinguish between Dynamic Programming and Greedy method.	K3	CO4	15M
4	Explain how Matrix – chain Multiplication problem can be solved using dynamic programming with suitable example.	K2	CO4	15M
5	Analyze the Dynamic 0/1 Knapsack Problem. Find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3) = (1,2,5), weights are (w1,w2,w3)=(2,3,4).	K4	CO4	15M
	UNIT 5			
1	What is a Backtracking and give the 4 – Queens's solution. Draw the portion of the state space tree for n = 4 queens using backtracking algorithm.	K2	CO5	15M
2	What is a Hamiltonian Cycle? Explain how to find Hamiltonian path and cycle using backtracking algorithm.	K2	CO5	15M
3	Explain the Graph – coloring problem. And draw the state space tree for m= 3 colors n=4 vertices graph. Discuss the time and space complexity.	K2	CO5	15M
4	Define Bounding Function? Give the statement of 0/1 Knapsack FIFO BB and explain the procedure with the knapsack instance for n=4.m=15,(p1,p2,p3,p4)=(10,10,12,18) (w1,w2,w3,w4) =(2, 4, 6, 9).	K2	CO6	15M
5	Analyze Travelling Salesman Problem(TSP) with the following example: 2 a b 5 8 7 3 c 1 d	K4	CO6	15M

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COURSE OUTCOMES: Students are able to

CO 1: Apply asymptotic notations to measure the performance of algorithms [K3].
CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].
CO 3: Identify all feasible solutions to get optimal solutions using greedy method [K3].
CO 4: Apply dynamic-programming approach, to solve real world problems [K3].
CO 5: Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3].
CO 6: Analyze least cost and FIFO branch and bound paradigms [K4].

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	Marks
	UNIT I			
1	What is an Algorithm? List out the characteristics of algorithm with example	K3	CO1	15M
2	Analyze analysis of algorithms priority with simple examples.	K4	CO1	15M
3	What is Pseudo – code and Analyze Pseudo – code conversions for expressing algorithm with an example?	K4	CO1	15M
4	Analyze asymptotic notation to represent Time Complexity of algorithm.	K4	CO1	15M
5	Analyze space complexity of program with an example.	K4	CO1	15M
6	What are the different methods to estimate Time Complexity of a program with an	K2	CO1	15M

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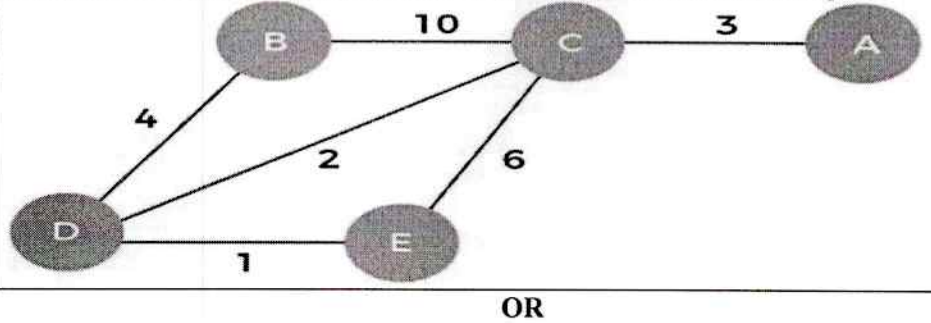
Model Question Paper (R20)
B. Tech VII Semester Regular Examinations
DESIGN AND ANALYSIS OF ALGORITHMS
COMPUTER SCIENCE AND ENGINEERING

Time: 3 Hrs **Code: R20CC3103** **Max. Marks: 75**

Answer ALL Questions.

S. No	Question	Marks
1	What are the different methods to estimate Time Complexity of a program with an example?	15
	OR	
2	Analyze asymptotic notation to represent Time Complexity of algorithm.	15
3	Explain Strassen's is matrix multiplication algorithm with an example.	15
	OR	
4	Draw the tree of calls of merge for the following set of elements (20, 30, 10, 40, 5, 60, 90, 45, 35, 25, 15, 55)	15
5	Analyze Prim's algorithm for Minimum Cost Spanning Tree with an example. 	15
	OR	
6	Analyze a Greedy Algorithm for Sequencing Unit Time Jobs with deadlines and profits.	15
7	Explain how Matrix – chain Multiplication problem can be solved using dynamic programming with suitable example.	15
	OR	
8	Analyze the Dynamic 0/1 Knapsack Problem. Find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3) = (1,2,5), weights are (w1,w2,w3)=(2,3,4).	15
9	What is a Hamiltonian Cycle? Explain how to find Hamiltonian path and cycle using backtracking algorithm.	15
	OR	
10	Define Bounding Function? Give the statement of 0/1 Knapsack FIFO BB and explain the procedure with the knapsack instance for n=4.m=15,(p1,p2,p3,p4)=(10,10,12,18) (w1,w2,w3,w4) =(2, 4, 6, 9).	15

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Yallmanda(Post), Narasaraopet- 522601
Department of MBA

COURSE INFORMATION SHEET-A.Y-2022-2023

PROGRAMME: MBA	
COURSE: MTOB	Semester : I CREDITS: 4
COURSE CODE: **19MBA1THO1** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **BREADTH**
COURSE AREA/DOMAIN: MANAGEMENT	PERIODS: 5 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM

COURSE OUTCOMES:

SNO	Course Outcome Statement
	CO1: Examine the Management concepts and functions. [K4]
	CO2: Apply the concepts of planning, decision making. [K3]
	CO3: Apply the concepts of delegation of authority, decentralisation and departmentation in real life situations. [K3]
	CO4: Analyse the controlling principles and practices, Ethics and corporate social responsibility. [K4]
	CO5: Adapt the effective organisational behaviour and climate. [K6]
	CO6: Evaluate the basic concepts of organisational conflicts and climate. [K5]

SYLLABUS:

UNIT	DETAILS
I	**MANAGEMENT:** Definition, Nature, Scope and Importance, Science, Art, Profession, Managerial roles and functions, Management skills, Evolution of management thought, levels of management, challenges of manage, management Vs Administration.
II	**PLANNING:** Nature and Importance of planning,– Steps in planning – Types of planning,– Planning premises, - Forecasting techniques- Decision making – Significance – Process of Decision making – techniques – MBO.
III	**ORGANIZING:** Concept, Nature, Principles, Types of Organization structures, Departmentation, Span of management, power, Authority and Responsibility Relationship, Delegation, Centralization and decentralization of Authority.
IV	**CONTROLLING:** Concepts, Steps, Design of effective control System, Types of Controlling Techniques. Co-ordination types and principles.
V	**ORGANISATIONAL BEHAVIOUR AND CULTURE:** Organisational Behaviour: Definition, Nature, Scope, Importance, Linkages with other social sciences-Organisational climate -Organisational Culture – Implications of OC.
VI	**ORGANISATIONAL CNFLICTS:** Goal conflict- Role- Organisational level of conflict – Group level – Conflict Management – Organisational effectiveness – concept – Approaches – Factors – Organisational change,-Nature – Factors – Process- Organisational growth & Change Agents- OD- concept, Process and Techniques

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TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	L.M. Prasad: "**Principles and Practice of Management**", Sultan Chand & Sons Publications, New Delhi,2001.
T2	Dr.P.SubbaRao and Prof. N.SambasivaRao:"**Management and organizational Behaviour- (Text and Cases)**", HimalayaPublishing House,Mumbai.
REFERENCE BOOKS	
R	BOOK TITLE/AUTHORS/PUBLISHER
R1	Koonz, Weihrich and Aryasri: "***Principles of Management***", Tata McGraw Hill, 2004.
R2	William, Tripathy: "**MGMT (including instructor recourses)**", CengageLearning, New Delhi,2013

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		
2		

WEB SOURCE REFERENCES:

1	https://www.youtube.com/results?search_query=what+are+the+functions+of+management+
2	https://www.youtube.com/watch?v=tUrjAn24Zi
3	https://www.youtube.com/watch?v=4lEoyYD4SWw
4	https://www.youtube.com/watch?v=UUKAX0E4ckM
5	https://www.youtube.com/watch?v=FRprRP0nT5s
6	https://www.youtube.com/watch?v=yrbDzgfOyrM
7	https://www.youtube.com/watch?v=Hs7ei24zjbU

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
C101.1	3	2	-	2	3	1	3	2	2	3	2	2	3	3
C101.2	2	2	1	1	-	1	3	3	1	3	-	3	1	3
C101.3	1	1	-	3	1	-	-	-	-	2	2	-	-	3
C101.4	1	-	-	-	3	2	2	1	2	2	2	2	3	3
C101.5	1	1	1	1	-	-	2	1	-	-	-	-	-	3

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							2.00	1.16	1.16	2.16	1.00	1.5	1.5	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C101	1.33	1.00	0.66	1.16	1.16	0.66	2.00	1.16	1.16	2.16	1.00	1.5	1.5	3.00

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

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

ANNEXURE I:

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

PO1: Ability to apply the knowledge of business management in to practice.

PO2: Ability to apply the knowledge of areas of economics, technology, law, accounting into complex situations and provide solution.

PO3:Able to receive and give clear instructions, comprehend, write reports, prepare documentation and make effective presentations.

PO4: Ability to work independently and also in a team in a diverse and multidisciplinary situations.

PO5: Ability to apply management principles in to practice and exhibiting leadership qualities.

PO6: Ability to keep abreast with the latest developments in the business environment by environmental scanning.

PO7: Ability to do research and apply modern statistical tools and computational tools to analyse the situations and take a right decisions.

PO8: Demonstrate IT knowledge and skills for efficient and effective business processes and develop innovative methods of applying IT and e-commerce for competitive advantage.

PO9: Ability to generate new & innovative ideas, putting it into practice by knowing the particulars of

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starting a business.

PO10: Demonstrate ethical conduct in personal and professional decisions and appreciation of business ethics and social responsibility and environmental concerns in the decision making process.

PO11: Ability to actively involve and understanding the importance of independent and continuous learning and research.

PO12: Formulate and communicate an original business idea to the broader business public and or formulate and communicate business plan

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: Equip students with necessary knowledge and managerial skills and competencies to occupy positions of management and administration in business, industry, public system and the government.

PSO2: Develop the ability to examine and analyse the impact of the changing environment and to respond appropriately at tactical and strategic level.

PSO3: Develop essential decision making, critical and creative thinking, leadership and entrepreneurial abilities.

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: Student is able to

CO1: Examine the Management concepts and functions. [K4]
CO2: Apply the concepts of planning, decision making. [K3]
CO3: Apply the concepts of delegation of authority, decentralization and departmentation in real life situations. [K3]
CO4: Analyse the controlling principles and practices, Ethics and corporate social responsibility. [K4]
CO5: Adapt the effective organizational behavior and climate. [K6]
CO6: Evaluate the basic concepts of organizational conflicts and climate. [K5]

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		LEVEL	
	UNIT I		
1	Explain the functions of management	K2	CO1
2	What are the characteristics of management?	K1	CO1
3	Discuss Henry fayol 14 principles	K6	CO1
	UNIT 2		
1	Discuss the planning process	K6	CO2
2	What are the characteristics of planning?	K1	CO2
3	Discuss the decision making process	K6	CO2
4	Explain the various types of planning premises.	K2	CO2
	UNIT 3		
1	What are the principles of organizing?	K1	CO3
2	Explain the process of authority and responsibility.	K2	CO3
3	Explain the various types of organization structures	K2	CO3
	UNIT 4		
1	Explain the types of controlling techniques	K2	CO4
2	How can you design effective control system?	K1	CO4
3	Classify the various principles of coordination	K4	CO4
	UNIT 5		
1	Define Organizational Behavior and explain Nature of the Organizational Behavior	K1	CO5
2	What is the importance of organizational behavior and culture?	K1	CO5
3	Explain the scope of organizational behavior and culture	K2	CO5
	UNIT 6		
1	Discuss the organizational level of conflicts	K6	CO6
2	What are the factors affecting on organizational change?	K1	CO6
3	Explain the process of organizational development	K2	CO6

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Subject Code: 19MBA1TH01

MBA I Semester Regular Examinations, Model Paper-I

MANAGEMENT THEORY AND ORGANIZATIONAL BEHAVIOUR

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

Answer FOUR of the following

All questions carry equal marks. Part-A is compulsory

****

(PART-A)

1. Case Study 1x12 = 12 M

The managing director of ABC airlines, seeing that costs were getting out of control, as the company grow, brought in as an assistant a brilliant young man who was a certified charted accountant. The assistant was told about the company's problem of rising costs and was asked for his help in solving the problem.

The new assistant gathered a staff of high quality industrial engineers, financial analysts and recent top graduates from one of the best known graduate schools of business administration. After laying out the company's problem, he assigned them to investigate cost problems and management methods in the airline's operations, maintenance, engineering and sales departments. After a number of studies, the M.Ds assistant found many sources of inefficiency in the various departments and initiated a number of changes in operating practices. In addition, he made many reports to the MD outlining in detail in efficiencies his staff had found and the measures being taken to corrupt them. These reports also showed, with ample supporting detail, the crores of rupees, which his actions were saving the company.

(PART-B)

PART–B (48 Marks)

Answer any FOUR Questions

S. No	Question	Cognitive Level	CO	Marks
2	Define management. Explain nature and scope of management	K2	1	12
3	What is planning? Discuss the decision making process	K1	2	12
4	Differentiate Power and Authority, could you agree if span of management is increased, organisation effectiveness is disturbed.	K4	3	12
5	Training is short term, development is long term perspective. Explain	K2	4	12
6	What is meant by motivation? Write the importance of motivation with theory X and Y.	K1	5	12
7	Discuss the role of corporate social responsibility of organizations'	K6	6	12

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Department of MCA

COURSE INFORMATION SHEET

PROGRAMME: I M.C.A I Sem.,	
COURSE: **DATABASE MANAGEMENT SYSTEMS**	Semester : **I** CREDITS: 3
COURSE CODE:**R20MCA103** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: DATABASE	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Able to master the basic concepts and understand the applications of database systems.
CO2	Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
CO3	Able to construct unary/binary/set/aggregate queries in Relational Algebra.
CO4	Understand and apply database normalization principles.

SYLLABUS:

UNIT	DETAILS
I	Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, History of Data base Systems. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.
II	Algebra and Calculus: Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus. Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.
III	Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND,THIRD Normal forms – BCNF –Properties of Decompositions- Loss less-join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.
IV	Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks –

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	Performance of Locking – Transaction Support in SQL. Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery
V	Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations. Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.
VI	Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3 rd Edition, 2003.
T2	Data base System Concepts, A.Silberschatz,H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
T3	Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant B.Navathe,Pearson Education,2008.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Database Management System Oracle SQL and PL/SQL,P.K.DasGupta,PHI.
R2	Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
R3	Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg,Pearson education.
R4	Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2 nd ,ELSEVIER
R5	Fundamentals of Relational Database Management Systems,S.Sumathi,S.Esakkirajan, Springer.
R6	Introduction to Database Management,M.L.Gillenson and others,Wiley Student Edition.
R7	Database Development and Management,Lee Chao,Auerbach publications,Taylor & Francis Group.
R8	Introduction to Database Systems,C.J.Date,Pearson Education.

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TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Computer Networks Techniques.	

WEB SOURCE REFERENCES:

1	nptel.ac.in/courses/106106093
2	nptel.ac.in/courses/106104135

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
C103.1	3	3	1	1	-	-	-	-	-	-	-	2	-	3
C103.2	3	3	2	2	-	-	-	-	-	-	-	2	-	3
C103.3	3	3	2	2	1	-	-	-	-	-	-	2	-	3
C103.4	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
C103	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

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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

B.Siva prasad
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) :

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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

CO 1: Able to master the basic concepts and understand the applications of database systems.
CO 2: Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
CO 3: Able to construct unary/binary/set/aggregate queries in Relational Algebra.
CO 4: Understand and apply database normalization principles.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	a) Define DBMS. Explain about the Purpose of DBMS. b) Briefly Explain about levels of Data Abstraction	K1	CO1
2	a) Differentiate between DDL and DML. b) Define Entity, Attribute and Relationship set with neat diagrams	K2 K1	CO1
3	a) Briefly Explain Integrity Constraints over Relations. b) Briefly Explain Structure of DBMS.	K2	CO1
	UNIT 2		
1	a) Explain about Selection and Projection operators in Relational Algebra. b) Explain the Types of Set Operations in Detail.	K1,K2	CO2
2	a) Discuss about different types of Joins with Example.	K2	CO2

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	b) Briefly discuss about the difference between TRC and DRC.		
3	Explain set operations in relational algebra	K1,K2	CO2
	UNIT 3		
1	Closure set of functional dependencies	K1,K2	CO3
2	Explain Normal forms	K1,K2	CO3
3	Explain join dependency ,multi value dependency	K1,K2	CO3
	UNIT 4		
1	a) Explain in briefly about ACID properties. b) Define Schedule. Explain about serializable schedule.	K1	CO3
2	a) Define Lock. Explain Strict 2PL locking protocol b) b) Explain dead lock and dead lock prevention Techniques	K2	CO3
3	a) Define Thomas Write rule. b) Define CLR and Explain	K1	CO3
4	Explain B+ Trees in Concurrency control.	K1	CO3
	UNIT 5		
1	a) Explain in detail about file organisation. b) Define Index. Explain different types of Indexing techniques.	K2	CO4
2	a) Explain Index data structures. b) Briefly Explain Comparison on file Organisation.	K1,K2	CO4
3	Discuss about Memory hierarchy.	K2	CO4
4	Briefly Explain RAID Levels.	K2	CO4
	UNIT 6		
1	Explain acid properties	K1,K5	CO4
2	Explain two phase locking protocol	K1,K2	CO4
3	Define Thomas write rules	K1,K2	CO4

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Model Question Paper

Code: R20MCA103

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(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
I MCA II SEM., Regular Examinations
: DATABASE MANAGEMENT SYSTEMS

[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	Define DBMS	K2	1	2
	b	Define joins, divisions	K2	2	2
	c	What is join dependency	K3	3	2
	d	What Ahead log protocal	K2	4	2
	e	Explain Tree based.	K4	5	2
	f	Define Hashing	K4	6	2

PART–B (48 Marks)
Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	Explain Structure of DBMS	K2,K4	1	6
	b	Write Integrity Constrains over Relations	K3	1	6
3	a	Write different types of joins with Example	K3	2	8
	b	Explain the difference between TRC and DRC with Example.	K4	2	4
4	a	Explain the problems that caused by the Redundancy.	K4	3	6

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	b	Write Normal Forms. Explain 2nd Normal Form.	K3	3	6
5	a	Explain different types of Indexing techniques.	K4	4	8
	b	Explain ISAM.	K4	4	6
6	a	Write different types of RAID levels.	K3	5	6
	b	Explain ACID Properties?	K4	5	6
7	Explain B+ Trees with example and write Hashing Techniques.		K4,K3	12	12

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DATABASE MANAGEMENT SYSTEMS

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20MCA103	DATABASE MANAGEMENT SYSTEMS(R20)	I	MCA	6	A

COURSE OUTCOMES: Students are able to

CO1: Able to master the basic concepts and understand the applications of database systems. **[K1 and K2]**

CO2: Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model. **[K2 and K3]**.

CO3: Able to construct unary/binary/set/aggregate queries in Relational Algebra.**[k4]**

CO4: Understand and apply database normalization principles.**[k4]**

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO1: Able to master the basic concepts and understand the applications of database systems. **[K1 and K2]**		**UNIT I**			
		1.	Database System Applications, Purpose of Database Systems.	T1 R1	10	Chalk & Talk, PPT, Active Learning & Tutorial
		2	Database Languages – DDL, DML, Database Access from Applications Programs.	T1		
		3	Relationships and Relationship sets, Additional features of ER Model.	T1		
2	CO1: Able to master the basic concepts and understand the applications of database systems. **[K1 and K2]**		**UNIT II**			
		1	Relational Algebra and Calculus: Relational Algebra – Selection and Projection, Set operations, Renaming.	T2	20	Chalk & Talk, PPT Tutorial, Active Learning
		2	Joins, Division, Examples of Algebra Queries	T2		
		3	Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins.	T2		
3	CO2: Able to construct an entity-relationship(E-R) model from specifications and to transform to relational model. **[K2 AND K3]**		**UNIT III**			
		1	Introduction to Schema Refinement – Problems Caused by redundancy.	T1, R1	10	Chalk & Talk, PPT, Tutorial
		2	Normal Forms – FIRST, SECOND,THIRD Normal forms – BCNF –Properties of Decompositions- Loss less-join Decomposition.	T1, R1		
		3	Join Dependencies, FIFTH Normal form, Inclusion Dependencies.	T1, R1		
MID I EXAMINATION DURING EIGHTH WEEK						
4	CO3: Able to construct		**UNIT IV**			
		1	The ACID Properties	T2, R2	7	Chalk & Talk, PPT &
		2	Deadlocks – Performance of Locking Transaction Support in SQL.	T2		

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	unary/binary/set/aggregate queries in Relational Algebra. [[K4]	3	Case Study: face Recognition	T2		Tutorial, , Industrial Visit, Demonstration with models.
5	CO3: Able to construct unary/binary/set/aggregate queries in Relational Algebra. [K4]		**UNIT V**			
		1.	Data on External Storage, File Organization and Indexing – Clustered Indexes	T1, R1	6	Chalk & Talk, PPT, Virtual labs, Tutorial, & Project based learning
		2.	Primary and Secondary Indexes, Index data Structures	T1, R1		
		3.	Disks and Files: -The Memory Hierarchy.	T1, R1		
6	CO4: Understand and apply database normalization principles [K4]		**UNIT VI**			
		1	Tree Structured Indexing: Intuitions for tree Indexes.	T1, R1	17	Chalk & Talk, PPT, Virtual labs, Tutorial, & Project based learning
		2.	Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.	T1, R1		
		3	Static Hashing, Extendable hashing.	T1, R1		
				Total	70	
MID II EXAMINATION DURING SIXTEENTH WEEK						
END EXAMINATIONS						

Text Books:

T1: Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3 rd Edition, 2003.

T2: Data base System Concepts, A.Silberschatz,H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.

Reference Books:

R1: Database Management System Oracle SQL and PL/SQL,P.K.DasGupta,PHI.
R2: Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
R3: Database Systems, A Practical approach to Design Implementation and ManagementFourth edition, Thomas Connolly, Carolyn Begg,Pearson education.
R4: Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2 nd ed.,ELSEVIER

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R5: Fundamentals of Relational Database Management Systems,S.Sumathi,S.Esakkirajan, Springer.

Principal HOD Faculty

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech., II Semester, ECE-A Class Time Table for the A.Y. 2022-2023

ROOM.NO:3301 — W.E.F: 16.01.2023

	1	2	3	4		5	6	7
FROM	09:10	10:00	11:00	11:50	12:40	01:30	02:20	03:10
TO	10:00	10:50	11:50	12:40	01:30	02:20	03:10	04:00
MON	IOT	IOT LAB			LUNCH BREAK	A&DC	EC&PC	IOT
TUE	EMWTL	A&DC	EC&PC	TCE-II		A&DC/EC&PC LAB		
WED	EMWTL	TCE-II	IOT	EMWTL		TCE-II	A&DC	EC&PC
THU	A&DC	IOT	EMWTL	TCE-II		EC&PC	A&DC	EMWTL
FRI	D&SEC LAB					EC&PC	IOT	A&DC
SAT	EC&PC	TCE-II	EMWTL	IOT		A&DC/EC&PC LAB		

BREAK 10:50-11:00

THEORY

IOT	INTERNET OF THINGS	Dr.K.RAJU
A&DC	ANALOG AND DIGITAL COMMUNICATIONS	Mr.P.JAYA BABU
EC&PC	ELECTRONIC CIRCUITS AND PULSE CIRCUITS	Mr.PSS.CHAKRAVARTHY
EMWTL	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	Dr.B.SUNEETHA
TCE-II	TECHNICAL COMMUNICATIVE ENGLISH-II	Mr.A.VENUGOPAL

LABORATORY

IOT LAB	INTERNET OF THINGS LAB	Dr.K.RAJU Dr.SK.BAJID VALI
A&DC LAB	ANALOG AND DIGITAL COMMUNICATIONS LAB	Mr.P.JAYA BABU Mr.SK.MD.SHAREEF
EC&PC LAB	ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB	Mr.SK.MD.GOUSE Mr.PSS.CHAKRA VARTHY Mrs.G.RAJAVALI
D&SEC LAB	DESIGN AND SIMULATION OF ELECTRONIC CIRCUITS LAB	Dr.Y.JAIPAL REDDY Mrs.SK.AREEFA BEGAM

CLASS TEACHER:Mr.P.S.S.CHAKRAVARTHY

MENTORS:Mr.A.RAVEENDRA BABU,Mr.P.BHAGYA RAJU,Dr.K.RAJU

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NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS): NARASARAOPET

DEPARTMENT OF CIVIL ENGINEERING

III B.TECH II SEM TIME TABLE - DECEMBER, 2022

Section - A Room No: **1306** **w.e.f : 12-12-2022**

Time	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30.-2.20	2.20-3.10	3.10-4.00
MON	ENGLISH - LAB				EE	UNCH BREA	EITK	FE	H&IE
TUE	FE	RS&GIS	BREAK	H&IE	EE		D&DSS		RS&GIS
WED	FE	D&DSS		EE	RS&GIS		GIS/EE - LAB		
THU	D&DSS	RS&GIS		FE	EE		GIS/EE - LAB		
FRI	H&IE	RS&GIS		D&DSS			FE	EITK	H&IE
SAT	EE	H&IE		H&IE	FE		CED - LAB		

Class Incharge: Mr. K. ANIL KUMAR

CODE	SUBJECT NAME	FACULTY NAME
R20CC32OE01	Remote Sensing And GIS	Dr. P. Naga Sowjanya
R20CE3201	Design and Drawing Of Steel Structures	Dr. G. Ranganathan
R20CE3202	Environmental Engineering	D. Pradeep
R20CE3203	Hydrology & Irrigation Engineering	D. Naga Raju
R20CE3204	Foundation Engineering	Dr.CH.Kannam Naidu
R20CE32L1	Environmental Engineering Lab	D. Pradeep -/ S.V. Siva Raju
R20CE32L2	GIS Lab	Mr. K. Venkatesh/ B. Siva Manikanta.
R20CE32L3	Civil Engineering Drawing	Mr.G. Anjineyulu/ A. Suseela
R20CC32L4	English for Employability Skills	Mr.M. Purnachandra Rao
R20CC32MC1	Essence of Indian Traditional Knowledge	Mr. Y. Suresh

TIME TABLE I/C IQAC HOD-CE PRINCIPAL

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NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET (AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
II B.TECH II SEM TIME TABLE

ROOM NO:1212

Wef: 17/01/2023

	1	2	BREAK	3	4		5	6	7	8
TIMINGS	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30-2.20	2.20-3.10	3.10-4.00	
MON	TCE-II	KOM		MT		LUNCH	CVPS		TCE-II	Honors/ Minors
TUE	ATD	ATD/CAE LAB					KOM		TCE-II	Honors/ Minors
WED	KOM	MD/MT LAB					ATD		Honors/Minors	
THU	ATD	KOM		MT			CVPS			ATD
FRI	TCE-II	ATD/CAE LAB					TCE-II	CVPS		Honors/ Minors
SAT	KOM			ATD			MD/MT LAB			

CODE	SUBJECT	FACULTY
ATD	Applied Thermodynamics	Mr.K.Johan Babu
CVPS	Complex Variables, Probability& Statistics	Msr.A. Aparna
KOM	Kinematics of Machinery	Mr.T.Ashok kumar
MT	Manufacturing Technology	Dr. D. Suneel
TCE-II	Technical & Communicative English-II	Mr.A.Venu Gopal
MD LAB	Machine Drawing Lab	Mr.R.Chinna Rao / T.N.V.Mahesh Babu
ATD LAB	Applied Thermodynamics Lab	Mr.Y.Suvarna Kumar/A.Pavan Kumar
MT LAB	Manufacturing Technology Lab	Dr.M.Sreenivasa Kumar/ T.Ashok Kumar
CAE LAB	Computer Aided Engineering Lab	D.Raghavendra/ B.Ajay Kumar

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NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET (AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
III B.TECH II SEM TIME TABLE
Section-A

ROOM NO: 1320 **Wef: 12/12/2022**

	1	2	BREAK	3	4		5	6	7	8
TIMINGS	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30-2.20	2.20-3.10	3.10-4.00	
MON	ROB&A			EITK	DM	LUNCH	DME-II	DOM		Honors/ Minors
TUE	DME-II	HT/ MT&MD LAB					ROB&A	DOM		Honors/ Minors
WED	DOM			HT			EITK	DM	Honors/Minors	
THU	HT			DM	DME-II		MT&MD / P&HVAC LAB			
FRI	DME-II	HT/ P&HVAC LAB					EES LAB			
SAT	DM			HT			ROB&A		DME-II	Honors/ Minors

CODE	SUBJECT	FACULTY
DME-II	Design of Machine Elements –II	Dr.T.Raja Santosh Kumar
HT	Heat Transfer	Dr.D.Jagadish
DOM	Dynamics of Machinery	Dr.B.Ravi Naik
ROB&A	Robotics & Applications	Mr.T.V.Rao
DM	Digital Marketing	Mrs:SD.Salma
MT&MD LAB	Machine Tools & Machine Dynamics Lab	Mr.M.Srinivasa Rao/N.Arun Kumar
HT LAB	Heat Transfer Lab	Mr.K. K.John Babu /E.Saidulu
P&HVAC-LAB	Pneumatics & HVAC Lab	Mr. M.Venkaiah/P.Sravani
EES LAB	English Employability Skills Lab	Mr.A.Venu Gopal
EITK	Essence of Indian Traditional Knowledge	Mr.D.Satish

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DEPARTMENT OF MCA
I MCA (2022 BATCH) II SEMESTER TIME TABLE

W.e.f:13-03-2023

DAY	9:10 TO 10:00	10:00 TO 10:50	10:50 TO 11:00	11:00 TO 11:50	11:50 TO 12:40	12:40 TO 01:30	01:30 TO 02:20	02:20 TO 03:10	03:10 TO 04:00
MON	DW&M	DW&M	BREAK	DAA	DAA	LUNCH	CN	CN	SE
TUE	OOP	OOP	BREAK	CN	LUNCH	Object Oriented Programming using JAVA Lab			
WED	OOP	OOP	BREAK	DAA	DAA	LUNCH	SE	SE	CN
THU	DAA	DAA	BREAK	DW&M	DW&M	LUNCH	OOP	OOP	SE
FRI	CN	CN	BREAK	SE	LUNCH	Statistical Programming with R Lab			
SAT	DW&M	Employability Skills Lab				LUNCH	DW&M	SE	SPORTS

S.NO	FACULTY NAME	SUBJECT NAME
1	V. MAHESH BABU	OBJECT ORIENTED PROGRAMMING USING JAVA
2	G. SAMBASIVA RAO	DESIGN AND ANALYSIS OF ALGORITHMS
3	B. SIVA PRASAD	SOFTWARE ENGINEERING
4	M. SAI YASWANTH	COMPUTER NETWORKS
5	CH. SRAVAN KUMAR	DATA WAREHOUSING AND DATA MINING
6	V. MAHESH BABU & CH. SRAVAN KUMAR	OBJECT ORIENTED PROGRAMMING USING JAVA LAB
7	G. SAMBASIVA RAO	STATISTICAL PROGRAMMING WITH R LAB
8	SK. RAFI (BS&H)	EMPLOYABILITY SKILLS LAB

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MBA DEPARTMENT

2022-24 Batch MBA II SEM TIME TABLE

w.e.f. 13-03-2023

	1	2		3	4		5	6	7
	09:10 to 10:00	10:00 to 10:50	10:50 to 11:00	11:00 to 11:50	11:50 to 12:40	12:40 to 01:30	01:30 to 02:20	02:20 to 03:10	03:10 to 04:00
MON	POM	BRM	BREAK	FM	BL	LUNCH	HRM	MM	M. P(I. S)
TUE	HRM	BL		POM	MM		FM	BRM	M. P(T.M)
WED	BL	MM		BRM	HRM		POM	FM	SPORTS
THU	IT FOR MANAGERS-2			IT FOR MANAGERS-2			HRM	MM	M. P(S.S)
FRI	BRM	FM		POM	MM		BL	B-Lab(M.A)	LIBRARY
SAT	FM	BRM		HRM	BL		POM	B-Lab(Y.S)	B-Lab(D.S)

NAME OF THE FACULTY HANDLING THE SUBJECTS :

FM	Financial Management	:	T. Mallikarjuna Rao
HRM	Human Resource Management	:	SD.Salma
MM	Marketing Management	:	Dr. P. Patttabhi Ram
POM	Production & Operations Management	:	Dr. M. Aravind
CL	Business Law	:	I.Sridhar
BRM	Business Research Methodology	:	Y.Suresh
IT-LAB-2	IT for Managers-2	:	M. Sai Yaswanth / B.Siva Prasad
B-LAB	Business Lab	:	All the faculty
M.P	Mini Project	:	All the faculty

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NARASARAOPETA ENGINEERING COLLEGE :: NARASARAOPET
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DEPARTMENT OF BASIC SCIENCES AND HUMANITIES
ACADEMIC YEAR : 2022-2023
I B.Tech [ECE-C] II SEMESTER TIME TABLE

ROOM NO:					WEF: 13/3/23			
Day	1	2	3		4	5	6	7
Time	9.10 –10.00	10.00 10.50	10.50 11.40	11.40 -12.30	12.30 –1.20	1.20 – 2.10	2.20 – 3.10	3.10-4.00
MON	NA	AP	AP	LUNCH	DS	DS	DEVC	PSP
TUE	DS LAB				PSP	DS	NA	NA
WED	DEVC	DEVC	NA		AP	PYTHON LAB		
THU	AP	PSP	PSP		DEVC	DEVC	AP	MENTORING
FRI	DS	NA	PSP		PSP	AP	COI	LIBRARY/ SPORTS
SAT	DEVC	DS	COI		NA	PHYSICS LAB		

DEVC :Differential Equations&Vector Calculus	B. Swapna
PSP:Problem Solving Using Python	M.H.H. Sastry
AP:Applied Physics	Dr. N. Giridhar
DS:Data Structures Using C	M. Mounica Naga Bhavani
NA:Network Analysis	Dr. Sk. Md. Shareef
COI:Constitution of India	D. Satish Babu
AP:Applied Physics Lab	Dr. N. Giridhar
PSP:Problem Solving Using Python Lab	M.H.H. Sastry
DS:Data Structures Using C Lab	M. Mounica Naga Bhavani

HEAD OF THE DEPARTMENT

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NARASARAOPETA ENGINEERING COLLEGE (Autonomous)

Department of Electrical and Electronics Engineering

Academic year 2022-2023 (Second semester)

Class Time Table

Class In-Charge:-Mr. Sk. Karimulla **Class: II B.Tech/II Sem/EEE-A** **Room No: - 3312** **w.e.f:-18/01/23**

TIME / WEEK	09:10am-10:00am	10:00am-10:50am	10:50am-11:00am	11:00am-11:50am	11:50am-12:40pm	12:40pm-01:30pm	01:30pm-02:20pm	02:20pm-03:10pm	03:10pm-04:00pm
MON	TEC-II	DE	**BREAK**	EM-II	CS	**LUNCH**	DE/EM-II LAB		
TUE	CS	TEC-II		EM-II	DE		DE/CS LAB		
WED	TEC-II	DE		CS	CVPS		CVPS	EM-II	TEC-II
THU	CVPS	EM-II		CVPS	TEC-II		CS	DE	CS
FRI	CS	CS/EM-II LAB					CS	EM-II	CVPS
SAT	EM-II	CVPS	**BREAK**	DE	TEC-II		NTM-LAB		

S.No.		Name of the Subject	Name of the Faculty	No. of Periods/Week
1.	TEC-II	Technical and Communicative English-II	Mr.G.R.K Murthy	6
2.	CVPS	Complex Variables , Probability and Statistics	Dr.Ch.Maheswari	6
3.	CS	Control Systems	Mr. G Nagaraju	7
4.	EM-II	Electrical Machines-II	Mr. Sk. Karimula	6
5.	DE	Digital Electronics	Dr.P.Lakshmanan	5
6.	CS LAB	Control System Lab	Mrs. Raghavarani/ Mr. G Nagaraju	3
7	EM -II LAB	Electrical Machines Lab-II	Mr. Sk. Karimula/ Mr. P.D.V.S.K.Kishore	3
8	DE– LAB	Digital Electronics Laboratory	Mrs. Sk. Areefa Begum	3
9	NTM-LAB	Numerical Techniques using MATLAB	Mr. Sk Abdul Kalam	3

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DEPARTMENT OF CIVIL ENGINEERING

II B.TECH II SEM TIME TABLE - JANUARY, 2023

Section - ALL Room No: **1306** **w.e.f : 18-01-2023**

Time	9.10-10.00	10.00-10.50	10.50-11.00	11.00-11.50	11.50-12.40	12.40-1.30	1.30.-2.20	2.20-3.10	3.10-4.00
MON	EG	SM	BREAK	SM	EG	LUNCH BREAK	H&HM	SA	
TUE	SM	SURVEYING/CT - LAB					FM&H/EG - LAB		
WED	TCE-II	EG		TCE-II	SM		SA	EG	H&HM
THU	H&HM			SM			SURVEYING/CT - LAB		
FRI	TCE-II	H&HM		EG	SA		FM&H/EG - LAB		
SAT	SA			TCE-II	EG		H&HM	MENTOR	TCE-II

Class Incharge: Mr. M.N.S.SAMBA SIVA RAO

CODE	SUBJECT NAME	FACULTY NAME
R20CC2201	TECHNICAL AND COMMUNICATIVE ENGLISH – II	Mr. S.A. RIYAZ
R20CE2202	ENGINEERING GEOLOGY	Mr. K. ANIL KUMAR
R20CE2203	STRUCTURAL ANALYSIS	Dr.Y J CHNDRAMOULY
R20CE2204	STRENGTH OF MATERIALS-II	Mr. K. MEGHANADH
R20CE2205	HYDRAULICS AND HYDRAULIC MACHINERY	Mr. M.N.S.SAMBA SIVA RAO
R20CE22L1	ENGINEERING GEOLOGY LAB	Mr. K. ANIL KUMAR/ M. VASAVI
R20CE22L2	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	Mr. M.N.S.SAMBA SIVA RAO/ K. PRATYUSHA
R20CE22L3	CONCRETE TECHNOLOGY LAB	M. VASAVIN. /N.VENKATESWARLU
R20CE22SC1	ADVANCED SURVEYING	Mr. K. MEGHANADH/ K. PRATYUSHA

TIME TABLE I/C IQAC **HOD-CE** PRINCIPAL NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS) NARASARAOPET - 522 601. Guntur (Dist.), A.P. **PRINCIPAL**

NARASARAOPETA ENGINEERING COLLEGE:: NARASARAOPET
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DEPARTMENT OF CHEMISTRY
ENGINEERING CHEMISTRY

BRANCH: CSE, IT, AI & CS **YEAR & SEM: I BTECH/II SEM** **A.Y: 2022-23**

LESSON PLAN

S.No.	No. of Periods	Cumulative Periods	Topic	Methodology
			UNIT-I	
			WATER CHEMISTRY	
1	1	1	Sources of water, Impurities of water, Hardness, types and its units.	Chalk & Talk
2	1	2	Industrial water characteristics.	Chalk & Talk
3	2	4	External treatment methods–(Lime–Soda, Zeolite and Ion exchange process)	PPT
4	1	5	Numerical Problems on lime-soda process.	Chalk & Talk
5	2	7	Desalination of brackish water (Reverse osmosis and Electrodialysis)	PPT and Tutorial
6	2	9	Estimation of Alkalinity and hardness (complex-metric) of water.	Virtual Lab
7	3	12	Estimation of free chlorine (break point chlorination), Dissolved Oxygen, BOD and COD.	Students Seminars
			UNIT-II	
			POLYMERS AND FUEL TECHNOLOGY	
8	3	15	Introduction-Classification of polymers–Polymerization, types and mechanism of polymerization	Chalk & Talk
9	1	16	Plastics, Thermoplastics and thermosetting plastics	Active Learning
10	1	17	Plastic moulding methods (Compression and Injection moulding methods)	PPT & Web Resources
11	2	19	Rubbers –Natural rubber processing- vulcanization	Students Seminars
12	1	20	Introduction, Classification, Calorific value–HCV and LCV	Chalk & Talk
13	1	21	Problems on calorific value (Theoretical Dulongs Formula)	Chalk & Talk
14	1	22	Coal–Proximate and ultimate analysis.	PPT
15	2	24	Petroleum–Refining, Catalytic Cracking, knocking and anti knocking agents-Octane and Cetane Number	PPT & Quiz
			UNIT-III	
			CHEMISTRY OF ADVANCED MATERIALS	
16	1	25	Introduction-Sol-Gel method, chemical reduction metod.	Chalk & Talk
17	1	26	Characterization of nanomaterials by BET and TEM methods.	PPT & Web Resources
18	1	27	Types and Preparation of carbon nanotubes, properties and applications	PPT & Tutorial
19	1	28	Types and preparation of fullerenes, properties and	Chalk & Talk

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			applications.	
20	1	29	Introduction, types and engineering applications of liquid crystals	PPT & Quiz
21	2	31	Composites-Introduction-Types-Applications-cermets	Students Seminars
			UNIT-IV	
			ELECTRO CHEMICAL CELLS AND CORROSION	
22	1	32	Introduction, Galvanic cells, Single electrode potential	Chalk & Talk
23	1	33	Reference electrodes, Electrochemical series	PPT
24	3	37	Batteries (primary, secondary and fuel cells)	PPT & Quiz
25	2	39	Causes and effects of corrosion, Theories of corrosion (dry, chemical and electrochemical corrosion)	PPT & Web Resources
26	3	41	Factors effecting corrosion, Corrosion control methods, Cathode protection, Sacrificial anodic, Impressed current methods	Chalk & Talk, Quiz
27	2	43	Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)	PPT & Web Resources
28	2	45	Organic surface coatings–Paints–Constituents and their functions-pigment volume concentration,	NPTEL/Moocs
			UNIT-V	
			CHEMISTRY OF ENGINEERING MATERIALS	
30	2	47	Introduction-Mechanism of Lubrication-Classification of lubricants	Chalk & Talk
31	1	48	Properties and Testing of Lubricants-Viscosity, Flash and Fire point	PPT & Web Resources
32	1	49	Oiliness, Cloud and Pour point, Emulsification.	PPT & Quiz
33	2	51	Carbon Residue, Aniline point, Acid value, Saponification value and Iodine value,	Students Seminars & Active Learning
34	2	53	Introduction-manufacture of Port land cement	Chalk & Talk
35	2	55	Setting and Hardening of Cement-failures of cement-slag cement	PPT & Tutorial
36	1	56	Refractory-Introduction-Classification	Chalk & Talk
37	2	58	Properties Refractories-Refractoriness, Chemical Inertness	PPT
38	2	60	Properties Refractories-Strength (RUL-Test),Porosity	Chalk & Talk, Quiz

1) 2) 3) 4) T. Anusha 5)

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

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical and Electronics Engineering	
COURSE:**DIGITAL ELECTRONICS**	Semester : **II/II** CREDITS: **3**
COURSE CODE: **R20EE2205** REGULATION: **R20**	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. **[K2,K3]**
CO2	Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions. **[K3,K4]**
CO3	Design and analyze combinational circuits for various Applications. **[K2,K3]**
CO4	Design and analyze sequential circuits for various Applications. **[K2,K4]**
CO5	Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs. **[K2,K4]**

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

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	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

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MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C203	2.8		2.4		2.4		2.4						2.8	2.6

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

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.

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(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: Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD. **[K2, K3]**

CO2: Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions. **[K3, K4]**

CO3: Design and analyze combinational circuits for various Applications. **[K2, K3]**

CO4: Design and analyze sequential circuits for various Applications. **[K2, K4]**

CO5: Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs. **[K2, 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
	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 $F(A,B,C,D) = \sum m(0,1,4,8,9,10)$	K3	CO2

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	UNIT 3		
1	**Design** a 1:8 Demultiplexer using two 1:4 Demultiplexer	**K6**	**CO3**
2	**Design** and draw a full adder which uses two half adders	**K6**	**CO3**
3	**Explain** the operation of half subtractor? Realize full subtractor using logic gates.	**K2**	**CO3**
	UNIT 4		
1	**Explain** the race around condition and how to avoid it along with circuit diagram	**K2**	**CO4**
2	What do you mean by triggering? **Explain** the various triggering modes with examples.	**K3**	**CO4**
3	**Convert** the following a) JK flip-flop to T flip-flop b) RS flip-flop to D flip-flop	**K6**	**CO4**
	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**	**CO5**
2	**Implement** the following multi Boolean function using 3*4*2 PLA PLD	**K2**	**CO5**
3	**Design** a combinational using a PROM. The circuit accepts 3-bit binary number and generates its equivalent Excess-3 code	**K2**	**CO5**

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

Sub Code: R20EE2205 **DIGITAL ELECTRONICS**

Time: 3 hours (EEE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No.		Questions	CO	KL	Marks
		Unit-I			
1	a	i) Perform the binary subtraction for the following using 1's compliment method. a) 28-8 b) 30-25 c) 25.5-12.25 d) 10.625 - 8.75	1	K3	[7M]
		ii) Perform the following subtraction operations using 9's and 10's complements a) 83-25 b) 37-69 b) 56.25-17.12	1	K3	[67M]
		OR			
	b	i) Perform the following subtraction operations using 2's compliment. a) (111001)2-(101011)2 b) (1111)2-(1010)2 c) (112)10-(65)10 d) (100.5)10-(50.75)10	1	K3	[7M]
		ii) Convert the following to Decimal and then to octal. a) 25716 b) 19916 c) 101100012 d) 110011002	1	K3	[7M]
		Unit-II			
2	a	i) Reduce the following expressions using K-map a) AB + ABC + ABC + BC b) AB + AC + C + AD + ABC + ABC	2	K3	[7M]
		ii) Simplify the following Boolean function by using tabulation method. f (A, B, C, D) = ∑m (0,1,2,5,7,8,9,10,13,15)	2	K3	[7M]
		OR			
	b	i) Find the minimum product-of-sums form for the following functions a) f_1 = ∑m (0, 1, 2, 3, 4, 9, 10, 13, 14) ii) f_2 = ABC' + AB + C + BC' + DB'	2	K3	[7M]
		ii) Obtain the minimal expression for f = ∑m (1, 2, 3, 5, 6, 7, 8, 9, 12, 13, 15) using the tabularmethod	2	K3	[7M]
		Unit-III			
3	a	i) Explain the operation of carry look-a-head adder?	3	K2	[7M]
		ii) Implement the following logic functions using 8 × 1 and 4 × 1 multiplexers? f (A, B, C, D) = ∑m(1, 3, 4, 6, 7, 9, 10, 11, 14)	3	K3	[7M]
		OR			
	b	i) Implement the following functions using a decoder. **$F_1(x,y,z)$ =∑m(0,1,3,7) $F_2(x,y,z)$ =∑m(2,3,7)**	3	K3	[7M]
		ii) Design 4 bit XS3 adder/subtractor circuit and explain the circuit operation?	3	K2	[7M]
		Unit-IV			
4	a	i) Realize D Flip-Flop using JK Flip-Flop.	4	K3	[8M]
		ii) Explain different types of shift registers.	4	K2	[6M]
		OR			
	b	i) Convert an SR flip flop into a) T flip flop b) JK flip flop	4	K2	[7M]
		ii) Explain the working of 3-bit bi-directional shift register with the help of diagram?	4	K2	[7M]
		Unit-V			
5	a	i) Draw and explain the block diagram of PLA.	5	K2	[7M]
		ii) Implement the following Boolean functions using PAL F1(x,y,z) =∑m (0,2,12,13) F2(x,y,z) = ∑m (0,2,6,8,9,12,13) F3(x,y,z) = ∑m (0,2,9,10,12,13) F4(x,y,z) = ∑m (1,3,4,6,12,14)	5	K3	[7M]
		OR			
	b	i) Write the programming table to implement BCD to using a PLA?	5	K2	[7M]
		ii) Design a combinational using a PROM. The circuit accepts 3-bit binary number and generates its equivalent Excess-3 code	5	K3	[7M]

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One more Model Paper to be added

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20EE2205	Digital Electronics (R20)	II	EEE	5	A & B

COURSE OUTCOMES: Students are able to

CO1: Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD **[K3]**.

CO2: Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions **[K4]**.

CO3: Design and analyze combinational circuits for various Applications **[K6]**.

CO4: Design and analyze sequential circuits for various Applications **[K6]**.

CO5: Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs **[K4]**

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD **[K3]**.		**Unit-1. Number Systems & Codes**			
		1.1	Number systems: Representation of numbers of different radix	T1, T2, R1	12	Chalk & Talk, PPT, Active Learning & Tutorial
		1.2	Conversation from one radix to another radix,	T1, T2, R1		
		1.3	r-1's compliments and r's compliments of signed numbers, Problem solving	T1, T2, R1		
		1.4	Arithmetic operations (addition & subtraction):	T1,T2, R1		
		1.5	Binary, Octal, Decimal & Hexadecimal. Binary Codes: Classifications, BCD, Execess-3, Gray and their Properties	T1,T2, R1		
2	CO2. Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions **[K4]**.		**Unit-2. Logic Operations And Minimization Techniques**			
		2.1	Logic Operations: Basic logic operations- AND, OR, NOT, Universal building blocks, EX-OR, EX- NOR gates	T1, T2, R3	12	Chalk & Talk, PPT Tutorial, Active Learning
		2.2	Boolean theorems, Principle of complementation & Duality,	T1, T2, R3		
		2.3	De-Morgan theorems, Standard SOP& POS forms and their conversions, Two level NAND – NAND and NOR- NOR realizations.	T1, T2, R3		
		2.4	Minimization Techniques: Minimization of logic functions using Boolean theorems,.	T1, T2, R3		
		2.5	minimization of switching functions using K-Map up to 4 variables, Tabular (Quine-McCluskey) minimization, Problem solving	T1,T2, R3		
3	CO 3. Design and analyze combinational circuits for various Applications **[K6]**.		**Unit-3. Combinational Logic Circuit Design**			
		3.1	Introduction, Design of Half adder, Full adder, half subtractor, Full subtractor. Applications:	T2, T3, R2	12	Chalk & Talk, PPT, Tutorial
		3.2	4-bit binary parallel adder, Binary parallel subtractor, Adder-Subtractor circuits & Look ahead carry adder.	T2, T3, R2		
		3.3	BCD adder circuit, Excess 3adder circuit. Encoders & Decoder: Design of decoder, Encoder, priority encoder,	T2, T3, R2		

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		3.4	Realization of Boolean functions using decoders. Multiplexers & Demultiplxer: Design, Higher order,	T2, T3, R2		
		3.5	Realization of Boolean functions using multiplexers & demultiplxer. Comparators: Design of 2, 3 & 4-bit digital comparator	T2, T3, R2		
MID I EXAMINATION DURING EIGHT WEEK						
4	CO 4. Design and analyze sequential circuits for various Applications **[K6]**.	**Unit-4. Sequential Logic Circuit Design**				
		4.1	Introduction, Distinctions between Combinational and Sequential circuits.	T2, T3, R4	12	Chalk & Talk, PPT & Tutorial.
		4.2	**Latches and Flip Flops:** SR, JK, D and T type Flip Flops, Race around Condition in JK, JK Master Slave flip flop	T2, T3, R4		
		4.3	Excitation table of all Flip Flops. Conversion from one flip-flop to another flip-flop.	T2, T3, R4		
		4.4	**Registers and Counters:** Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers	T2, T3, R4		
		4.5	Bidirectional Shift Registers, and Universal Shift register. Design of synchronous and Asynchronous Counters, Design and Operation of Ring and Twisted Ring Counter	T2, T3, R4		
5	CO 5. Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs **[K4]**	**Unit 5. introduction to PLDs**				
		5.1	Introduction to PLDs,	T3, R4	12	Chalk & Talk, PPT
		5.2	Realization of switching functions using PROM, PLA and PAL	T3, R4		
		5.3	Basics structures, Programming tables of PLDs, Merits & demerits of PROM	T3, R4		
		5.4	PAL and PLA comparison, Implementation of code converters. Introduction to FPGAs.	T3, R4		
				Total	60	
MID II EXAMINATION DURING SIXTEENTH WEEK						
END EXAMINATIONS						

Text Books:

T1 Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.

T2 Switching and Finite Automata Theory – ZviKohavi, Cambridge University Press, ThirdEdition, 2009.

T3 Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt.Ltd,Second Edition, 2014.

Reference Books:

R1 Modern Digital Electronics - R.P. Jain, TMH, Fourth Edition, 2009.

R2 Fundamentals of Logic Design – Charles H. Roth, Jr, Jaico Publishing House, Fourth Edition, 2006.

R3 Microelectronics – Jacob Millman, Arvin Grabel, TMH, Second Edition, 2009.

R4 Introduction to Switching Theory & Logical Design – Frederick J. Hill & Gerald R. Peterson,John Wiley & Sons Inc, Second Edition, 2012.

Principal **HOD** **Faculty**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LESSON PLAN
ACADEMIC YEAR: 2022 - 2023

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20EE3205	**ELECTRICAL DRIVES**	III-II	Electrical and Electronics Engineering	5	A & B

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	**Know** about the fundamentals of electric drive and different electric braking methods. [K3]
CO2	**Operation** of single-phase controlled converter fed dc motors and Analyse the steady state behavior of DC motor drive.[K4]
CO3	**Apply** the knowledge of choppers for speed control of DC Motors. [K3]
CO4	**Know** the analysis of speed control of induction motor with variable voltage and v/f Control. [K4]
CO5	**Know** the analysis of speed control mechanism of synchronous motors. [K4]

Unit No	Outcome		Topics/Activity	Text book	Total Periods	Delivery Method
1	**CO1:** **Know** about the fundamentals of electric drive and different electric braking methods. [K3]	**Fundamentals of Electric Drives**				
		1.1	Electric drive	T2,R1	1	Chalk & Talk
		1.2	Fundamental torque equation	T2,R1	1	Chalk & Talk
		1.3	Load torque components	T1, T2,R1	2	Chalk & Talk
		1.4	Nature and classification of load torques	T1, T2 R2	2	Chalk & Talk
		1.5	Steady state stability	T1, T2, R1	2	NPTEL
		1.6	Four quadrant operation of drive (hoist control)	T1, R2	2	Chalk & Talk
		1.7	Braking methods: Dynamic – Plugging – Regenerative methods	T1, R1	2	PPT
		1.8	Typical load torque Characteristics	T1, R2	2	Chalk & Talk
Assignment Exam – I						
2	**CO2:** **Operation** of single-phase controlled converter fed	**Controlled Converter Fed DC Motor Drives**				
		2.1	1-phase half controlled converter fed separately and self-excited DC motor drive	T1, R2,R1	1	Chalk & Talk
		2.2	1-phase Fully controlled converter fed separately and self-excited DC motor drive	T2,R2	2	Chalk & Talk
		2.3	Output voltage and current waveforms	T2, R2	2	Students seminars

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	dc motors and Analyse the steady state Behavior of DC motor drive. [K4]	2.4	Speed-torque expressions	T1, T2,R2	2	NPTEL
		2.5	Speed-torque characteristics	T1, T2, R2	2	Active learning
		2.6	Principle of operation of dual converters	T2, R2	1	Chalk & Talk
		2.7	dual converter fed DC motor drives	T2,R1	2	PPT
		2.8	Numerical	T2, R2	1	Chalk & Talk
3	**CO 3:** **Apply** the knowledge of choppers for speed control of DC Motors. [K3]	**DC–DC Converters Fed DC Motor Drives:**				
		3.1	Single quadrant – Two quadrant and four quadrant DC-DC converters	T2,T1, R2	2	Chalk & Talk
		3.2	DC-DC converter fed separately excited Motors	T,T2, R2	2	Chalk & Talk
		3.3	DC-DC converter fed Self excited Motors	T1, R2	1	Tutorials
		3.4	Continuous current operation	T1, T2,R2	2	Web resources
	MID I EXAMINATION					
	CO 3: **Apply** the knowledge of choppers for speed control of DC Motors. [K3]	3.5	Output voltage and current waveforms	T1, R1	2	PPT
		3.6	Speed–torque expressions Speed–torque characteristics	T1, R1	2	PPT,quiz
		3.7	Four quadrant operation	T1,T2	1	Students seminars
		3.8	Closed loop operation (qualitative treatment only).	T1, R1	2	PPT
4	**CO4:** **Know** the analysis of speed control of induction motor with variable voltage and v/f Control. [K4]	**Control of 3-phase Induction motor Drive**				
		4.1	Stator voltage control using 3-phase AC voltage regulators	T1,T2, R2	2	Chalk & Talk
		4.2	Waveforms –Speed torque Characteristics	T2,R1	2	Chalk & Talk
		4.3	Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter	T2,R1	2	Chalk & Talk
	Assignment Exam - II					
	CO4: **Know** the analysis of speed control of induction motor with variable voltage and v/f Control. [K4]	4.4	Closed loop v/f control of induction motor drives (qualitative treatment only).	T1, T2,R2	2	PPT,Quiz
		4.5	Static rotor resistance control – Slip power recovery schemes	T2,R1	2	Chalk & Talk
		4.6	Static Scherbius drive – Static Kramer drive	T2,R2	2	Chalk & Talk
		4.7	Performance and speed torque characteristics – Advantages – Applications	T2,R2	2	Chalk & Talk
5	**CO5:** **Know** the analysis of speed control mechanism of synchronous motors. [K4]	**Synchronous Motor Drives**				
		5.1	Separate control of synchronous motor	T1,T2, R2	2	Chalk & Talk
		5.2	self-control of synchronous motor employing load commutated thyristor inverter	T1, R2	2	Chalk & Talk

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		5.3	Closed loop control of synchronous motor drive	T1, R2	2	PPT,quiz
		5.4	PMSM (Basic Operation only).	T1,T2, R2	1	Chalk & Talk
MID II EXAMINATION						
END EXAMINATIONS						

TEXT BOOKS

T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Fundamentals of Electric Drives – by G K Dubey Narosa Publications
T2	Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

REFERENCE BOOKS

R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
R2	Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.

Faculty **HOD** **Principal**

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

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Electrical & Electronics Engineering	
COURSE: **ELECTRICAL DRIVES**	Semester : VI CREDITS: **3**
COURSE CODE: **R20EE3205** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **POWER ELECTRONICS**	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20EE3102	**PE**	Knowledge of Power Electronic Devices and Converters	**III/I**
R20EE2103	**EM I**	Knowledge about both AC & DC Machines	**II/I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Know** about the fundamentals of electric drive and different electric braking methods. [K3]
CO2	**Operation** of single-phase controlled converter fed dc motors and Analyse the steady state behavior of DC motor drive.[K4]
CO3	**Apply** the knowledge of choppers for speed control of DC Motors. [K3]
CO4	**Know** the analysis of speed control of induction motor with variable voltage and v/f Control. [K4]
CO5	**Know** the analysis of speed control mechanism of synchronous motors. [K4]

SYLLABUS:

UNIT	DETAILS
I	**Fundamentals of Electric Drives:** Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods, Typical load torque Characteristics –Selection of motor- Numerical problems.
II	**Controlled Converter Fed DC Motor Drives:** 1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics– Principle of operation of dual converters and dual converter fed DC motor drives –Numerical problems.
III	**DC–DC Converters Fed DC Motor Drives:** Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation – Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics – Four quadrant operation – Closed loop operation (qualitative treatment only).
IV	**Control of 3-phase Induction motor Drive:** Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque Characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop v/f control of induction motor drives (qualitative treatment only).Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages – Applications.

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V	**Synchronous Motor Drives:** Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter – closed loop control of synchronous motor drive – PMSM (Basic Operation only).

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Fundamentals of Electric Drives – by G K Dubey Narosa Publications
T2	Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
R2	Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Braking Methods	PO1,PSO2
2	Semi converter fed DC drive	PO2,PSO3

WEB SOURCE REFERENCES:

1	https://youtu.be/wz9-e9BmJfM
2	https://youtu.be/zt9anNjlTc8
3	https://youtu.be/Ub-csHc4VhA?list=PLED1B6C0DE8A84B6E
4	https://youtu.be/VoN0e3n6EGA?list=PLED1B6C0DE8A84B6E
5	https://youtu.be/K3jUTnhzA-Q?list=PLED1B6C0DE8A84B6E
6	https://youtu.be/F5XLJijIiYw?list=PLED1B6C0DE8A84B6E
7	http://ied-nitk.vlabs.ac.in/#

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
C3205.1	2	2	3	1	-		-	-	-	-	-	-	-	-
C3205.2	3	2	2	1	-	1	-	-	-	-	2	-	-	-
C3205.3	2	2	3	2	-	1	-	-	-	-	-	2	-	-

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C3205.4	2	2	1	2	-	1	1	-	-	-	2	-	2	1
C3205.5	3	2	2	2	-	2	2	-	-	-	1	1	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
C3205	2.5	2.0	2.2	1.33	0.33	1.16	0.5	-	-	-	1.16	0.83	1.00	0.5

<table>
<tr><th colspan="3">Course Outcome Assessment Methods</th><th colspan="2">Weightages</th><th rowspan="4">Final Course Outcome (100%)</th></tr>
<tr><td rowspan="3">Direct Assessment</td><td rowspan="3">Cumulative Internal Examinations (CIE)</td><td>Descriptive Test</td><td rowspan="3">30%</td><td rowspan="2">90%</td></tr>
<tr><td>Objective Test</td></tr>
<tr><td>Assignment Test</td></tr>
<tr><td colspan="2">Semester End Examinations (SEE)</td><td>70%</td></tr>
<tr><td>Indirect Assessment</td><td colspan="2">Course End Survey</td><td>10%</td></tr>
</table>

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

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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 drives.
2. Obtain additional skills and knowledge to develop and implement electric drives.

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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Unit wise Sample assessment questions

Course Outcomes

After completion of this course Students will be able to

1. Know about the fundamentals of electric drive and different electric braking methods.
2. **Operation** of single-phase controlled converter fed dc motors and Analyse the steady state Behavior of DC motor drive.
3. **Apply** the knowledge of choppers for speed control of DC Motors..
4. **Know** the analysis of speed control of induction motor with variable voltage and v/f Control
5. **Know** the analysis of speed control mechanism of synchronous motors.

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Write the torque equation of the motor-load system? What is meant by acceleration mode of the electric drive?	K2	CO1
2	What are the different load torque components, how they are approximated in deriving the torque equation of motor-load system?	K2	CO1
3	Enumerate all the conditions to be satisfied for regenerative braking operation takes place?	K2	CO1
	UNIT 2		
1	When discontinuous mode of operation is occurs in the operation of converter fed DC drives?	K2	CO2
2	Describe the draw backs if armature current in a DC motor is discontinuous?	K3	CO2
3	How do you control separately excited DC motor in the fourth-quadrant?	K2	CO2
4	How do you control DC series motor in the second-quadrant?	K3	CO2
5	What are the advantages of DC-DC converter fed drives compared to converter fed drives?	K2	CO2
	UNIT 3		
1	Draw the speed-torque characteristics of DC motor with variable supply voltage using Different types of Choppers?	K2	CO3
2	Why it is required to maintain low Duty cycle to control the speed of DC motor?	K2	CO3
3	Compose in detail about the closed loop operation of chopper Based Speed control in detail.	K3	CO3

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	UNIT 4		
1	Draw the speed-torque characteristics of induction motor with variable supply voltage and constant frequency?	**K2**	**CO4**
2	Why it is required to maintain the ratio of V/f is constant in the control of induction motor?	**K3**	**CO4**
3	Compose in detail about the closed loop operation of armature voltage control method with field weakening mode control in detail.	**K2**	**CO4**
	UNIT 5		
1	Explain margin angle control of synchronous motor drive.	**K2**	**CO5**
2	Describe the open loop v/f control of VSI fed synchronous motor in detail.	**K2**	**CO5**
3	Discuss the construction and working of permanent magnet synchronous motor with neat diagram.	**K2**	**CO5**

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NAKASARAOPETA
NEC ENGINEERING COLLEGE
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III B.Tech II Semester Regular Examinations, Month/Year

Sub Code: R20EE3205 **ELECTRICAL DRIVES**

Time: 3 hours (EEE) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No.		Questions	Marks
		Unit-I	
1	a	i) Explain the four quadrant operation of low speed hoist in detail.	[7M]
		ii) Explain and derive an equation to find out equivalent load torque in a motor load system with translational and rotational motion.	[7M]
		OR	
	b	i) Explain in detail about steady state stability in electrical drive system.	[7M]
		ii) Describe the typical load torque characteristics of electrical drive.	[7M]
		Unit-II	
2	a	i)How do you control separately excited DC motor in the fourth-quadrant?	[7M]
		ii) Draw the speed torque characteristics for a single phase fully controlled converter fed self excited dc motor	[7M]
		OR	
	b	Draw the speed torque characteristics and equations for a single phase fully controlled converter fed dc separately excited dc motor	[14M]
		Unit-III	
3	a	i) Discuss the different control techniques of chopper in detail.	[7M]
		ii) A 200V, 875 rpm, 150A separately excited dc motor has an armature resistance of 0.06 Ω. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, Calculate (i) Firing angle for rated motor torque and (-750) rpm (ii) Motor speed for α=160° and rated torque.	[7M]
	b	Discuss about the steady state analysis of three phase converter fed DC motor drive for continuous mode of conduction	[14M]
		Unit-IV	
4	a	i) Explain in detail the static rotor resistance control in the induction motor.	[7M]
		ii) Describe the working of static scherbius drive in detail.	[7M]
	b	i) Show and explain with a neat diagram the field weakening mode control of induction motor drives.	[7M]
		ii) Describe the closed loop speed control of VSI fed induction motor drive.	[7M]
		Unit-V	
5	a	i) Explain margin angle control of synchronous motor drive.	[7M]
		ii) Describe the open loop v/f control of VSI fed synchronous motor in detail.	[7M]
		OR	
	b	i) Describe the closed loop operation of permanent magnet synchronous motor drive in details.	[7M]
		ii) Summarize the self-control technique of synchronous motor in detail with the operation rotor position encoder.	[7M]

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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: **EM WAVES & TRANSMISSION LINES**	YEAR/SEMESTER : **II/II** CREDITS: **3**
COURSE CODE: R20EC2205 REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **EM WAVES & TRANSMISSION LINES**	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
R20CC1102	Linear Algebra and Calculus	Principles of linear algebra and Calculus	I/I
R20EC1205	Applied Physics	Knowledge of Physics of material and technology are required.	I/II
R20CC1201	Differential Equations and Vector Calculus	Fundamentals of partial differentiations	I/II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Apply** the concepts of Electric and Magnetic Fields in different applications **[K3]**.
CO2	**Apply** Maxwell's equations in electromagnetics **[K3]**.
CO3	**Analyze** wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media **[K4]**.
CO4	**Analyze** wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications **[K4]**.

SYLLABUS:

UNIT	DETAILS
I	**UNIT-I:REVIEW OF COORDINATE SYSTEMS&STATIC FIELDS** **ELECTROSTATICS** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Field Intensity due to point charge, Infinite line charge, Infinite sheet of charge, Uniformly charged sphere, Electric Potential - Electric Potential due to point charge and infinite line charge, Energy Density, Poisson's and Laplace's Equations. . **MAGNETOSTATICS** Biot-Savart Law, Ampere's Law and Applications, Magnetic Flux Density, Magnetic Vector Potential.
II	**UNIT- II: MAXWELL'S EQUATIONS** Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Continuity Equation, Maxwell's Equations in Differential and Integral Forms and Word Statements for static fields and time varying fields of electric and magnetic.
III	**UNIT- III: EM WAVES** Types of Media, Wave Propagation in Perfect Dielectrics, Loss (General Case - conducting) media. Uniform Plane Waves – Definition, Uniform Plane Wave Propagation in Free Space, Poynting Vector and Poynting Theorem, Electric and Magnetic Boundary Conditions, Polarization, EM Wave Normal Incidence on Perfect Conductor and Dielectric, EM Wave Oblique incidence on Dielectric with Parallel and Perpendicular Polarizations, Brewster Angle, Critical Angle and Total Internal Reflection.

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IV	**UNIT- VI: TRANSMISSION LINES** Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless/Low Loss Characterization, Distortion – Condition for Distortion less and Minimum Attenuation, Loading - Types of Loading
V	**UNIT- V: TRANSMISSION LINES-II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR,. UHF Lines as Circuit Elements; $\lambda/4$, $\lambda/2$ and $\lambda/8$ Lines.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, Second Edition, 2000.
T2	Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press, Third Edition, 2001
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Electromagnetics – J. D. Kraus, Keith R. Carver, TMH, Third Edition, 1984
R2	Electromagnetic Field Theory and Transmission Lines – G. Sasi Bhushana Rao, Wiley India Pvt Ltd, 2012.
R3	Electromagnetic Waves and Transmission Lines – G. S. N. Raju, Pearson Education India, 2006.
R4	Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2010.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Analytical calculations of magnetic field in air gap	PO1,PO2, PSO3
2	Effects of Electro Magnetic fields on Human Body and plants	PO1,PO3, PSO2,PSO3

WEB SOURCE REFERENCES:

1	http://jntuk-coeerd.in/faculty_subjects.php
2	http://nptel.ac.in/courses/115101005/
3	http://www.scribd.com/collections/3218090/electromagnetics
4	http://ocw.mit.edu/resources/res-6-001-electromagnetic-fields-and-energy-spring-2008/
5	http://www.transmission-line.net/search/label/Electromagnetics

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
☐Collaborative Learning	☐Cooperative Learning	☑Problem based Learning

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C224.1	3	3	3	3	2	-	-	-	-	-	-	2	1	1	1
C224.2	3	3	3	3	2	-	-	-	-	-	-	2	1	1	1
C224.3	2	3	3	3	1	-	-	-	-	-	-	2	1	1	1
C224.4	3	3	3	2	2	-	-	-	-	-	-	3	1	1	1
Average	2.75	3	3	2.75	1.75	-	-	-	-	-	-	2.25	1	1	1

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C224	2.75	3	3	2.75	-	-	-	-	-	-	-	-	-	1

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

1.
2.
Course Instructor

Course Coordinator

Module Coordinator

Head of the Department

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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: 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.
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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Unit wise Sample assessment questions

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

CO1: Apply the concepts of Electric and Magnetic Fields in different applications. **(K3)**

CO2: Apply Maxwell's equations in electromagnetics. **(K3)**

CO3: Analyze wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media. **(K4)**

CO4: Analyze wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications. **(K4)**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Develop field equation due to surface charge.	K3	CO1
2	Make use of Gauss law to get field from line charge.	K3	CO1
3	Distinguish the electric flux and flux density.	K4	CO1
4	Develop field due to volume charge	K3	CO1
5	Inference about the energy density.	K4	CO1
	UNIT 2		
1	Model and Prove Biotsavart's law	K3	CO2
2	Model and Prove Ampere's law	K3	CO2
3	List the applications of Ampere's law	K4	CO2
4	Examine about magnetic vector potential	K4	CO2
	UNIT 3		
1	Compare both the transformer emf and motional emf	K4	CO3
2	Develop the continuity equation	K3	CO3
3	List Maxwell's equations for time varying fields aswell as for free space	K4	CO3
	UNIT 4		
1	Inference about uniform plane wave.Prove that $E_z = H_z = 0$ when 'z' is the direction of propagation	K4	CO3
2	Develop and Prove poynting theorem	K3	CO3
3	Examine the wave propagation in perfect dielectric and lossy media	K4	CO3
	UNIT 5		
1	Write about the wave propagation in a Lossless Media.	K3	CO4
2	What is meant by total internal reflection explain?	K3	CO4
3	c) Write about the wave propagation in a Lossless Media.	K3	CO4

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Model Question Paper

Code: R20EC2205 **R20**

Narasaraopeta Engineering College

(Autonomous)

Yallmanda(Post), Narasaraopet- 522601

II B. Tech II Semester Regular Examinations

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

ELECTRONICS AND COMMUNICATION ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Execution Plan

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

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Develop an Expression for Electric field Intensity vector for a line charge distribution.	K3	1	7M
		ii) Develop a Relation between E and V in a given Electro Static Field.	K3	1	7M
		OR			
	b	i) Develop an Expression for D and E for an infinite sheet of charge using Gauss Law.	K3	1	7M
		ii) Develop an Expression for Electric Potential due to Point charge.	K3	1	7M
2		Unit-II			
	a	i) Examine about Faraday's law	K4	2	7M
		ii) Make use of Maxwell's Equations for Time Varying fields in detail.	K3	2	7M
		OR			
	b	i) Examine Continuity Equation in detail.	K4	2	7M
		ii) Make use of Maxwell's Equations for Static fields in detail.	K3	2	7M
3		Unit-III			

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	a	i) Develop Wave Equations for Free Space.	K3	3	7M
		ii) Inspect about the total internal reflection through the critical angle	K4	3	7M
		OR			
	b	i) List the different types of polarization	K4	3	7M
		ii) Develop an Expression for Poynting Theorem for a given medium	K3	3	7M
		Unit-IV			
4	a	i) Develop Equation for Characteristic impedance.	K3	4	7M
		ii) List out different types of Loadings in Transmission Lines.	K4	4	7M
		OR			
	b	i) Categorize Various Parameters of Transmission Lines in detail.	K4	4	7M
		ii) Survey the infinite transmission line is equal to finite line when it is terminated with it's characteristic impedance.	K4	4	7M
		Unit-V			
5	a	Examine the Transmission lines with different lengths ($\lambda/4$, $\lambda/2$ and $\lambda/8$) Lines.	K4	4	14M
		OR			
	b	Develop the expression for input impedance for Open and Short Circuited Transmission Line.	K3	4	14M

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Model Question Paper

Code: R20EC2205 **R20**

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II B. Tech II Semester Regular Examinations

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

ELECTRONICS AND COMMUNICATION ENGINEERING

[OUTCOME BASED EDUCATION PATTERN]

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

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Execution Plan

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

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i) Develop an Expression for Columbs force between two static point charge placed apart in free space and explain each term in detail.	K3	1	7M
		ii) Estimate the force F_{21} & F_{12}, If the charge $Q_1 = 3x10^{-4}$ C is located at (1,2,3) & charge $Q_2 = 10^{-4}$ C at (2,0,5) in a vacuum.	K5	1	7M
		OR			
	b	i) Distinguish the position vector and distance vector, relate them with one example	K4	1	7M
		ii) Inference about Biot Savart's law. Give Expressions Magnetic field using Biot-Savart law for Line, Surface and Volume Currents.	K4	1	7M
2		Unit-II			
	a	Develop an Expression for Modified Ampere's law.	K3	2	14M
		OR			
	b	i) Model the Maxwell's equations for time varying fields in all possible forms.	K3	2	7M
		ii) Experiment with Faradays law and derive vemf.	K3	2	7M
3		Unit-III			

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	a	i) Develop Wave equations for E and H in free space conditions.	K3	3	7M
		ii) Examine the critical angle theorem.	K4	3	7M
		OR			
	b	i) Compare the wave propagation in perfect dielectric, good dielectric, good conducting medium.	K4	3	7M
		ii) Develop the conditions of the field vectors at the boundary surface between dielectric-dielectric media.	K3	3	7M
4		Unit-IV			
	a	i) Identify the applications of Transmission Lines.	K3	4	7M
		ii) Develop the transmission line equations.	K3	4	7M
		OR			
	b	i) Inspect both loss less and distortion less transmission lines in detail.	K4	4	7M
		ii) Develop the condition for minimum attenuation in transmission lines.	K3	4	7M
5		Unit-V			
	a	Develop an Expression for input impedance of Transmission Line.	K3	4	14M
		OR			
	b	Develop a relationship between Reflection Coefficient and VSWR for a Transmission Line.	K3	4	14M

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Department of Electronics and Communication Engineering

LESSON PLAN

Course Code	Course Title (Regulation)	Year - Semester	Branch	Contact Periods/ Week	Sections
R20EC2205	**Electromagnetic Waves & Transmission Lines (R20)**	II-II	ECE	6	A, B, C & D

COURSE OUTCOMES:

CO1: Apply the concepts of Electric and Magnetic Fields in different applications **(K3)**.
CO2: Apply Maxwell's equations in electromagnetics **(K3)**.
CO3: Analyze wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media **(K4)**.
CO4: Analyze wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications **(K4)**.

Unit No.	Outcome		Topics/Activity	Ref Text Book	Total Periods	Delivery Method(s)
1	CO1: **Apply** the concepts of Electric and Magnetic Fields in different applications **[K3]**.	**UNIT–I: ELECTROSTATICS AND MAGNETOSTATICS**				
		1.1	Overview of EM waves and Transmission Lines	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.2	Columb's Law	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.3	Electric Field Intensity, Electric Flux Density	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.4	Gauss Law and its Applications	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.5	Electric Field Intensity due to Point Charge	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.6	Infinite Line Charge	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.7	Electric Field Intensity due to Infinite Sheet of Charge	T1, T2	1	Chalk & Talk, PPT, Quiz, Web Resources
		1.8	Uniformly Charged Sphere, Problems	T1, T2	1	Chalk & Talk, PPT, Quiz, Problem based Learning
		1.9	Electric Potential: Electric Potential due to Point Charge and Infinite Line Charge	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.10	Energy Density	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.11	Poison's and Laplace's Equations	T1, T2	1	Chalk & Talk, PPT, Quiz, Web Resources
		1.12	Introduction to Magneto statics,	T1, T2	1	Chalk & Talk,

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			Biot-Savart Law			PPT, Quiz
		1.13	Ampere's Law, Applications	T1, T2	1	Chalk & Talk, PPT
		1.14	Introduction to Magnetic Flux Density	T1, T2	1	Chalk & Talk, PPT, Quiz
		1.15	Magnetic Vector Potential, Problems	T1, T2	1	Chalk & Talk, Problem based Learning
			UNIT–II: MAXWELL'S EQUATIONS			
2	**CO2: Apply** Maxwell's equations in electromagnetics **[K3]**.	2.1	Faraday's Law	T1, T2	1	Chalk & Talk, PPT, Quiz
		2.2	Transformer EMF	T1, T2	1	Chalk & Talk, PPT, Quiz, Web Resources
		2.3	Inconsistency of Ampere's Law	T1, T2	1	Chalk & Talk, PPT, Quiz, Web Resources
		2.4	Displacement Current Density	T1, T2, R2	1	Chalk & Talk, PPT, Quiz
		2.5	Continuity Equation	T1, T2, R2	1	Chalk & Talk, PPT, Quiz
		2.6	Differential Forms	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		2.7	Maxwell's Equations in Integral Forms	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		2.8	Word Statements for Static and Time varying fields of Electric and Magnetic	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		2.9	Problems	T1, T2, R1	1	Chalk & Talk, PPT, Quiz,
			UNIT–III: EM WAVES			
3	**CO3: Analyze** wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media **[K4]**	3.1	Types of Media: Wave Propagation in Perfect Dielectrics	T1, T2, R1	1	Chalk & Talk, PPT, Quiz, Web Resources
		3.2	Wave Propagation in Lossy (General Case-Conducting) media	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.3	Uniform Plane Waves-Definition,	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.4	Uniform Plane Wave Propagation in Free Space	T1, T2, R1		Chalk & Talk,
		3.5	Uniform Plane Wave Propagation in Conducting Media	T1, T2, R1		PPT, Quiz
		3.6	Types of Media: Wave Propagation in Perfect Dielectrics	T1, T2, R1		Chalk & Talk,
		3.7	Conductors –Characterization	T1, T2, R1		PPT, Quiz
		3.8	Dielectrics –Characterization	T1, T2, R1		Chalk & Talk,
		3.9	Poynting Vector and Poynting Theorem	T1, T2, R1		PPT, Quiz
		3.10	Electric Boundary Conditions	T1, T2, R1		Chalk & Talk,
			MID-I EXAMINATION			
		3.11	Magnetic Boundary Conditions	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.12	Polarization	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.13	Reflection of Plane Waves	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.14	Refraction of Plane Waves	T1, T2, R1	1	Chalk & Talk,

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						PPT, Quiz
		3.15	Problems on Reflection	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.16	Problems on Refraction	T1, T2, R1	1	Chalk & Talk, PPT, Quiz
		3.17	Brewster Angle	T1, T2, R1	1	Chalk & Talk,
		3.18	Critical Angle	T1, T2, R1	1	PPT, Quiz
		3.19	Total Internal Reflection	T1, T2, R1	1	Chalk & Talk,
		3.20	Problems	T1, T2, R1	1	Chalk & Talk, Problem based Learning
4	**CO4: Analyze** wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications **[K4]**	**UNIT–IV: TRANSMISSION LINES-I**				
		4.1	Types, Parameters	T1, T2, R2	1	Chalk & Talk, PPT, Quiz
		4.2	Transmission Line Equations	T1, T2, R2	1	Chalk & Talk, PPT, Quiz,
		4.3	Primary and Secondary Constants	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.4	Expressions for Characteristic Impedance	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.5	Propagation Constant, Phase and Group Velocities	T1, T2, R3	1	Chalk & Talk, PPT, Quiz, Web Resources
		4.6	Infinite Line Concepts	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.7	Lossless/Low Loss Characterization.	T1, T2, R3	1	Chalk & Talk, PPT, Quiz,
		4.8	Distortion: Condition for Distortion less and Minimum Attenuation	T1, T2, R3	1	Chalk & Talk, PPT, Quiz
		4.9	Loading-Types of Loading	T1, , R3	1	Chalk & Talk, PPT, Quiz
5	**CO5 Analyze** wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications **[K4]**	**UNIT–V: TRANSMISSION LINES-II**				
		5.1	Input impedance relations	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.2	SC and OC Lines.	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.3	Reflection Coefficient.	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.4	VSWR	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.5	UHF Lines as Circuit Elements: $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines.	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.6	UHF Lines as Circuit Elements: $\lambda/2$ and $\lambda/8$ Lines.	T1, T2, R1, R3	1	Chalk & Talk, PPT, Quiz
		5.7	Problems	T1, T2, R1, R3	1	Chalk & Talk, PPT
				Total Classes	**60**	
		MID-II EXAMINATION				
		END SEMESTER EXAMINATION				

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TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI Second Edition, 2000.
T2	Elements of Electromagnetics – Mathew N.O. Sadiku, Oxford Univ.Press, Third Edition, 2001.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Electromagnetic Field Theory and Transmission Lines – G. Sai Bhushana Rao, Wiley India Pvt Ltd, 2012.
R2	Electromagnetics – J.D. Kraus, Keith R. Carver, TMH, Third Edition, 1984. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2010.
R3	Electromagnetic Field Theory and Transmission Lines – G. Sai Bhushana Rao, Wiley India Pvt Ltd, 2012.

WEB SOURCE REFERENCES:

1	http://jntuk-coeerd.in/faculty_subjects.php
2	http://nptel.ac.in/courses/115101005/
3	http://www.scribd.com/collections/3218090/electromagnetics
4	http://ocw.mit.edu/resources/res-6-001-electromagnetic-fields-and-energy-spring-2008/
5	http://www.transmission-line.net/search/label/Electromagnetics

1. B.G.W.
2.

Faculty Member **Head of the Department** **Principal**

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Department of Electronics and Communication Engineering

COURSE INFORMATION SHEET

PROGRAMME: B. Tech Electronics and Communication Engineering	
COURSE: **VLSI Design**	Year/Semester : **III/II** CREDITS: **3**
COURSE CODE: **R20EC3202** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **VLSI**	PERIODS: **6** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
19BEC2204	Switching Theory & Logic Design	Knowledge of Boolean algebra and logic gates is required.	II/II
19BEC2101	Electronic Devices and Circuits	Knowledge of Diodes, BJT, FET is required.	II/I
R16EC3101	Linear & Digital IC Applications	Knowledge of BJT, CMOS & Integrated Circuits is required	III/I

COURSE OUTCOMES:

SNO	Course Outcome Statement	Knowledge Level
CO1	Demonstrate various fabrication steps of IC and come across basic electrical Properties of MOSFET.	K2
CO2	Illustrate concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).	K2
CO3	Interpret the pass transistor, inverters and scaling rules of MOS technology.	K2
CO4	Analyze the difference between static and dynamic CMOS design.	K3
CO5	Compute inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design.	K3

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS:** VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Regions of operation of MOSFET. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.
II	**BASIC CIRCUIT CONCEPTS:** Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers. Switch logic, Gate logic.
III	**VLSI CIRCUIT DESIGN PROCESS:** MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits. SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise

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	and current density. **BASIC BUILDING BLOCKS OF ANALOG IC DESIGN:** Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load
IV	**CMOS COMBINATIONAL AND SEQUENTIALLOGIC CIRCUIT DESIGN:** **STATIC CMOS DESIGN:** Introduction to Complementary CMOS, Rationed Logic, Pass Transistor Logic. **DYNAMIC CMOS DESIGN:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates. Latch versus Register, Latch based design, timing decimation, positive feedback, instability, Meta-stability, multiplexer based latches.
V	**FPGA DESIGN:** FPGA design flow, Basic FPGA architecture, FPGA Technologies. **INTRODUCTION TO ADVANCED TECHNOLOGIES:** Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	"Essentials of VLSI Circuits and Systems"/ Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian,/Prentice-Hall of India Private Limited, 2009 Edition.
T2	"Design of Analog CMOS Integrated Circuits"/Behzad Razavi/McGraw Hill, 2003
T3	"Digital Integrated Circuits"/Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic/2nd Edition,2016
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	"Introduction to VLSI Circuits and Systems"/John P. Uyemura/ John Wiley & Sons, reprint 2009.
R2	"Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies"/Vinod Kumar Khanna/Springer India, 1st Edition, 2016.
R3	"FinFETs and other multi-gate transistors"/ColingeJP/Editor New York, Springer,2008.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Recent advances in VLSI technology	PO1, PO12, PSO1
2	Physical design optimization techniques like Floorplanning, placement, Global and detailed routing, Transistor and gate sizing.	PO1,PO3, PO5, PSO1

WEB SOURCE REFERENCES:

1	http://nptel.ac.in/courses/ModernVLSI
2	https://nptel.ac.in/courses/117106093/Dr. Nandita Dasgupta
3	FPGA Trainer kits, XILINX place & route software, Mentor Graphics Front End & Back End Tool

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
☐Collaborative Learning	☑ Problem based Learning	☐Co-operative Learning

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C412.1	3	3	1	1	–	–	–	–	–	–	–	2	3	1	3
C412.2	3	3	2	2	–	–	–	–	–	–	–	2	3	1	3
C412.3	3	3	2	2	–	–	–	–	–	–	–	2	3	1	3
C412.4	3	3	3	2	–	–	–	–	–	–	–	2	3	1	3
C412.5	3	3	3	3	–	–	–	–	–	–	–	2	3	1	3
Average	3	3	2.2	2	-	–	–	–	–	–	–	2	3	1	3

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C412	3	3	2.2	2	-	–	–	–	–	–	–	2	3	1	3

<table>
<tr><th colspan="3">Course Outcome Assessment Methods</th><th>Weightages</th><th rowspan="4">Final Course Outcome (100%)</th></tr>
<tr><td rowspan="3">Direct Assessment</td><td rowspan="3">Cumulative Internal Examinations (CIE)</td><td>Descriptive Test</td><td rowspan="3">30%</td><td rowspan="3">90%</td></tr>
<tr><td>Objective Test</td></tr>
<tr><td>Assignment Test</td></tr>
<tr><td colspan="2">Semester End Examinations (SEE)</td><td>70%</td></tr>
<tr><td>Indirect Assessment</td><td colspan="2">Course End Survey</td><td>10%</td></tr>
<tr><td colspan="5">Rubrics for overall attainment of course outcomes:</td></tr>
<tr><td colspan="5">If 50% of the students crossed 50% of the marks: Attainment Level 1</td></tr>
<tr><td colspan="5">If 60% of the students crossed 50% of the marks: Attainment Level 2</td></tr>
<tr><td colspan="5">If 70% of the students crossed 50% of the marks: Attainment Level 3</td></tr>
</table>

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

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

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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 and develop IoT applications using Rasberry PI, Arduino and other advance processors.
2. Design synthesis various circuits using latest hardware and EDA tools.
3. Design and analyse modern communication systems to meet the present and future needs of industry with cost of 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.
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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UNIT WISE SAMPLE ASSESSMENT QUESTIONS

COURSE OUTCOMES: Students are able to

CO1: Demonstrate various fabrication steps of IC and come across basic electrical properties of MOSFET. **[K2]**

CO2: Illustrate concepts and techniques of modern integrated circuit design and testing (CMOS VLSI). **[K2]**

CO3: Interpret the pass transistor, inverters and scaling rules of MOS technology. **[K2]**

CO4: Analyze the difference between static and dynamic CMOS design. [K3].

CO5: Compute inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design. **[K3]**

S. No.	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT- I		
1	**Why** do we use NMOS technology in the design of integrated circuit?	K1	CO1
2	**Compare** CMOS and Bipolar technologies.	K4	CO1
3	**What** are the steps involved in IC fabrication. **Explain**	K2	CO1
	UNIT- II		
4	**Explain** in detail about formal estimation of CMOS inverter delay.	K1	CO2
5	**What** is meant by sheet resistance Rs? **Explain** the concept of Rs applied to MOS transistors.	K2	CO2
6	**What** are the limits on logic levels and supply voltage due to noise in scaling?	K2	CO2
	UNIT- III		
7	**What** is the need of stick diagrams?	K1	CO3
8	**Explain** in brief about the general observations on the design rules.	K2	CO3
9	**Outline** a stick diagram and layout for two input CMOS NAND gate indicating all the regions and layers.	K2	CO3
	UNIT- IV		
10	**List** different logics used under static CMOS design and explain them	K4	CO4
11	**Distinguish** Static CMOS logic with Dynamic CMOS logic	K4	CO4
12	**Explain** Dynamic Power dissipation.	K2	CO4
	UNIT-V		
13	**What** are FPGAs? **Explain** the principle and operation.	K2	CO5
14	**Explain** the Discuss the VLSI design issues and design trends	K2	CO5
15	**Explain** the ASIC design flow.	K2	CO5

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Code: R20EC3202

I-Model Question Paper- R20

III B. Tech, II Semester Regular/Supplementary Exams, Month, Year

VLSI DESIGN

(ECE)

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.

S.No		Questions	KL	CO	M
1		**UNIT-I**			
	A	i) Explain the step by step CMOS n-well fabrication with neat diagram	K5	1	6
		ii) Compare CMOS and bipolar technologies.	K4	1	6
		OR			
	B	i) Identify the operative regions of nMOS transistor in enhancement mode with neat sketches.	K3	1	6
		ii) Determine the pull-up to pull-down ration for an nMOS inverter driven by another nMOS inverter.	K5	1	6
2		**UNIT-II**			
	A	i) What is sheet resistance Rs? Explain the concept of Rs applied to MOS transistors	K1	2	6
		ii) Determine the ON resistance (VDD to GND) of an NMOS inverter having pull up to pull down ratio of 4:1, If n channel resistance is Rsn $=10^4$ Ω per square.	K5	2	6
		OR			
	B	i) Examine the issues involved in driving large capacitor loads in VLSI circuits.	K4	2	6
		ii) Determine the expression for the CMOS inverter delay.	K5	2	6
3		**UNIT-III**			
	A	i) Explain the Labda-based design rules of CMOS circuits.	K5	3	6
		ii) Make use of the concept of stick diagrams draw the stick diagrams for CMOS Inverter and CMOS NAND gates.	K3	3	6
		OR			
	B	i) Why scaling is required? Write the scaling factors for different types of device parameters.	K1	3	6
		ii) Make use of the concept of Layout, draw the Layout for CMOS NAND gate.	K3	3	6
4		**UNIT-IV**			
	A	List different logics used under static CMOS design and explain them.	K4	4	12
		OR			
	B	i) Distinguish Static CMOS logic with Dynamic CMOS logic.	K4	4	6
		ii) Analyze, how the power will dissipate in CMOS Dynamic logic	K4	4	6
5		**UNIT-V**			
	A	Explain basic FPGA Architecture with neat diagrams.	K4	5	12
		OR			
	B	i) Draw and explain the FPGA design flow.	K4	5	6
		ii) Compare FinFET and TFET.	K4	5	6

***KL: Blooms taxonomy Knowledge level, CO: Course Outcome, M: Marks**

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Code: R20EC3202

II-Model Question Paper- R20

III B. Tech, II Semester Regular/Supplementary Exams, Month, Year

VLSI DESIGN

(ECE)

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.

S.No		Questions	KL	CO	M
1		**UNIT-I**			
	A	i) Explain the step by step CMOS p-well fabrication with neat diagram	K5	1	6
		ii) Compare CMOS and bipolar technologies.	K4	1	6
		OR			
	B	i) Identify the operative regions of pMOS transistor in enhancement mode with neat sketches.	K3	1	6
		ii) Develop the relation between I_{DS} and V_{DS} in Saturation mode.	K5	1	6
2		**UNIT-II**			
	A	Explain the concept of propagation delays with relevant examples.	K4	2	12
		OR			
	B	i) What is Standard unit of capacitance □Cg? Explain.	K4	2	6
		ii) Determine □Cg for 5μm, 2 μm and 1.2 μm design rules.	K5	2	6
3		**UNIT-III**			
	A	i) List the color coding used for stick diagrams and layers used in Layouts for CMOS circuits.	K4	3	6
		ii) Make use of the concept of stick diagrams draw the stick diagrams for CMOS inverter and CMOS NOR gates.	K3	3	6
		OR			
	B	i) Why scaling is required? Write the scaling factors for different types of device parameters.	K1	3	6
		ii) Make use of the concept of Layout, draw the Layout for $Y = \overline{A + BC}$	K3	3	6
4		**UNIT-IV**			
	A	List and explain the issues encountered in Dynamic CMOS design.	K4	4	12
		OR			
	B	i) Distinguish Static CMOS logic with Dynamic CMOS logic.	K4	4	6
		ii) Explain the concept of Meta stability in CMOS Dynamic logic	K4	4	6
5		**UNIT-V**			
	A	Explain basic FinFET Architecture with neat diagrams.	K4	5	12
		OR			
	B	i) Draw and explain internal arrangement of CLB in FPGA.	K4	5	6
		ii) Identify, how metal gate technology differ from FPGA Technology.	K3	5	6

***KL: Blooms taxonomy Knowledge level, CO: Course Outcome, M: Marks**

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NARASARAOPETA ENGINEERING COLLEGE
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Yallamanda (Post), Narasaraopet- 522601

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Year/Semester	Branch	Contact Periods/Week	Sections
R20EC3202	VLSI Design (R20)	III/II	Electronics and Communication Engineering	6	A, B, C & D

COURSE OUTCOMES: Students are able to
CO1: Demonstrate various fabrication steps of IC and come across basic electrical Properties of MOSFET. **[K2].**
CO2: Illustrate concepts and techniques of modern integrated circuit design and testing (CMOS VLSI). **[K2].**
CO3: Interpret the pass transistor, inverters and scaling rules of MOS technology. **[K2].**
CO4: Analyze the difference between static and dynamic CMOS design. **[K3].**
CO5: Compute inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design.**[K3].**

Unit	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	**CO 1.** Demonstrate various fabrication steps of IC and come across basic electrical Properties of MOSFET. **[K2].**		**UNIT-I: INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS**			
		1.1	VLSI Design Flow, Introduction to IC Technology, IC production process	T1, R1	2	Chalk & Talk, PPT
			Fabrication process: nMOS, pMOS and CMOS	T1, R1	3	Chalk & Talk, PPT
		1.2	Regions of operation of MOSFET. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit.	T1, R1	3	Chalk & Talk, PPT, Quiz
		1.3	nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors.	T1, R1	2	Chalk & Talk, PPT
		1.4	Alternative forms of pull-up, The CMOS Inverter	T1, R1	2	Chalk & Talk, PPT
		1.5	Latch-up in CMOS circuits, Bi-CMOS Inverter,	T1, R1	2	Chalk & Talk, PPT
		1.6	Comparison between CMOS and BiCMOS technology.	T1, R1	1	Chalk & Talk, PPT
2	**CO 2.** Illustrate concepts and techniques of modern integrated circuit design and testing (CMOS VLSI). **[K2].**		**UNIT -II: BASIC CIRCUIT CONCEPTS**			
		2.1	Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverter	T1, R1	2	Chalk & Talk, PPT
		2.2	Area Capacitance calculations, Standard unit of capacitance	T1, R1	2	Chalk & Talk, PPT
		2.3	The Delay Unit, Inverter Delays, Propagation Delays	T1, R1	2	Chalk & Talk, PPT
		2.4	Driving large Capacitive Loads, Wiring Capacitances	T1, R1	2	Chalk & Talk, PPT
		2.5	Choice of layers.	T1, R1	2	Chalk & Talk, PPT
		2.6	Switch logic, Gate logic.	T1, T3, R1	2	Chalk & Talk, PPT, Quiz
			UNIT-III: VLSI CIRCUIT DESIGN PROCESS			
		3.1	MOS layers	T1, R1	1	Chalk & Talk, PPT

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3	**CO 3.** Interpret the pass transistor, inverters and scaling rules of MOS technology. **[K2].**	3.2	Stick diagrams	T1, R1	2	Chalk & Talk, PPT, Tutorial
		3.3	Design rules and layout	T1, R1	2	Chalk & Talk, PPT, Tutorial
		3.4	Layout Diagrams for MOS circuits.	T1, R1	2	Chalk & Talk, PPT, Tutorial
		3.5	**SCALING OF MOS CIRCUITS:** Scaling models and scaling factors, Scaling factors for device parameters	T1, R1	2	Chalk & Talk, PPT
		3.6	Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density.		2	Chalk & Talk, PPT
		3.7	**BASIC BUILDING BLOCKS OF ANALOG IC DESIGN:** Modelling of transistor,	T2, R1, R2	1	Chalk & Talk, PPT
		3.8	Body bias effect, biasing styles,	T2, R1, R2	1	Chalk & Talk, PPT
		3.9	Single stage amplifier with resistive load, single stage amplifier with diode connected load	T2, R1, R2	2	Chalk & Talk, PPT
MID I EXAMINATION DURING 9th WEEK						
4	**CO 4.** Analyze the difference between static and dynamic CMOS design. **[K3].**		**UNIT -IV: CMOS COMBINATIONAL AND SEQUENTIALLOGIC CIRCUIT DESIGN:**			
		4.1	**STATIC CMOS DESIGN:** Introduction to Complementary CMOS, Rationed Logic,	T2, R1, R2	1	Chalk & Talk, PPT
		4.2	Pass Transistor Logic.	T2, R1, R2	1	Chalk & Talk, PPT
		4.3	**DYNAMIC CMOS DESIGN:** Dynamic Logic-Basic Principles	T2, R1, R2	1	Chalk & Talk, PPT
		4.4	Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design	T2, R1, R2	2	Chalk & Talk, PPT
		4.5	Cascading Dynamic Gates.	T2, R1, R2	1	Chalk & Talk, PPT
		4.6	Latch versus Register, Latch based design	T2, R1, R2	1	Chalk & Talk, PPT
		4.7	Timing decimation, positive feedback, instability, Meta-stability	T2, R1, R2	2	Chalk & Talk, PPT
		4.8	Multiplexer based latches	T2, R1, R2	1	Chalk & Talk, PPT
5	**CO 5:** Compute inverter delays, fan-in and fan-out, power calculation and clock mechanism in VLSI design. **[K3]**		**UNIT-V: FPGA DESIGN**			
		5.1	FPGA design flow, Basic FPGA architecture	T2, T3, R3	2	Chalk & Talk, PPT
		5.2	FPGA Technologies.	T2, T3, R3	2	Chalk & Talk, PPT
		5.3	**INTRODUCTION TO ADVANCED TECHNOLOGIES:** Giga-scale dilemma	T2, T3, R3	1	Chalk & Talk, PPT
		5.4	Short channel effects, High–k	T2, T3, R3	2	Chalk & Talk, PPT
		5.5	Metal Gate Technology	T2, T3, R3	1	Chalk & Talk, PPT
		5.6	FinFET	T2, T3, R3	1	Chalk & Talk, PPT
		5.7	TFET	T2, T3, R3	1	Chalk & Talk, PPT
				Total	60	
MID II EXAMINATION DURING 18th WEEK						
END EXAMINATIONS						

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Text Books:

T	BOOK TITLE/AUTHORS/PUBLISHER
T1.	"Essentials of VLSI Circuits and Systems"/ Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian,/Prentice-Hall of India Private Limited, 2009 Edition.
T2.	"Design of Analog CMOS Integrated Circuits"/Behzad Razavi/McGraw Hill, 2003
T3.	"Digital Integrated Circuits"/Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic/2nd Edition,2016

Reference Books:

R	BOOK TITLE/AUTHORS/PUBLISHER
R1.	"Introduction to VLSI Circuits and Systems"/John P. Uyemura/ John Wiley & Sons, reprint 2009.
R2.	"Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies"/Vinod Kumar Khanna/Springer India, 1st Edition, 2016.
R3.	"FinFETs and other multi-gate transistors"/ColingeJP/Editor New York, Springer,2008

Web Source References:

S. No	Name	URL
1.	CMOS Fabrication process	https://www.youtube.com/watch?v=sV2xT-WCSSI
2.	MOS and BiCMOS circuit design process	https://drive.google.com/file/d/1JK888NP4JRqq-_xxIxuusX6msuwnqj0s/view?usp=sharing
3.	VLSI Circuit design	https://docs.google.com/presentation/d/1gB2b2wV86f4QGg4M4X1CDfstlBsw9AMY/edit?usp=sharing&ouid=102828445989699361381&rtpof=true&sd=true

Faculty Member **Head of the Department** **Principal**

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NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAMME: B. Tech Civil Engineering	
COURSE: **HYDRAULICS & HYDRAULIC MACHINES**	Year/Sem : II/ II CREDITS: 3
COURSE CODE: **R20CE2205** REGULATION: **R20**	COURSE TYPE (**CORE** /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: **Fluid Mechanics**	PERIODS: 6 Per Week

COURSE PRE-REQUISITES:

COURSE NAME	DESCRIPTION	Year/SEM
Fluid Mechanics	Introduction to fluid and Fluid properties	**II/I**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Solve uniform open channel flow problems
CO2	Solve non uniform open channel flow problems.
CO3	Understand about Basics of Turbo machinery.
CO4	Understand the working principles of various hydraulic turbines.
CO5	Understand the working principles of various pumps.

SYLLABUS:

UNIT	DETAILS
I	**Open Channel Flow-Uniform Flow:** Introduction, Classification of flows, Types of channels; Chezy, Manning's, Bazin, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels; Velocity distribution; Energy and momentum correction factors. Concept of specific energy; Critical flow; Critical flow in a rectangular channel, critical depth.
II	**Open Channel Flow-Non Uniform Flow:** Gradually Varied Flow: Dynamic equation; Surface Profiles; Computation of surface profiles by single step & multi step methods; Back water Curves and Draw down curves, Control section. Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jumps; Location and applications of hydraulic jump; Energy loss in a hydraulic jump.
III	**Basics of Turbo Machinery:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.
IV	**Hydraulic Turbines:** Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working

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	proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.
V	**Centrifugal-Pumps:** Pump installation details-classification-work done- Manometric headminimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH- Cavitation. **Reciprocating Pumps:** Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Flow in Open Channels, K. Subramanya
T2	Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
T3	A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Open Channel Flow by M.Hanif Chaudhary.
R2	Fluid Mechanics by A. K Jain, Khanna Publishers
R3	Fluid Mechanics, Hydraulics& Hydraulic Machines by K R Arora, Standard Publishers.

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/105105203
2	https://www.youtube.com/watch?v=z9wsUWaN-oY&list=PL485F1F6C7083FBE1
3	https://nptel.ac.in/courses/112/106/112106300/
4	https://www.caee.utexas.edu/prof/maidment/CE365KSpr14/Visual/OpenChannels.pdf
5	https://nptel.ac.in/courses/105103096

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

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MAPPING CO'S WITH PO'S

Sub Code: R20CE2205												
COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1: Solve uniform open channel flow problems.	2	2	3	3	-	2	-	-	-	-	-	2
CO2: Solve non uniform open channel flow problems	2	2	3	2	-	1	-	-	-	-	-	3
CO3: Understand about Basics of Turbo machinery.	3	2	3	3	-	-	1	-	-	-	-	2
CO4: Understand the working principles of various hydraulic turbines.	2	2	3	2	-	1	1	-	-	-	-	3
CO5: Understand the working principles of various pumps.	2	2	3	3	-	-	-	-	-	-	-	3
CO	2.2	2	3	2.6	-	1.5	1	-	-	-	1.75	2.6

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
R20CE2205	2.2	2	3	2.6	-	1.5	1	-	-	-	1.75	2.6		2	

1. Copy the Direct CO Attainment Level (Internal) and Direct CO Attainment Level (External) from the previous sheets and then find the Direct CO Attainment Level.
2. Find Direct CO attainment level using the formula:
   CO Attainment Level (Internal) * 30% + CO Attainment Level (External) * 70
3. Copy Indirect CO Attainment Level.
4. Find the CO attainment level using the formula:
   Direct CO Attainment Level *90% + Indirect CO Attainment Level * 10%

Course Coordinator

Module Coordinator

Head of the Department

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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):

Civil Engineering graduates will be able to:

1. Apply technical skills and modern engineering tools for civil engineering day to day practice.
2. Participate in critical thinking and problem solving of civil engineering filed that requires analytical and design requirements.
3. Pursue lifelong learning and professional development to face the challenging and emerging needs of our society.

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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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Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

CO1: Solve uniform open channel flow problems.
CO2: Solve non uniform open channel flow problems.
CO3: Understand about Basics of Turbo machinery.
CO4: Understand the working principles of various hydraulic turbines.
CO5: Understand the working principles of various pumps

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Differences between open channel flow and pipe flows.	K2	CO1
2	Derive the Energy and Momentum correction factors	K2	CO1
3	The velocity Distribution of a rectangular channel of width B and depth of flow y was approximated as $v=k\sqrt{y}$ in which k is a constant. Calculate the average velocity for the cross section and correction coefficients α and β.	K3	CO1
	UNIT 2		
1	A triangular channel of side slopes of 1.5h to 1v has a longitudinal slope of 0.0004 and Manning's n = 0.022. when discharge in the channel is 1.5 m3/s, estimate the water surface slope relative to the horizontal at a section where the depth of the flow is 1.1m	K4	CO2
2	Explain the term hydraulic jump. Derive an Expression for the depth of hydraulic jump in terms of the upstream Fr number.	K3	CO2
3	Find an expression for loss of energy head for a hydraulic jump.	K3	CO2
	UNIT 3		
1	Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes at the center of the semi-circular plate is two times the force exerted by the jet on an fixed vertical plate	K3	CO3
2	Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30 m/s.	K3	CO3
3	Obtain an expression for the force exerted by a jet of water on a moving curved plate when the plate is moving in the direction of jet.	K3	CO3
4	A jet of water diameter 10 cm strikes a flat plate normally with a velocity of 15 m/s. the plate is moving with a velocity of 6 m/s in the direction of jet and away from the jet. Find:	K4	CO3

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	a) Force exerted by the jet on the plate b) Work done by the jet on the plate per second. c) Efficiency of the jet		
5	A jet of water diameter 10 cm strikes a flat plate normally with a velocity of 15 m/s. the plate is moving with a velocity of 6 m/s in the direction of jet and away from the jet. Find: i. Force exerted by the jet on the plate ii. Work done by the jet on the plate per second. iii. Efficiency of the jet	K4	CO3
	UNIT 4		
1	Explain briefly the how Kaplan turbine works	K1	CO4
2	A pelton wheel has a main bucket of speed of 10m/s with a jet of water flowing at the rate of 700 lit/s under a head of 30m. The buckets deflected jet an angle of 160°. Calculate the power given by water to the runner and hydraulic efficiency of the turbine. Assume coefficient of the velocity as 0.98	K4	CO4
3	Explain the Layout of a typical Hydropower installation.	K2	CO4
	UNIT 5		
1	Define a centrifugal pump and explain the working procedure of a single stage centrifugal pump with neat sketch.	K2	CO5
2	A centrifugal pump is to discharge 0.118 m3/s at a speed of 1500 RPM against head of 22m. Impeller dia is 250mm, its width of outlet is 50 mm and monometer efficiency is 75%. Determine the vane angle at outer periphery of the impeller.	K4	CO5
3	Define a reciprocating pump and explain the working procedure of a reciprocating pump with neat sketch.	K2	CO5

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II B. Tech II Semester Regular Examinations, Month/Year: /2022

Sub Code: R20CE2205 **SUBJECT NAME: HYDRAULICS AND HYDRAULIC MACHINERY (ME)**

MODEL PAPER-I

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q. No.		Questions	Knowledge Level	Marks
1		Unit-I		
	a	1.Differences between open channel flow and pipe flows.	K4	[7M]
		2. Derive the equation for the Kinetic Energy factor (α) and Momentum Correction factor (β).	K3	[7M]
		OR		
	b	Determine the economical cross-section for an open channel of trapezoidal section with side slopes of 1 vertical to 2 horizontal, to carry 10 m 3 /s, the bed slope being 1/2000. Assume Manning coefficient as 0.022.	K4	[14M]
2		Unit-II		
	a	A triangular channel of side slopes of 1.5h to 1v has a longitudinal slope of 0.0004 and Manning's n = 0.022. when discharge in the channel is 1.5 m3/s, estimate the water surface slope relative to the horizontal at a section where the depth of the flow is 1.1m	K4	[14M]
		OR		
	b	Explain the term hydraulic jump. Derive an Expression for the depth of hydraulic jump in terms of the upstream Fr number.	K3	[14M]
3		Unit-III		
	a	Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes at the center of the semi-circular plate is two times the force exerted by the jet on an fixed vertical plate	K3	[14M]
	b	1. Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30 m/s.	K4	[7M]
		2. Obtain an expression for the force exerted by a jet of water on an inclined plate moving in the direction of jet.	K3	[7M]
4		Unit-IV		
	a	1. Explain briefly the how Kaplan turbine works	K2	[7M]
		2. A pelton wheel has a main bucket of speed of 10m/s with a jet of water flowing at the rate of 700 lit/s under a head of 30m. The buckets deflected jet an angle of 160°. Calculate the power given by water to the runner and hydraulic efficiency of the	K3	[7M]

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		turbine. Assume coefficient of the velocity as 0.98		
		OR		
	b	1.Explain the Layout of a typical Hydropower installation.	K2	[7M]
		2. Differentiate between: (a) impulse and reaction turbines (b) radial and axial flow turbines	K4	[7M]
5		Unit-V		
	a	Define a centrifugal pump and explain the working procedure of a single stage centrifugal pump with neat sketch.	K2	[14M]
		OR		
	b	A centrifugal pump is to discharge 0.118 m3/s at a speed of 1500 RPM against head of 22m. Impeller dia is 250mm, its width of outlet is 50 mm and monometer efficiency is 75%. Determine the vane angle at outer periphery of the impeller.	K4	[14M]

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Yallamanda(Post), Narasaraopet- 522601

DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Year & sem	Branch	Contact Periods/Week	Sections
R20CE2205	Hydraulics & Hydraulic Machines	II& II	Civil Engineering	6	A&B

COURSE OUTCOMES: Students are able to

CO1: Solve uniform open channel flow problems.
CO2: Solve non uniform open channel flow problems.
CO3: Understand about Basics of Turbo machinery.
CO4: Understand the working principles of various hydraulic turbines.
CO5: Understand the working principles of various pumps.

Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
CO 1. Solve uniform open channel flow problems.		**Unit-1. Open Channel Flow-Uniform Flow**			
	1.1	Introduction	T1, R1	8	Chalk & Talk, PPT
	1.2	Classification of flows, Types of channels	T1, R1		
	1.3	Chezy, Manning's, Bazin, Kutter's Equations	T1, R1		
	1.4	Rectangular, Trapezoidal and Circular channels	T1, R1		
	1.5	Velocity distribution	T1, R1		
	1.6	Energy and momentum correction factors	T1, R1		
	1.7	Concept of specific energy; Critical flow	T1, R1		
	1.8	Critical flow in a rectangular channel, critical depth.	T1, R1		
CO2. Solve non uniform open channel flow problems		**Unit-2. Open Channel Flow-Non Uniform Flow**			
	2.1	Gradually Varied Flow: Dynamic equation; Surface Profiles	T1, R1	8	Chalk & Talk
	2.2	Computation of surface profiles by single step & multi step methods	T1, R1		
	2.3	Back water Curves and Draw down curves, Control section.	T1, R1		
	2.4	Hydraulic jump; Elements and characteristics of hydraulic jump	T1, R1		
	2.5	Types of hydraulic jumps;	T1, R1		
	2.6	Location and applications of hydraulic jump	T1, R1		
	2.7	Energy loss in a hydraulic jump.	T1, R1		
		Unit-3. Basics of Turbo Machinery			
	3.1	Hydrodynamic force of jets on stationary and moving flat	T2, T3, R2	8	Chalk & Talk,

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CO3 Understand about Basics of Turbo machinery.	3.2	Hydrodynamic force of jets on inclined and curved vanes	T2, T3, R2		PPT
	3.3	expressions for work done and efficiency	T2, T3, R2		
	3.4	Angular momentum principle.	T2, T3, R2		
	3.6	PROBLEMS	T2, T3, R2		
CO4 Understand the working principles of various hydraulic turbines.		**Unit-4. Hydraulic Turbines**			
	4.1	Layout of a typical Hydropower installation	T2, T3, R2, R3	8	Chalk & Talk, PPT
	4.2	Heads and efficiencies - classification of turbines	T2, T3, R2, R3		
	4.3	Governing of turbines-surge tanks-unit and specific quantities	T2, T3, R2, R3		
	4.4	selection of turbines	T2, T3, R2, R3		
	4.5	performance characteristics	T2, T3, R2, R3		
	4.6	geometric similarity, cavitation	T2, T3, R2, R3		
CO5 Understand the working principles of various pumps.		**Unit 5. Centrifugal-Pumps and Reciprocating pumps**			
	5.1	Pump installation details	T2, T3, R2, R3	8	Chalk & Talk, PPT
	5.2	Monomeric head minimum starting speed-losses and efficiencies	T2, T3, R2, R3		
	5.3	specific speed, multistage pump	T2, T3, R2, R3		
	5.4	Reciprocating Pumps: Introduction, classification,	T2, T3, R2, R3		
	5.5	components, working, discharge	T2, T3, R2, R3		
	5.6	work done and slip	T2, T3, R2, R3		

TEXT BOOKS:

T1. Flow in Open Channels, K. Subramanya

T2. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi

T3. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi.

REFERENCES:

R1. Open Channel Flow by M.Hanif Chaudhary.

R2. Fluid Mechanics by A. K Jain, Khanna Publishers

R3. Fluid Mechanics, Hydraulics& Hydraulic Machines by K R Arora, Standard Publishers.

Principal **HOD** **Faculty**

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Dept. of Civil Engineering

COURSE INFORMATION SHEET: 2022-23

PROGRAMME: B. Tech Civil Engineering	
COURSE: **CONSTRUCTION TECHNOLOGY AND MANAGEMENT**	Semester: **IV-II** CREDITS: **3**
COURSE CODE: **19BCE8TH01** REGULATION: **R19**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: **CONSTRUCTION MANAGEMENT**	PERIODS: **8 Per Week.**

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BCE6PE08	**Alternative Construction Technology**	An ability to understand the basic concepts of the alternative technologies used in recent constructions.	**III-II**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	To understand the concept of project management including network drawing and monitoring. K1 & K2
CO2	Appreciate the importance of construction planning and Project Management. K1 & K2
CO3	Apply the gained knowledge to project Planning and Control. K1 & K3
CO4	To understand the concept of cost control and resource management. K1 & K2
CO5	Apply the concept of Quality control and Safety Management in construction. K1 & K3

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION:** Construction projects- Project management- Main causes of project failure, Origin of PERT and CPM, Planning, Scheduling and controlling, Bar charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law), Dummy activities.
II	**PROJECT MANAGEMENT THROUGH NETWORKS:** Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path. Updating – Process of updating. **COST CONTROL:** Direct cost- indirect cost- total project cost- Optimization of cost through networks- Steps involved in optimization of cost.

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III	**PROJECT PLANNING & ORGANIZATION:** Development of project plan, objective and conception– Programming – Scheduling – Project Organization – Project budget fund flow statement – Controlling system. **CONTRACTS:** Introduction – Types of Contract – Contract document – Specifications – Important conditions of contract – Tender and tender document – Deposits by the contractor – Arbitration – M. Book, R.A Bills & Advances – Muster Roll.
IV	**RESOURCE MANAGEMENT:** Introduction- Resource smoothing- Resource leveling- Objectives of material management- Costs- Functions of material management department- ABC classification of materials-Introduction to Green Technologies-NBC code book-2016.
V	**QUALITY CONTROL AND SAFETY MANAGEMENT:** Importance of quality- Elements of quality- Organization for quality control- Quality assurance techniques- Total quality management- ISO – 9000. Accident prevention program- immediate attention in case of accident- Approaches to improve safety in construction- Safety benefits, Prevention of fires in construction industries- Safety information system.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Construction Engineering and Management by Dr. S. Seetharaman- Umesh Publications, Nai Sarark, Delhi.
T2	Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee- Khanna Publishers, Nai Sarak- Delhi.
T3	S. Sanga Reddy & Meyyappan, "Construction Management", Kumaran Publications, 2009.
T4	Gahlot, P.S & Dhir, D.M., "Construction Planning and Management", Wiley Eastern Limited, 1992.
T5	Punmia B.C., "Project Planning and Control with PERT and CPM", Laxmi Publications, New Delhi, 1987.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Construction Management & Planning by B. Sengupta & H. Guha- Tata Mc Graw – Hill Publishing Co. Ltd., New Delhi.
R2	Construction Planning, Equipment & Methods by Peurifoy R. L. - Mc Graw – Hill International Book Company.
R3	PERT and CPM – Punmia, Laxmi Publications, 3rd edition 1987.
R4	PERT & CPM Principles and applications by L. S. Srinath- Affiliated East West Press.
R5	Jerome D. Wiest & K. Levy, "Management Guide to PERT/CPM".
R6	Clough R.H. & Sears. G.A, "Construction Project Management" 2008.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Modern Construction Materials	PO1, PO2, PO5, PO6, PO7& PSO1&PSO2

WEB SOURCE REFERENCES:

1	http://nptel.ac.in/courses/105103093/
2	https://archive.nptel.ac.in/courses/105/103/105103093/
3	https://onlinecourses.nptel.ac.in/noc21_ce21/preview

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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
☐Evidence based learning	☐Collaborative learning	✓☐Problem based learning
☐Cooperative learning	☐Activity based learning	☐Student centric learning

MAPPING CO'S WITH PO'S

CO	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	3	-	2	2	-	2	1	-	3	1	2
CO2	3	2	3	-	2	-	-	-	-	-	1	2	-	3
CO3	3	-	-	-	2	2	-	2	2	2	-	3	1	2
CO4	3	2	-	-	1	2	2	-	1	2	-	2	1	2
CO5	3	3	-	2	2	2	3	-	1	1	-	2	1	2
AVG	3.0	2.25	3.0	2.5	1.75	2.0	2.33	2.0	1.5	1.5	1.0	2.4	1.0	2.2

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
19BCE8TH01	3.0	2.25	3.0	2.5	1.75	2.0	2.33	2.0	1.5	1.5	1.0	2.4	1.0	2.2

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level-1

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If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Instructor 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) :

I. The students will be able to apply fundamental concepts of structural, geotechnical, water resources and environmental engineering to make best projects in civil engineering.

II. The students will develop skills to design sustainable solutions for real time problems of civil engineering by adopting modern technologies and designing tools.

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Cognitive levels as per Revised Blooms Taxonomy:

Cognitive Domain	LEVEL	Keywords
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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

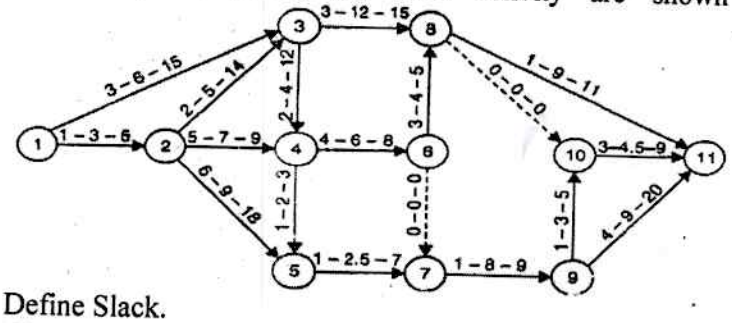
IMPORTANT QUESTIONS

UNIT-I

1. Define Bar chart and milestone chart.
2. Describe various phases of project management.
3. Enumerate the causes for project failure.
4. Elaborate the qualities of a project manager
5. Write short notes on the following :
   a. Planning
   b. Scheduling
   c. Controlling
6. Explain in brief about the differences between PERT and CPM.
7. Explain in detail about the events and activities.

UNIT-II

1. A construction company has an opportunity to submit a bid for the construction of a new apartment building. From the specification provided by the developer, the PERT network along with the -time estimate (in a week) for each activity are shown in Fig. Determine the critical path.



2. Define Slack.
3. Give the factors affecting the project duration.
4. Write short notes on the following:
   a. Start and finish time estimates
   b. Floats

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5. Define Project scheduling.
6. Explain about Critical and Sub-critical path.
7. Briefly discuss about Updating and the process of updating.
8. Distinguish between Direct cost and indirect cost.
9. Define total project cost.
10. How to optimize the cost through networks?
11. What are the steps involved in optimization of cost.

UNIT-III

1. How to develop project plan?
2. Write short notes on the following:
   a. Programming
   b. Scheduling
3. Define Project organization.
4. Explain about project budget flow statement.
5. Define controlling system.
6. Define Contracts and explain in detail about the types of contracts.
7. Discuss about contract document and specifications.
8. What are the important conditions of contract?
9. Define Tender and explain about tender document.
10. Explain in detail about deposits by the contractor.
11. Define Arbitration.
12. Write short notes on the following:
    a. M.Book
    b. R.A Bills
    c. Advances
13. What is Muster Roll?

UNIT-IV

1. Write short notes on the following:
   a. Resource smoothing
   b. Resource leveling
2. Briefly discuss the objectives of material management.
3. Explain the functions of material management department.
4. What are the ABC classification materials?
5. Define Green technologies.
6. What are the merits and demerits of green technologies?
7. Discuss the purpose of NBC code book-2016.

UNIT-V

1. What do you mean by quality control?
2. Give the importance of quality.
3. What are the elements of quality?
4. Discuss briefly about the organization for quality control.
5. What are the quality assurance techniques?
6. Define TQM (Total Quality Management).
7. Discuss about ISO-9000.
8. Define safety management.
9. Briefly discuss about accident prevention program.
10. What is immediate attention in case of accident?
11. What are the approaches to improve safety in construction?
12. List the safety benefits.
13. Enumerate the steps in prevention of fires in construction industries.
14. Briefly discuss about safety information system.

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NARASARAOPETA ENGINEERING COLLEGE
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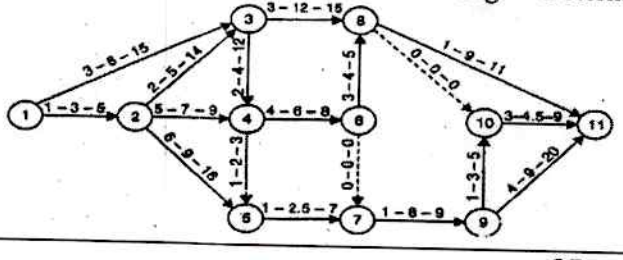
IV B. Tech II Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BCE8TH01 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No		Questions	KL	CO	M
1		**Unit-I**			
	a	i) Describe various phases of project management.	K1	1	6M
		ii) Explain in brief about the differences between PERT and CPM.	K2	1	6M
		OR			
	b	i) Enumerate the causes for project failure	K1	1	6M
		ii) Explain in detail about the events and activities.	K2	1	6M
2		**Unit-II**			
	a	A construction company has an opportunity to submit a bid for the construction of a new apartment building. From the specification provided by the developer, the PERT network along with the -time estimate (in a week) for each activity are shown in Fig. Determine the critical path. 	K4	2	12M
		OR			
	b	i) Distinguish between Direct cost and indirect cost.	K2	2	6M
		ii) What are the steps involved in optimization of cost.	K1	2	6M
3		**Unit-III**			
	a	i) Explain about project budget flow statement.	K2	3	6M
		ii) How to develop project plan?	K1	3	6M
		OR			
	b	i) Define Tender and explain about tender document.	K1	3	6M
		ii) Explain in detail about deposits by the contractor.	K2	3	6M
4		**Unit-IV**			
	a	i) Write short notes on the following: a. Resource smoothing b. Resource leveling	K1	4	6M
		ii) What are the ABC classification materials?	K1	4	6M
		OR			
	b	i) Briefly discuss the objectives of material management.	K2	4	6M
		ii) Discuss the purpose of NBC code book-2016.	K2	4	6M
5		**Unit-V**			
	a	i) What are the elements of quality?	K1	5	6M
		ii) What are the quality assurance techniques?	K1	5	6M
		OR			
	b	i) Briefly discuss about accident prevention program.	K2	5	6M
		ii) Enumerate the steps in prevention of fires in construction industries.	K1	5	6M

KL: Knowledge Level CO: Course Outcome M: Marks

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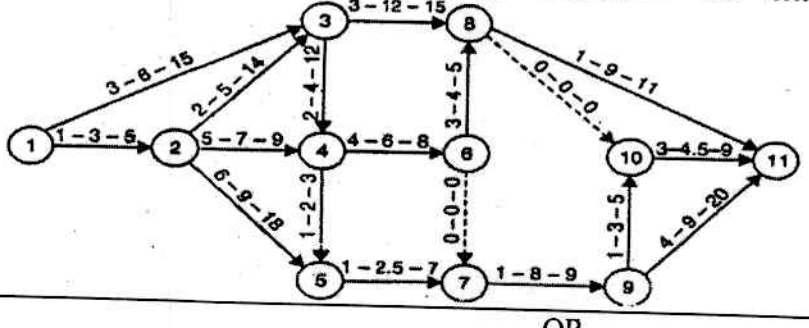
IV B. Tech II Semester Regular/Supple. Examinations, Month/Year

Sub Code: 19BCE8TH01 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Time: 3 hours (CE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No		Questions	KL	CO	M
1		**Unit-I**			
	a	i) Define Bar chart and milestone chart.	K1	1	6M
		ii) Elaborate the qualities of a project manager	K2	1	6M
		OR			
	b	Write short notes on the following : a. Planning b. Scheduling c. Controlling	K1	1	6M
2		**Unit-II**			
	a	A construction company has an opportunity to submit a bid for the construction of a new apartment building. From the specification provided by the developer, the PERT network along with the -time estimate (in a week) for each activity are shown in Fig. Determine the critical path. 	K4	2	12M
		OR			
	b	i) Give the factors affecting the project duration.	K1	2	6M
		ii) How to optimize the cost through networks?	K1	2	6M
3		**Unit-III**			
	a	i) Write short notes on the following: a. Programming b. Scheduling	K1	3	6M
		ii) Define Contracts and explain in detail about the types of contracts.	K1	3	6M
		OR			
	b	i) Write short notes on the following: a. M.Book b. R.A Bills c. Advances	K1	3	6M
		ii) What are the important conditions of contract?	K1	3	6M
4		**Unit-IV**			
	a	i) Write short notes on the following: a. Resource smoothing b. Resource leveling	K1	4	6M
		ii) Explain the functions of material management department.	K2	4	6M
		OR			
	b	i) Define Green technologies.	K1	4	6M
		ii) What are the merits and demerits of green technologies?	K1	4	6M

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5		**Unit-V**			
	a	i) What do you mean by quality control and give the importance of quality control.	K1	5	6M
		ii) Define TQM (Total Quality Management).	K2	5	6M
		OR			
	b	i) What are the approaches to improve safety in construction?	K1	5	6M
		ii) Briefly discuss about accident prevention program and what is the immediate attention in case of accident?	K2	5	6M

KL: Knowledge Level CO: Course Outcome M: Marks

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN: 2022-23

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19BCE8TH01	CONSTRUCTION TECHNOLOGY AND MANAGEMENT (R19)	IV-II	Civil Engineering	8	A & B

COURSE OUTCOMES:

CO1	To understand the concept of project management including network drawing and monitoring. K1 & K2
CO2	Appreciate the importance of construction planning and Project Management. K1 & K2
CO3	Apply the gained knowledge to project Planning and Control. K1 & K3
CO4	To understand the concept of cost control and resource management. K1 & K2
CO5	Apply the concept of Quality control and Safety Management in construction. K1 & K3

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
UNIT – I	**INTRODUCTION:**					
1	To understand the concept of project management including network drawing and monitoring. K1 & K2	1.1	Construction projects-Project management-Main causes of project failure	T1,T2,R1	2	Chalk & Talk, Students Seminars
		1.2	Origin of PERT and CPM, Planning, Scheduling and controlling	T1,T2,R2	2	Chalk & Talk
		1.3	Bar charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks – Comparison	T2,T3,R2	3	PPT
		1.4	Event, Activity, Rules for drawing networks	T1,T2,R4	3	PPT, Chalk & Talk
		1.5	Numbering the events (Fulkerson's law), Dummy activities	T4,T2,R3	3	Chalk & Talk
UNIT – II	**PROJECT MANAGEMENT THROUGH NETWORKS AND COST CONTROL:**					
2	Appreciate the importance of construction	2.1	Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time	T4,T5,R6	3	Chalk & Talk, Project based learning
		2.2	slack, project duration, probability of completion	T3,T4,R3	2	Chalk & Talk, Project based learning
		2.3	Start and Finish time estimates,	T3,T4,R4	2	Chalk & Talk,

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	planning and Project Management. K1 & K2		Floats			Problem based learning
		2.4	Project scheduling, Critical and sub-critical path	T2,T5,R2	3	Chalk & Talk, Project based learning
		2.5	Updating – Process of updating	T1,T4,R1	1	Chalk & Talk, Active Learning
		2.6	Direct cost- indirect cost- total project cost	T3,T4,R3	2	NPTEL/MOOCS
		2.7	Optimization of cost through networks	T2,T3,R2	2	Chalk & Talk, Tutorial
		2.8	Steps involved in optimization of cost	T1,T2,R4	1	PPT, Students Seminars
Mid examinations-I						
UNIT – III PROJECT PLANNING & ORGANIZATION AND CONTRACTS:						
3	Apply the gained knowledge to project Planning and Control. K1 & K3	3.1	Development of project plan, objective and conception	T2,T3,R2	2	Chalk & Talk, Project based learning
		3.2	Programming – Scheduling – Project Organization	T3,T4,R3	2	PPT, Tutorial
		3.3	Project budget fund flow statement – Controlling system	T1,T4,R2	2	Chalk & Talk, Active Learning
		3.4	Introduction to Contracts and its types	T2,T3,R3	1	PPT, Tutorial
		3.5	Contract document – Specifications – Important conditions of contract	T3,T4,R1	3	Chalk & Talk, Active Learning
		3.6	Tender and tender document	T2,T5,R1	2	Chalk & Talk, Active Learning
		3.7	Deposits by the contractor – Arbitration	T3,T5,R3	2	PPT, Web Resources
		3.8	M. Book, R.A Bills & Advances – Muster Roll	T2,T3,R2	3	Chalk & Talk, Active Learning
UNIT – IV RESOURCE MANAGEMENT:						
4	To understand the concept of cost control and resource management. K1 & K2	4.1	Introduction to Resource Management	T1,T2,R3	1	Chalk & Talk, PPT
		4.2	Resource smoothing- Resource leveling	T1,T2,R3	2	PPT, Tutorial
		4.3	Objectives of material management- Costs- Functions of material management department	T1,T2,R4	3	PPT, Active Learning
		4.4	ABC classification of materials	T2,T3,R3	1	Chalk & Talk, Active Learning

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		4.5	Introduction to Green Technologies-NBC code book-2016	T1,T4,R3	2	Students Seminars, PPT
UNIT – V QUALITY CONTROL AND SAFETY MANAGEMENT:						
5	Apply the concept of Quality control and Safety Management in construction. K1 & K3	5.1	Importance of quality- Elements of quality	T1,T3,R6	1	PPT, Student Seminars
		5.2	Organization for quality control- Quality assurance techniques	T1,T3,R6	2	Tutorial, Active Learning
		5.3	Total quality management- ISO – 9000	T1,T3,R6	1	Chalk & Talk, PPT
		5.4	Accident prevention program- immediate attention in case of accident	T1,T3,R6	2	Tutorial, Web resources
		5.5	Approaches to improve safety in construction- Safety benefits	T1,T3,R6	2	NPTEL/MOOCS
		5.6	Prevention of fires in construction industries	T1,T3,R6	1	PPT, Student Seminars
		5.7	Safety information system	T1,T3,R6	2	PPT, Problem based learning
Mid examinations-II						
				Total	66	
END EXAMINATIONS						

TEXT BOOKS:

T1. Construction Engineering and Management by Dr. S. Seetharaman- Umesh Publications, Nai Sarark, Delhi.

T2. Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee- Khanna Publishers, Nai Sarak- Delhi

T3. S. Sanga Reddy & Meyyappan, "Construction Management", Kumaran Publications, 2009

T4. Gahlot, P.S & Dhir, D.M., "Construction Planning and Management", Wiley Eastern Limited, 1992

T5. Punmia B.C., "Project Planning and Control with PERT and CPM", Laxmi Publications, New Delhi, 1987.

REFERENCE:

R1. Construction Management & Planning by B. Sengupta & H. Guha- Tata Mc Graw – Hill Publishing Co. Ltd., New Delhi

R2. Construction Planning, Equipment & Methods by Peurifoy R. L. - Mc Graw – Hill International Book Company

R3. PERT and CPM – Punmia, Laxmi Publications, 3rd edition 1987

R4. PERT & CPM Principles and applications by L. S. Srinath- Affiliated East West Press

R5. Jerome D. Wiest & K. Levy, "Management Guide to PERT/CPM"

R6. Clough R.H. & Sears. G.A, "Construction Project Management" 2008

Signature of faculty **Head of the Department**

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

COURSE INFORMATION SHEET Academic -Year-2022-23

PROGRAMME: B.Tech(CSE)	
COURSE : E-COMMERCE	Year/Sem : IV /II CREDITS: 3
COURSE CODE: 19BCI8PE08 REGULATION: R19	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): Elective
COURSE AREA/DOMAIN:CSE	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

Course CODE	COURSE NAME	DESCRIPTION	YEAR/SEM
19BCI8PE08	E-COMMERCE	To introduce the fundamental principles of e-business, e-commerce, and the role of management	IV /II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Interpret the E-commerce applications and Process Model. [K2]
CO2	Compare and contrast various electronic Payment Systems. [K3]
CO3	Interpret the Intra Organizational Commerce. [K2]
CO4	Outline the corporate digital library and marketing research. [K2]
CO5	Analyze resource discovery and information filtering. [K4]

SYLLABUS:

UNIT	DETAILS
I	Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications
II	Consumer Oriented Electronic commerce - Mercantile Process models.Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.
III	Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.
IV	Corporate Digital Library - Document Library, digital Document types, corporate DataWarehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.
V	Consumer Search and Resource Discovery - Information search and Retrieval, CommerceCatalogues, Information Filtering. Digital Video and electronic Commerce

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TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Kalakata, Whinston, "Frontiers of electronic commerce", Pearson
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Hendry Chan,
R2	S.Jaiswal – Galgotia, "E-Commerce".
R3	Efrain Turbon, Jae Lee, David King, H.Michael Chang, "E-Commerce".
R4	Gary P.Schneider, "Electronic Commerce", Thomson.
R5	E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol GuyericoTraver.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	-	-

WEB SOURCE REFERENCES:

1	https://www.slideshare.net/kamalgulati7/full-notes-on-ecommerce-study-material-for-ecommerce
2	http://www.vssut.ac.in/lecture_notes/lecture1428551057.pdf
3	https://www.geektonight.com/e-commerce-notes/

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

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MAPPING CO'S WITH PO'S

COs	POs														
	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
C I8PE08.1	1	1	2	3	2	-	-	-	-	-	-	-	1	1	2
C I8PE08.2	3	2	2	2	2	-	-	-	-	-	-	-	2	3	3
C I8PE08.3	2	1	1	2	2	-	-	-	-	-	-	-	3	2	2
C I8PE08.4	3	2	1	3	3	-	-	-	-	-	-	-	1	1	2
C I8PE08.5	3	2	-	2	-	-	-	-	-	-	-	-			2
CI8PE08	2.4	1.6	1.5	2.4	2.25	-	-	-	-	-	-	-	1.86	1.86	2.20

MAPPING COURSE WITH POs & PSOs

Course	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C I8PE08	2.4	1.6	1.5	2.4	2.25	-	-	-	-	-	-	-	1.86	1.86	2.20

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Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Coordinator **Module Coordinator** **HOD**

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Narasaraopeta Engineering College
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Yallmanda(Post), Narasaraopet- 522601

DEPARTMENT OF Computer Science and Engineering

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
19BCI8PE08	E-COMMERCE	VIII	CSE	6	3

COURSE OUTCOMES:

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

CO 1: Interpret the E-commerce applications and Process Model. [K2]

CO 2: Compare and contrast various electronic Payment Systems. [K3]

CO 3: Interpret the Intra Organizational Commerce. [K2]

CO 4: Outline the corporate digital library and marketing research. [K2]

CO 5: Analyze resource discovery and information filtering. [K4]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
			UNIT-I			
1	CO1: Interpret the E-commerce applications and Process Model. [K2].	1.1	Electronic Commerce-Framework	T1	2	Chalk & Talk
		1.2	anatomy of E-Commerce applications	T1	2	Chalk & Talk
		1.3	E-Commerce Consumer applications	T1	3	PPTS
		1.4	E-Commerce organization applications	T1	3	Chalk & Talk, NPTEL/MOOCS
2	CO2: Compare and contrast various electronic Payment Systems. [K3]		**UNIT-II**			
		2.1	Consumer Oriented Electronic commerce	T1	2	Chalk & Talk
		2.2	Mercantile Process models.	T1	2	Chalk & Talk
			1st MID EXAMINATION			
		2.3	Electronic payment systems	T1, R1	3	Chalk & Talk
		2.4	Risks in Electronic payment systems	T1, R1	3	Chalk & Talk, NPTEL/MOOCS
3	CO3: Interpret the Intra Organizational Commerce. [K2]		**UNIT-III**			
		3.1	Intra Organizational Commerce	T1, R3	3	Chalk & Talk, Tutorials
		3.2	Automation Customization	T1, R3	5	Chalk & Talk, Tutorials
		3.3	.InternalCommerce	T1, R3	2	Chalk & Talk, Tutorials
		3.4	Supply chain Management	T1,, R1	3	Chalk & Talk, Tutorials

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			UNIT-IV			
4	**CO 4:** Outline the corporate digital library and marketing research. [K2]	4.1	Corporate Digital Library	T1,R1	2	Chalk & Talk, Tutorials
		4.2	Document Library, digital Document types	T1,T2	2	Chalk & Talk, Tutorials
		4.3	corporate DataWarehouses.	T1,R1	2	Chalk & Talk, Tutorials
		4.4	Advertising and Marketing	T1, R1	2	Chalk & Talk, Seminar
		4.5	Information based marketing	T1, R1	2	Chalk & Talk, Seminar
		4.6	Advertising on Internet	T1, R1	2	Chalk & Talk, Tutorials
		4.7	on-line marketing process, market research.	T1, R1	2	Chalk & Talk, Case Study
5	**CO 5:** Analyze resource discovery and information filtering. [K4]]		**UNIT-V**			
		5.1	Consumer Search and Resource Discovery	T1, R1	3	Chalk & Talk, Tutorials
		5.2	Information search and Retrieval	T1, R1	3	Chalk & Talk, Tutorials
		5.3	CommerceCatalogues	T1, R1	2	Chalk & Talk, PPTS
		5.4	Information Filtering	T1,, R1	2	Chalk & Talk, PPTS
		5.5	Digital Video and electronic Commerce	T1,, R1	2	Chalk & Talk, PPTS
				Total	**60**	
			2nd MID EXAMINATION			
			SEMESTER EXAMINATION			

TEXT BOOKS :

T1: Kalakata, Whinston, "Frontiers of electronic commerce", Pearson.

REFERENCE BOOKS :

R1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, "E-Commerce fundamentals and applications"

R2. S.Jaiswal – Galgotia, "E-Commerce".

R3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, "E-Commerce".

R4. Gary P.Schneider, "Electronic Commerce", Thomson.

R5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

Faculty **HOD** **PRINCIPAL**

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

COURSE INFORMATION SHEET

PROGRAMME: I M.C.A II Sem.,	
COURSE: **Computer Networks**	Semester : **II** CREDITS: **3**
COURSE CODE:**R20MCA201** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
COURSE AREA/DOMAIN: NETWORKS	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20MCA204	**Design And Analysis of Algorithms**	Data communications refers to the transmission of this digital data between two or more computers and a computer network or data network is a telecommunications network that allows computers to exchange data. The best known computer network is the Internet.	**III**

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Interpret the basic computer network technology.
CO2	Identify the different types of network topologies and protocols.
CO3	Explain the layers of the OSI and TCP/IP model and the functions of each layer.
CO4	Design and implement data link or network layer protocols within a simulated networking environment

SYLLABUS:

UNIT	DETAILS
I	**Network Hardware Reference Model:** Transmission Media, Narrowband ISDN, Broadband ISDN, ATM. **The Data Link Layer:** Error detection and correction, Elementary Data Link Protocols, Sliding window protocols.
II	**Channel Allocation Methods:** TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols, IEEE standard BO2 for LANS, Ethernet, Token Bus, Token ring, Bridges.
III	**Network Layer Routing Algorithms:** Shortest path, Flow based Distance vector, Link state,Hierarchical, Broadcast routing, Congestion Control algorithms, General principles ofcongestion control, Congestion prevention polices.
IV	**Internet Working:** Tunneling, internetworking, Fragmentation, Network Layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP. **Network Layer in the ATM Networks**-cell formats, connection setup, routing and switching, service categories and quality of service, ATM LANs.
V	**The Transport Layer:** Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to End protocols: UDP, TCP Protocol and Remote Procedure Call.

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VI	**Application Layer:** Network Security, Cryptographic Algorithms: DES, RSA. Security Mechanisms: Authentication Protocols, Firewalls, DNS, Protocols-SMTP, MIME, HTTP, SNMP

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1 T2	Computer Networks andrew, Tanenbaum, 4/e, Pearson. Data and computer communications, Stallings, 8/e, PHI.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	1. Data communications and networking, Forouzan, 4/e, TMH.
R2	2. An Engineering approach to compute networking, Kesha, Pearson.
R3	3. Communication networks, 2/e, Leon-Garcia, TMH.
R4	4. Computer networks, C R Sarma, Jaico, Held, 7/e, Pearson.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Computer Networks Techniques.	

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc18_cs38
2	https://in.udacity.com/course/computer-networking--ud436
3	https://www.class-central.com/subject/computer-networking
4	https://www.youtube.com/watch?v=3DZLltfbqtQ&list=PL32DBC269EF768F74

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

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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**

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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.

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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: Interpret the basic computer network technology. **[K1 & K2].**

CO2: Identify the different types of network topologies and protocols. **[K1 & K2].**

CO3: Explain the layers of the OSI and TCP/IP model and the functions of each layer. **[K1 & K2].**

CO 4: Design and implement data link or network layer protocols within a simulated networking environment. **[K1 & K2].**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	a) Define Network. Explain Network Topology's. b) Discuss LAN,MAN,WAN	K1	CO1
2	a)Explain ISO/OSI Model b) Explain Guided Transmission media.	K2 K1	CO1
3	Explain Error Correction & Detection Codes.	K2	CO1
	UNIT 2		
1	Discuss a) Stop &Wait Protocal b) Go-Back-N Protocal c) Selective Repeat Protocal.	K1,K2	CO2
2	Explain IEEE Standard in Detail.	K2	CO2
3	Explain CSMA Protocol in Detail.	K1,K2	CO2
4	Define Bridges? Explain Different types of Bridges.	K1,K2	CO2

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	UNIT 3		
1	Explain Distance Vector Routing Algorithm with Example	**K1,K2**	**CO3**
2	Explain Shortest path Routing Algorithm with Example	**K1,K2**	**CO3**
3	Explain Congestion control Algorithm with different types of principals.	**K1,K2**	**CO3**
	UNIT 4		
1	a) Explain Tunneling in detail. b) Explain Internetwork Routing.	**K1**	**CO3**
2	Explain Fragmentation in detail	**K2**	**CO3**
3	Explain IPV4 Protocal in detail.	**K1**	**CO3**
4	Discuss a) IP Addresses b) Subnets	**K1**	**CO3**
	UNIT 5		
1	Explain ICMP Protocal in Detail.	**K2**	**CO4**
2	Explain Transport Service Primitives.	**K1,K2**	**CO4**
3	Explain Addressing in detail	**K2**	**CO4**
4	Explain Connection Established in detail	**K2**	**CO4**
	UNIT 6		
1	Explain RSA Algorithm with Example.	**K1,K5**	**CO4**
2	Define Firewall.Explain Configurations in firewall.	**K1,K2**	**CO4**
3	Explain HTTP	**K1,K2**	**CO4**

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Model Question Paper

Code: R20MCA201

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I MCA II SEM., Regular Examinations
COMPUTER NETWORKS
[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 35 Minutes x 4 Questions	140
4	Quick revision & Winding up	5
	Total	180

PART–A (22 Marks)
Answer ALL Questions.

S No		Question	Cognitive Level	CO	Marks
1	a	Define topology and mention the types of topologies.	K1	1	2
	b	Write the design issues of data link layer?	K6	2	2
	c	Explain about bridge?	K2	3	2
	d	Explain about fields present in IP address?	K2	3	2
	e	Define Flooding.	K1	3	2
	f	Define HTTP.	K1	4	2

PART–B (48 Marks)
Answer any THREE Questions

S. No		Question	Cognitive Level	CO	Marks
2	a	Explain CRC compute transmitted code for the data stream 1101011011 Using Generator G(X) 10011.	K2	1	6
	b	Distinguish between Broadcast Networking and point to point Networking.	K4	1	6
3	a	Explain Token Bus and Token Ring Protocol.	K2	2	8
	b	Explain Collision Free Protocols.	K2	2	4
4	a	Explain Congestion Control Algorithms.	K2	3	6

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	b	Explain Distance Vector routing Algorithm.	**K2**	**3**	**6**
5	**a**	Explain the Interior Gateway Routing Protocol.	**K2**	**3**	**8**
	b	Define cell formats of N/W layer in the ATM Networks.	**K1**	**3**	**6**
6	**a**	Explain RPC.	**K2**	**3**	**6**
	b	What are the services provided by Transport Layer?	**K2**	**3**	**6**
7	**a**	Explain Authentication Protocols in Application Layer.	**K2**	**3**	**12**

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COMPUTER NETWORKS
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20MCA201	CN(R20)	II	MCA	6	A

CO1: Interpret the basic computer network technology. **[K1 & K2].**
CO2: Identify the different types of network topologies and protocols. **[K1 & K2].**
CO3: Explain the layers of the OSI and TCP/IP model and the functions of each layer. **[K1 & K2].**
CO4: Design and implement data link or network layer protocols within a simulated networking environment. **[K1 & K2].**

Unit No	Outcome	Topics/Activity		Ref Text book	Total Periods	Delivery Method
1	CO1: Interpret the basic computer network technology. **[K1 & K2].**	**Unit-1 Network Hardware Reference Model**				
		1.	Transmission Media, Narrowband ISDN, Broadband ISDN, ATM.	T1 R1	12	Chalk & Talk, PPT, Active Learning & Tutorial
		2.	**The Data Link Layer:** Error detection and correction	T1		
		.3	Elementary Data Link Protocols, Sliding window protocols.	T1		
2	CO1: Interpret the basic computer network technology. **[K1 & K2].**	**Unit-2 Channel Allocation Methods**				
		1	TDM, FDM, ALOHA, Carrier sense Multiple access protocols	T2	10	Chalk & Talk, PPT, Active Learning & Tutorial
		2.	Collision Free protocols, IEEE standard BO2 for LANS, Ethernet	T2		
		3	Token Bus,Token ring, Bridges.	T2		
3	CO2: Identify the different types of network topologies and protocols. **[K1 & K2].**	**Unit-3 Network Layer Routing Algorithms**				
		1	Shortest path, Flow based Distance vector	T1, R1	10	Chalk & Talk, PPT, Tutorial
		.2	Link state,Hierarchical, Broadcast routing	T1, R1		
		3	Congestion Control algorithms, General principles ofcongestion control, Congestion prevention polices.	T1, R1		
		MID I EXAMINATION DURING EIGHTH WEEK				

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4	CO3: Explain the layers of the OSI and TCP/IP model and the functions of each layer. **[K1 & K2].**	**Unit-4 Internet Working & Network Layer in the ATM Networks**				
		.1	Tunneling, internetworking, Fragmentation	T2, R2	20	Chalk & Talk, PPT & Tutorial, , Industrial Visit, Demonstration with models.
		.2	Network Layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP.	T2		
		.3	**Network Layer in the ATM Networks**-cell formats, connection setup, routing and switching	T2		
		.4	service categories and quality of service, ATM LANs.	T2		
5	CO4: Design and implement data link or network layer protocols within a simulated networking environment. **[K1 & K2].**	**Unit-5 The Transport Layer**				
		1.	Elements of transport protocols – addressing, establishing a connection	T1, R1	10	Chalk & Talk, PPT, Virtual labs, Tutorial, & Project based learning
		2.	releasing connection, flow control and buffering and crash recovery	T1, R1		
		3.	End to End protocols: UDP, TCP Protocol and Remote Procedure Call.	T1, R1		
6	CO4: Design and implement data link or network layer protocols within a simulated networking environment. **[K1 & K2].**	**UNIT-6 Application Layer**				
		1	Network Security, Cryptographic Algorithms- DES, RSA	T1, R1	10	Chalk & Talk, PPT Tutorial, Active Learning & Seminars
		2.	Security Mechanisms: Authentication Protocols, Firewalls, DNS,,	T1, R1		
		3	Protocols-SMTP, MIME, HTTP, SNMP	T1, R1		
				Total	72	
MID II EXAMINATION DURING SIXTEENTH WEEK						
END EXAMINATIONS						

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Text Books:

T1 : Computer Networks andrew, Tanenbaum, 4/e, Pearson. (1,3,5,6)
T2: Data and computer communications, Stallings, 8/e, PHI.(2,4)

Reference Books:

R1. Data communications and networking, Forouzan, 4/e, TMH.
R2. An Engineering approach to compute networking, Kesha, Pearson.
R3. Communication networks, 2/e, Leon-Garcia, TMH.
R4. Computer networks, C R Sarma, Jaico, Held, 7/e, Pearson.

Principal HOD Faculty

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

COURSE INFORMATION SHEET

ACADEMIC YEAR: 2022-2023

PROGRAMME: B.Tech Electrical Engineering			
COURSE: UTILIZATION OF ELECTRICAL ENERGY	Year: IV	Semester : II	CREDITS: 3
COURSE CODE: 19BEE8TH01 REGULATION: R19	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): CORE		
COURSE AREA/DOMAIN: Electrical	PERIODS: 5 Per Week.		

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	YEAR-SEM
19BEE6PE07	CED	Control of Electrical Drives	III-II

COURSE OUTCOMES: Students will be able to

SNO	Course Outcome Statement
CO1	**Distinguish** between various types of electrical heating methods.[**K2**]
CO2	**Distinguish** between various types of electrical welding methods.[**K2**]
CO3	**Demonstrate** the basic principles illumination and light control for residential, commercial and industrial environments .[**K3**]
CO4	**Analyze** various speed time curves of electric traction .[**K4**]
CO5	**Examine** and **calculate** tractive power and specific energy consumption.[**K4**]

SYLLABUS:

UNIT	DETAILS
I	**Electric Heating** Advantages and methods of electric heating–Resistance heating-Direct & Indirect resistance heating methods- Arc furnaces-requirements of good heating material-causes of failure of heating elements-induction heating and its types-Dilectric heating.
II	**Electric Welding** Advantages of electrical welding-principle-Electric Welding types-resistance welding and its types-arc welding and its types-types of electrodes- Comparison between AC and DC Welding-Comparison between Resistance and Arc welding.
III	**Illumination** Introduction to sources of light-terms used in illumination- Laws of illumination-Basic principles of light control-types of lamps- Discharge lamps, MV and SV lamps, tungsten filament lamps and fluorescent tubes- Comparison between tungsten filament lamps and fluorescent tubes.
IV	**Electric Traction – I** System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed– time curves for different services – Trapezoidal and quadrilateral speed time curves.
V	**Electric Traction – II** Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking-retardation adhesive weight and coefficient of adhesion.

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TEXT BOOKS	
T	BOOK TITLE/AUTHORS/PUBLISHER
T1	Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
T2	Utilization of Electrical Energy – by G.C.Garg Khanna Publications.
T3	Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai& Sons
REFERENCE BOOKS	
R	BOOK TITLE/AUTHORS/PUBLISHER
R1	Utilization of Electrical Power including Electric drives and Electric traction – by N.V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.
R2	Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Operation of Electric Locomotive	PO5 & PSO2

WEB SOURCE REFERENCES:

1	www.nptel.iitm.ac.in
2	https://www.youtube.com/watch?v=gkZvcWsz_CM&list=PL9UVgH09hMZNF5TTEhkpxnnxl0gGoISIm
3	https://www.youtube.com/watch?v=7pXigtweJjo&list=PL9UVgH09hMZNF5TTEhkpxnnxl0gGoISIm&index=4
4	https://www.youtube.com/watch?v=fQrZMMWo1mA&list=PLbMVogVj5nJThs8VThC-DA8CZYsmaQypX

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
C4201.1	2	2	3	1	-		-	-	-	-	-	-	-	-
C4201.2	3	2	2	1	-	1	-	-	-	-	2	-	-	-
C4201.3	2	2	3	2	-	1	-	-	-	-	-	2	-	-
C4201.4	2	2	1	2	-	1	1	-	-	-	2	-	2	1
C4201.5	3	2	2	2	-	2	2	-	-	-	1	1	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

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MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C4201	2.5	2.0	2.2	1.33	0.33	1.16	0.5	-	-	-	1.16	0.83	1.00	0.5

<table>
<tr><th colspan="3">Course Outcome Assessment Methods</th><th colspan="2">Weightages</th><th rowspan="4">Final Course Outcome (100%)</th></tr>
<tr><td rowspan="3">Direct Assessment</td><td rowspan="3">Cumulative Internal Examinations (CIE)</td><td>Descriptive Test</td><td rowspan="3">40%</td><td rowspan="3">90%</td></tr>
<tr><td>Objective Test</td></tr>
<tr><td>Assignment Test</td></tr>
<tr><td colspan="2">Semester End Examinations (SEE)</td><td>60%</td></tr>
<tr><td>Indirect Assessment</td><td colspan="2">Course End Survey</td><td>10%</td></tr>
</table>

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

S.Saritha
Course Coordinator
(Mrs.S.Saritha)

Module Coordinator

Head of the Department
(Dr.P.Lakshmanan)

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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 appropriate techniques and modern tools in the field of electrical and electronics engineering.
2. Demonstrate the sustainable development in non-conventional Energy sources.

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.

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		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: **Distinguish** between various types of electrical heating methods. [**K2**]

CO2: **Distinguish** between various types of electrical welding methods. [**K2**]

CO3: **Demonstrate** the basic principles illumination and light control for residential, commercial and industrial environments. [**K3**]

CO4: **Analyze** various speed time curves of electric traction. [**K4**]

CO5: **Examine** and **calculate** tractive power and specific energy consumption. [**K4**]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain in brief how heating is done in the following cases: i) Resistance heating, ii) Induction heating iii) Dielectric heating	K2	CO1
2	List the different properties that are required for a good heating material.	K2	CO1
3	What are specific advantages and applications of dielectric heating?	K1	CO1
4	Describe the construction and principle of working of an induction furnace	K2	CO1
	UNIT 2		
1	Describe with neat sketches various methods of electric resistance welding. Give its merits and demerits with respect to arc welding.	K2	CO2
2	Describe the construction and principle of working of an induction furnace.	K2	CO2
3	What do you mean by negative resistance characteristics of an electric arc?	K1	CO2
4	Explain about arc welding, submerged arc welding methods with necessary illustrations.	K2	CO2
5	Distinguish between DC and AC welding.	K2	CO2
	UNIT 3		
1	How is luminous intensity measured, explain?	K2	CO3
2	What are various sources of light? Write short notes on filament lamps.	K1	CO3

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3	Describe two ways of how glare is produced and suggest how it can be avoided?	K2	CO3
4	Explain the construction and working of Sodium vapour lamp.	K2	CO3
5	What are discharge lamps? **Explain.**	K2	CO3
6	Compare fluorescent and filament lamps on basis of quality of light, capital and running costs.	K4	CO3
	UNIT 4		
1	Discuss the merits and demerits of the D.C and 1-phase A.C systems for the main and suburban line electrification of the railways.	K2	CO4
2	What are special features of a traction motor?	K1	CO4
3	Explain the significance of speed time curves? And give its merits.	K2	CO4
4	Explain the following terms: i)Crest speed ii) coasting iii)Schedule speed iv)Average speed	K2	CO4
5	Compare between D.C. and A.C. systems of railway electrification from the point of view of main line and suburban line railway service.	K4	CO4
	UNIT 5		
1	What is the tractive effort required to overcome train resistance, explain?	K1	CO5
2	Explain dead weight, accelerating weight and train resistance referred to traction	K2	CO5
3	Derive the necessary expressions for tractive effort of fraction system	K3	CO5
4	What is Specific energy consumption and list the factors that affect it	K1	CO5
5	Derive the expression for specific energy output from the driving axles using a Simplified speed time curve Assume the necessary initial conditions.	K3	CO5

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NARASARAOPETA ENGINEERING COLLEGE
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IV B.Tech II Semester Examinations,

Sub Code: 19BEE8TH01 **UTILIZATION OF ELECTRICAL ENERGY**

Time: 3 hours (EEE) Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12 = 60M)

Q.No.		Questions	Cognitive level	CO	Marks
		Unit-I			
1	a	**Explain** in brief how heating is done in the following cases: i) Resistance heating, ii) Induction heating iii) Dielectric heating.	K2	1	[12M]
		OR			
	b	i) **List** the different properties that are required for a good heating material.	K2	1	[6M]
		ii) **What** are specific advantages and applications of dielectric heating?	K1	1	[6M]
		Unit-II			
2	a	i) **Explain** about arc welding, submerged arc welding methods with necessary illustrations.	K2	2	[6M]
		ii) **Distinguish** between DC and AC welding.	K2	2	[6M]
		OR			
	b	**Describe** with neat sketches various methods of electric resistance welding. Give its merits and demerits with respect to arc welding.	K2	2	[12M]
		Unit-III			
3	a	i) the different measurement techniques used for luminous intensity	K2	3	[6M]
		ii) A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metre in diameter. The illumination of the disc increases uniformly from 0.5metre-candle at the edge to 2 metre-candle at the centre. **Determine** i. the total light received ii. Average illumination of the disc iii. Average c.p. of the source.	K2	3	[6M]
		OR			
	b	**Compare** fluoresecent and filament lamps on basis of quality of light, capital and running costs.	K4	3	[12M]
		Unit-IV			
4	a	i) **Explain** the significance of speed time curves? And give its merits..	K2	4	[6M]
		ii)For a quadrilateral speed-time curve of an electric train, **Derive** expression for the distance between stops and speed at the end of the coasting period	K2	4	[6M]

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		OR			
	b	**Compare** between D.C. and A.C. systems of railway electrification from the point of view of main line and suburban line railway service.	K4	4	[12M]
		Unit-V			
5	a	i) **What** is the tractive effort required to overcome train resistance, explain?	K1	5	[6M]
		ii) **What** is Specific energy consumption and list the factors that affect it?	K1	5	[6M]
		OR			
	b	**Derive** the expression for specific energy output from the driving axles using a Simplified speed time curve Assume the necessary initial conditions.	K3	5	[12M]

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

LESSON PLAN

ACADEMIC YEAR: 2022 - 2023

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R19BEE8TH01	UTILIZATION OF ELECTRICAL ENERGY	IV-II	Electrical and Electronics Engineering	5	A & B

COURSE OUTCOMES: Students are able to

CO1: **Distinguish** between various types of electrical heating methods.[**K2**]

CO2: **Distinguish** between various types of electrical welding methods.[**K2**]

CO3 **Demonstrate** the basic principles illumination and light control for residential, commercial and industrial environments .[**K3**]

CO4: **Analyze** various speed time curves of electric traction .[**K4**]

CO5: **Examine** and **calculate** tractive power and specific energy consumption.[**K4**]

Unit No	Outcome	Topics/Activity		Ref Text book	Total Periods	Delivery Method
1	CO1. **Distinguish** between various types of electrical heating methods.[**K2**]	**Electric Heating**				
		1.1	Advantages and methods of electric heating	T3,R1	1	Chalk & Talk
		1.2	Resistance heating-Direct & Indirect resistance heating methods	T2,R1	1	Chalk & Talk
		1.3	Arc furnaces	T1, T2,R1	2	Chalk & Talk
		1.4	Requirements of good heating material	T1, T3 R2	2	Chalk & Talk
		1.5	Causes of failure of heating elements	T1, T2, R1	2	NPTEL
		1.6	Induction heating and its types	T1, R2	2	Chalk & Talk
		1.7	Dielectric heating.	T1, R1	2	PPT
Assignment Exam – I						
2	CO2. **Distinguish** between various types of electrical	**Electric Welding**				
		2.1	Advantages of electrical welding	T1, R2,R1	1	Chalk & Talk
		2.2	principle-Electric Welding types	T3,R2	2	Chalk & Talk
		2.3	Resistance welding and its types	T2, R2	2	Students seminars
		2.4	Arc welding and its types	T1, T2,R2	2	NPTEL

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	welding methods.[K2] relays. [K4]	2.5	Types of electrodes	T1, T3, R2	2	Active learning
		2.6	Comparison between AC and DC Welding	T2, R2	1	Chalk & Talk
		2.7	Comparison between Resistance and Arc welding.	T2,R1	2	PPT
	Assignment Exam - II					
3	CO 3. **Demonstrate** the basic principles illumination and light control for residential, commercial and industrial environments .[K3]	**Illumination**				
		3.1	Introduction to sources of light	T3,T1, R2	2	Chalk & Talk
		3.2	Terms used in illumination	T3,T1, R2	2	Chalk & Talk
		3.3	Laws of illumination	T1, R2	1	Tutorials
		3.4	Basic principles of light control	T1, T2,R2	2	Web resources
		3.5	Types of lamps- Discharge lamps	T1, R1	2	PPT
		3.6	MV and SV lamps, tungsten filament lamps and fluorescent tubes	T1, R1	2	PPT,quiz
		3.7	Comparison between tungsten filament lamps and fluorescent tubes.	T1,T3	1	Students seminars
	MID I EXAMINATION DURING NINE WEEKS					
	CO4. **Analyze** various speed electric traction .[K4]	**Electric Traction-I**				
		4.1	System of electric traction and track electrification	T1,T2, R2	2	Chalk & Talk
		4.2	Review of existing electric traction systems in India	T3,R1	2	Chalk & Talk
		4.3	Special features of traction motor	T2,R1	2	Chalk & Talk
		Assignment Exam - III				
		4.4	Mechanics of train movement	T1, T2,R2	2	PPT,quiz
		4.5	Speed– time curves for different services	T2,R1	2	Chalk & Talk
		4.6	Trapezoidal and quadrilateral speed time curves	T3,R2	2	Chalk & Talk
5	CO5. **Examine** and **calculate** tractive power and specific energy consumption.[K4]	**Electric Traction-II**				
		5.1	Calculations of tractive effort-power	T1,T2, R2	2	Chalk & Talk
		5.2	Specific energy consumption for given run	T1, R2	2	Chalk & Talk
		5.3	Effect of varying acceleration and braking retardation	T1, R2	2	PPT,quiz
		Assignment Exam - IV				
		5.4	Adhesive weight and braking-retardation	T1,T2, R2	1	Chalk & Talk

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		5.5	Adhesive weight and coefficient of adhesion.	T2,R1	2	Active learning
MID II EXAMINATION DURING EIGHTEENTH WEEK						
END EXAMINATIONS						

Text Books:

T1 Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman

T2 Utilization of Electrical Energy – by G.C.Garg Khanna Publications.

T3 Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai& Sons

Reference Books:

R1 Utilization of Electrical Power including Electric drives and Electric traction – by N.V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.

R2 Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997

S. Saritha.
Faculty

HOD

Principal

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NARASARAOPETA ENGINEERING COLLEGE
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Dept. of Civil Engineering

COURSE INFORMATION SHEET: (2022-2023)

PROGRAMME: B.Tech Civil Engineering	
COURSE: **ENVIRONMENTAL ENGINEERING**	Semester : **III-II** CREDITS: **3**
COURSE CODE: **R20CE3202** REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **CORE**
Course area/domain: ENVIRONMENTAL ENGINEERING	PERIODS: 6 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CE3107	SOLID AND HAZARDOUS WASTE MANAGEMENT	An ability to understand the basic concepts of water demand, source, collection, estimation of quality & quantity, treatment and distribution.	III-I

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	Assess the quality and quantity of water requirements for a city. K2&K3
CO2	Design of different treatment units and distribution systems for water supply.K2&K3
CO3	Analyze the characteristics, collection, conveyance and disposal of wastewater.K2&K4
CO4	Design of sewers and various units in a wastewater treatment plant.K2&K4
CO5	Design of secondary and biological treatment units.K2&K3

SYLLABUS:

UNIT	DETAILS
I	**WATER DEMANDS- STANDARDS -SOURCES :**Aspects of Environmental Engineering – Protected water supply – Need – Water borne diseases –Water demands – Fluctuations – Design period- Population forecast – Water quality– Drinking water standards- Testing and significance – Quality and Quantity and other considerations of surface and sub- surface sources – Yield calculations – Intake works –Types of Intakes – Storage reservoir capacity – Systems of water

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	supply – Requirements – Detection of leakages – Selection of pump – Economical diameter of pumping main.
II	**TREATMENT OF WATER AND DISTRIBUTION:**Water treatment, conventional treatment flow diagram –Sedimentation types – Principles – Design factors – Coagulation –Design of Clariflocculator – Filtration – Slow, Rapid gravity filters and Pressure filters – Design principles-Disinfection – Theory of Chlorination– Distribution systems– Layouts – Design- and analysis, Hardy Cross method and Equivalent Pipe method. Valves – Other appurtenances.
III	**WASTEWATER MANAGEMENT:**Introduction: Waste water treatment system – Definitions of terms – Collection and conveyance of sewage – Sewage flow rates – Storm water – Characteristics of sewage– Cycles of decay – BOD – COD – Ultimate disposal of sewage–self-purification of rivers– sewage farming.
IV	**DESIGN OF SEWERS AND PRIMARY TREATMENT:**Layouts – Design of sewers – Sewers appurtenances – Sewage pumping -Conventional sewage treatment – Primary treatment: - Screens – Grit chamber – Sedimentation tanks – Design principles. Septic tanks and Imhoff tanks - rural latrines – House plumbing – Appurtenances.
V	**SECONDARY BIOLOGICAL TREATMENT:**Secondary treatment – Biological treatment – Trickling filters – Activated Sludge Process – Low cost waste treatment methods – Design of Oxidation ponds – Aerobic and Anaerobic lagoons. Sludge Digestion– Disposal.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	B.C. Punmia B C, A.K. Jain and A.K. Jain, —Water Supply Engineering‖, LaxmiPublications.2nd Edition1995, Reprint 2005.
T2	B.C. Punmia, A.K. Jain and A.K. Jain, —Wastewater Engineering, Laxmi Publications, 2nd Edition 1998, Reprint 2014.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	S.K. Garg, —Water Supply Engineering‖, Khanna Publishers, 26th revised Edition, New Delhi.2010.
R2	S.K. Garg, —Sewage disposal and Air Pollution Enginering‖, Khanna Publishers New Delhi. 36thEdition, 2017.
R3	H.S. Peavy, D. Rowe, and G. Tchobanoglous, —Environmental Engineering‖, McGraw HillPublishers, New Delhi. 1985.
R4	G.S. Birdie and J.S. Birdie, —Water Supply and Sanitary Engineering‖. Dhanpat Rai Publishing Company, New Delhi, 6th Edition, 2002.

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R5	K.N. Duggal, —Elements of Environmental Engineering‖, S.Chand & Company Limited, NewDelhi, 2007.
R6	P. N. Modi, —Sewage Treatment Disposal & Wastewater Engineering‖, Standard Book House, 2016.
R7	Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001.
R8	Water and Wastewater Engineering, NPTEL video lectures and web notes.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Rural Muncipal and Industrial water Management	PO1, PO2, PO5,PO6 ,PO7& PSO1&PSO2

WEB SOURCE REFERENCES:

1	https://nptel.ac.in
2	https://www.digimat.in
3	https://onlinecourses.nptel.ac.in
4	www.slideshare.net
5	www.britannica.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	✓☐Model Demonstration
☐Brain storming	☐Role Play	✓☐Virtual Labs
☐Evidence based learning	☐Collaborative learning	☐Problem based learning
☐Cooperative learning	☐Activity based learning	☐Student centric learning

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	
CO1	-	3	2	-	-	-	-	-	-	-	-	-	3	-	
CO2	-	-	-	-	-	-	2	-	-	1	-	-	2	-	
CO3	3	-	-	-	-	3	-	-	-	-	-	-	-	1	
CO4	-	2	-	-	-	3	1	-	-	-	-	-	-	3	
CO5	1	-	3	-	-	-	1	-	-	2	-	-	-	-	
Average	2.0	2.5	2.5		-	3.0	2.5	-	-	1.5	-	-	2.5	2.0	2.31

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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	PSO 1	PSO2
R20CE3202	2.0	2.5	2.5	-	-	3.0	2.5	-	-	1.5	-	-	2.5	2.0

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Instructor **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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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.

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

IMPORTANT QUESTIONS

UNIT - I

1) Explain the stepwise procedure to determine the reservoir capacity using masscurve technique?
2) Explain any three intake structures with neat sketches ?
3) What are the maximum acceptable BIS limits of i) Turbidity ii) Fluorides iii) Nitrates iv) Hardness in drinking water
4) What are the WHO guidelines for drinking water?
5) Define percapita demand and explain the various fluctuations of the water demand ?
6) What is meant by design period of a water supply scheme? Discuss various factors affecting design period?
7) Differentiate the surface and sub- surface sources of water supply with respect to quantity ,quality,treatment and suitability ?

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UNIT - II

1)Name various disinfection methods and explain any two in detail?
2) Give the Flow diagram of Water Treatment plant and write the principles involved at each stage?
3) What is meant by coagulation? What are the common coagulants used?
4) Differentiate between Hardy cross and equivalent pipe methods.
5) Explain the various layouts of distribution networks?
6) Explain theory of filtration as used in purification of water? Sketch and describe an outlet of a slow sand filter?

UNIT - III

1)Explain in detail the important characteristics of sewage.
2) For a wastewater sample, the 5 day BOD at 200 C is 200 mg/l and is 67% of the ultimate.What will be 4-day BOD at 30^0 C.
3) What is BOD? Explain the significance BOD/COD ratio.
4) Explain various stages in self purification of water body along with oxygen sag curve.
5) Give an account of factors affecting the quantity of storm water .
6) Explain about the physical ,chemical and biological characteristics of sewage .

UNIT - IV

1) Mention the appurtenances used in sewerage systems and explain with sketches.
2) Explain the components of a septic tank with a neat sketch.
3) What are the design criteria for design of septic tank?
4) Explain briefly the following one. (i) Bar Screens (ii) Grit Chamber (iii) Skimming Tank (iv) Primary Sedimentation Tank
5) Differentiate and discuss the functioning of Septic tank and Imhoff tank.
6) Explain various systems of sanitary plumbing. Write down the main characteristics of each system

UNIT - V

1) Analyze the role of sludge management in Sewage Treatment.
2) What do you mean by secondary treatment?
3) Explain the working principle of standard rate trickling filter with neat sketch
4) Discuss in detail three important modifications in Activated sludge process with neat sketches with important design parameters.
5) Explain about the low cost waste treatment methods.
6) Differentiate between the aerobic and anaerobic lagoons .
7) Explain the design of oxidation ponds.

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III B. Tech II Semester Examinations,
Sub Code: R20CE3202 **ENVIRONMENTAL ENGINEERING**
Time: 3 hours (CE) Max. Marks: 70

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
		Unit-I			
1	a	i)Explain the stepwise procedure to determine the reservoir capacity using masscurve technique?	K3	C01	7M
		ii)Define percapita demand and explain the various fluctuations of the water demand?	K1	C01	7M
		OR			
	b	i)Explain any three intake structures with neat sketches ?	K2	C01	7M
		ii)What are the WHO guidelines for drinking water?	K2	C01	7M
		Unit-II			
2	a	Name various disinfection methods and explain them in detail?	K1	C02	14M
		OR			
	b	i)Explain the various layouts of distribution networks?	K3	C02	7M
		ii)What is meant by coagulation? What are the common coagulants used?	K1	C02	7M
		Unit-III			
3	a	Explain in detail the important characteristics of sewage.	K4	C03	14M
		OR			
	b	i)For a wastewater sample, the 5 day BOD at 200 C is 200 mg/l and is 67% of the ultimate.What will be 4-day BOD at 30^0 C.	K3	C03	7M
		ii)Give an account of factors affecting the quantity of storm water .	K2	C03	7M
		Unit-IV			
4	a	Mention the appurtenances used in sewerage systems and explain with sketches.	K2	C04	14M
		OR			
	b	i)What are the design criteria for design of septic tank?	K4	C04	7M
		ii)Explain various systems of sanitary plumbing. Write down the main characteristics ofeach system	K3	C04	7M
		Unit-V			
5	a	i)Analyze the role of sludge management in Sewage Treatment.	K4	C05	7M
		ii)Explain about the low cost waste treatment methods.	K2	C05	7M
		OR			
	b	i)Differentiate between the aerobic and anaerobic lagoons .	K4	C05	7M
		ii)Explain the design of oxidation ponds.	K2	C05	7M

KL: Knowledge Level CO: Course Outcome M: Marks

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III B. Tech II Semester Examinations,

Sub Code: R20CE3202 **ENVIRONMENTAL ENGINEERING**

(CE)

Time: 3 hours Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

Q.No		Questions	KL	CO	M
1		Unit-I			
	a	i)What are the maximum acceptable BIS limits of i) Turbidity ii) Fluorides iii) Nitrates iv) Hardness in drinking water	K1	C01	7M
		ii)What is meant by design period of a water supply scheme? Discuss various factors affecting design period?	K2	C01	7M
		OR			
	b	Differentiate the surface and sub- surface sources of water supply with respect to quantity ,quality,treatment and suitability ?	K4	C01	14M
2		Unit-II			
	a	Give the Flow diagram of Water Treatment plant and write the principles involved at each stage?	K2	CO2	14M
		OR			
	b	i)Differentiate between Hardy cross and equivalent pipe methods.	K4	CO2	7M
		ii)Explain theory of filtration as used in purification of water? Sketch and describe an outlet of a slow sand filter?	K2	CO2	7M
3		Unit-III			
	a	i)Explain various stages in self purification of water body along with oxygen sag curve.	K2	CO3	7M
		ii)What is BOD? Explain the significance BOD/COD ratio.	K1	CO3	7M
		OR			
	b	Explain about the physical ,chemical and biological characteristics of sewage .	K2	CO3	14M
4		Unit-IV			
	a	i)Explain the components of a septic tank with a neat sketch.	K2	CO4	7M
		ii)Differentiate and discuss the functioning of Septic tank and Imhoff tank.	K4	CO4	7M
		OR			
	b	Explain briefly the following one. (i) Bar Screens (ii) Grit Chamber (iii) Skimming Tank (iv) Primary Sedimentation Tank	K2	CO4	14M
5		Unit-V			
	a	Discuss in detail three important modifications in Activated sludge process with neat sketches with important design parameters.	K3	CO5	14M
		OR			
	b	i)Explain the working principle of standard rate trickling filter with neat sketch.	K2	CO5	7M
		ii)What do you mean by secondary treatment?	K1	CO5	7M

KL: Knowledge Level CO: Course Outcome M: Marks

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN: 2022-2023

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CE3202	ENVIRONMENTAL ENGINEERING	III-II	Civil Engineering	6	A & B

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Assess the quality and quantity of water requirements for a city. K2&K3
CO2	Design of different treatment units and distribution systems for water supply.K2&K3
CO3	Analyze the characteristics, collection, conveyance and disposal of wastewater.K2&K4
CO4	Design of sewers and various units in a wastewater treatment plant.K2&K4
CO5	Design of secondary and biological treatment units.K2&K3

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
UNIT – I : WATER DEMANDS- STANDARDS -SOURCES						
1	**CO1**:Assess the quality and quantity of water requirements for a city. K2&K3	1.1	Aspects of Environmental Engineering	T1, T2, R1	1	Chalk ,Talk & Web resources
		1.2	Protected water supply - Need	T1, T2, R4	1	PPT, Active Learning & NPTEL
		1.3	Water borne diseases	T1, T2, R1	1	PPT, Active Learning
		1.4	Water demands – Fluctuations	T1, T2, R2	2	case study & Tutorial
		1.5	Design period-Population forecast	T1, T2, R1	2	Chalk ,Talk & Model Demonstration
		1.6	Water quality– Drinking water standards	T1, T2, R4	2	PPT, Active Learning
		1.7	Testing and significance	T1, T2, R1	1	Chalk , Talk & Virtual labs
		1.8.1	Quality and Quantity and other considerations of surface and sub- surface sources	T1, T2, R3	1	Chalk ,Talk & Web resources

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		1.8.2	Yield calculations	T1, T2, R1	1	PPT, Active Learning & NPTEL
		1.8.3	Intake works –Types of Intakes	T1, T2, R4	1	PPT, Active Learning
		1.9	Storage reservoir capacity – Systems of water supply_ Requirements	T1, T2, R1	1	Chalk ,Talk & Web resources
		1.9.1	Detection of leakages		1	PPT, Active Learning & NPTEL
		1.9.2	Selection of pump – Economical diameter of pumping main.		1	PPT, Active Learning
2	**CO2:** Design of different treatment units and distribution systems for water supply. K2&K3	**UNIT – II : TREATMENT OF WATER AND DISTRIBUTION:**				
		2.1	Water treatment, conventional	T1, T2, R3	1	Chalk , Talk & Industrial visit
		2.2	Treatment flow diagram	T1, T2, R3	1	PPT, Active Learning & Student seminars
		2.3	Sedimentation types – Principles – Design factors	T1, T2, R5	1	PPT, Active Learning & Quiz
		2.4	Coagulation –Design of Clariflocculator	T1, T2, R3	2	case study & Tutorial
		2.5	Filtration – Slow, Rapid gravity filters and Pressure filters	T1, T2, R6	2	Chalk , Talk & PPT
		2.6	Design principles-Disinfection – Theory of Chlorination	T1, T2, R3	2	PPT, Active Learning
		2.7	Distribution systems– Layouts	T1, T2, R7	2	Chalk ,Talk & NPTEL
		2.8	Design- and analysis	T1, T2, R7	2	Chalk & Talk, PPT, Tutorial
		2.9	Hardy Cross method and Equivalent Pipe method	T1, T2, R3	2	Chalk & Talk, PPT, Tutorial
		3.0	Valves – Other appurtenances.	T1, T2, R3	2	Chalk & Talk, PPT, Tutorial
MID EXAMINATIONS-I						
3		**UNIT – III : WASTEWATER MANAGEMENT:**				
		3.1	Introduction: Waste water treatment system	T1, T2, R1	2	Chalk & Talk, PPT, Tutorial
		3.2	Definitions of terms	T1, T2, R1	2	Chalk & Talk, PPT, Tutorial

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	CO3: Analyze the characteristics, collection, conveyance and disposal of wastewater. K2&K4	3.3	Collection and conveyance of sewage	T1, T2, R1	2	PPT, Active Learning
		3.4	Sewage flow rates – Storm water	T1, T2, R1	2	PPT, Active Learning
		3.5	Characteristics of sewage	T1, T2, R1	2	Chalk & Talk, PPT, Tutorial
		3.6	Cycles of decay – BOD – COD	T1, T2, R1	2	PPT, Active Learning
		3.7	Ultimate disposal of sewage	T1, T2, R1	2	PPT, Active Learning
		3.8	self-purification of rivers– sewage farming.	T1, T2, R1	2	Chalk & Talk, PPT, Tutorial
4	**CO4:**Design of sewers and various units in a wastewater treatment plant.K2&K4	**UNIT – IV : DESIGN OF SEWERS AND PRIMARY TREATMENT:**				
		4.1	Layouts – Design of sewers––	T1, T2, R3	1	Chalk , Talk & PPT
		4.2	Sewers appurtenances	T1, T2, R3	2	PPT, Active Learning & Student seminars
		4.3	Sewage pumping - Conventional sewage treatment	T1, T2, R3	2	PPT, Active Learning
		4.4	Primary treatment: - Screens – Grit chamber	T1, T2, R3	2	case study & Tutorial
		4.5	Sedimentation tanks – Design principles.	T1, T2, R2	2	Chalk , Talk & PPT
		4.6	Septic tanks	T1, T2, R2	2	PPT, Active Learning
		4.7	Imhoff tanks - rural latrines	T1, T2, R3	2	Chalk ,Talk & Model demonstration
		4.8	House plumbing	T1, T2, R3	2	Chalk ,Talk & Model demonstration
		4.9	Appurtenances.	T1, T2, R3	2	Chalk & Talk, PPT, Tutorial
5	**CO5:** Design of secondary and biological treatment units.K2&K3	**UNIT – V: SECONDARY BIOLOGICAL TREATMENT:**				
		5.1	Secondary treatment	T1, T2, R3	2	Chalk ,Talk & Tutorial
		5.2	Biological treatment	T1, T2, R5	1	PPT, Quiz & Active Learning
		5.3	Trickling filters	T1, T2, R5	2	PPT, Active Learning & Student seminars

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		5.4	Activated Sludge Process	T1, T2, R3	2	case study, web resources & Tutorial
		5.5	Low cost waste treatment methods	T1, T2, R4	2	Chalk , Talk & Model demonstration
		5.6	Design of Oxidation ponds	T1, T2, R8	2	Chalk , Talk & Model demonstration
		5.7	Aerobic and Anaerobic lagoons.	T1, T2, R3	1	PPT, Active Learning & Student seminars
		5.8	Sludge Digestion– Disposal.	T1, T2, R3	2	Chalk , Talk & Model demonstration
MID EXAMINATIONS-II						
				Total	80	
END EXAMINATIONS						

Text Books:

T1- B.C. Punmia B C, A.K. Jain and A.K. Jain, —Water Supply Engineeringl, LaxmiPublications.2nd Edition1995, Reprint 2005.

T2- B.C. Punmia, A.K. Jain and A.K. Jain, —Wastewater Engineering, Laxmi Publications, 2nd Edition 1998, Reprint 2014.

Reference Books:

R1- S.K. Garg, —Water Supply Engineeringl, Khanna Publishers, 26th revised Edition, New Delhi.2010.

R2- S.K. Garg, —Sewage disposal and Air Pollution Engineringl, Khanna Publishers New Delhi. 36thEdition, 2017.

R3- H.S. Peavy, D. Rowe, and G. Tchobanoglous, —Environmental Engineeringl, McGraw HillPublishers, New Delhi. 1985.

R4- G.S. Birdie and J.S. Birdie, —Water Supply and Sanitary Engineeringl Dhanpat Rai Publishing Company New Delhi, 6th Edition, 2002.

R5- K.N. Duggal, —Elements of Environmental Engineeringl, S.Chand & Company Limited, NewDelhi, 2007.

R6- P. N. Modi, —Sewage Treatment Disposal & Wastewater Engineeringl, Standard Book House, 2016.

R7- Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001.

R8- Water and Wastewater Engineering, NPTEL video lectures and web notes.

Signature of faculty

Head of the Department

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Department of Basic Sciences & Humanities (Mathematics)

COURSE INFORMATION SHEET

PROGRAMME: II B.Tech. Mechanical Engineering	
COURSE: Complex Variables, Probability and Statistics	**SEMESTER :** II **CREDITS:** 3
COURSE CODE: R20CC2202 **REGULATION: R20(2022-23)**	**COURSE TYPE (CORE /ELECTIVE / BREADTH/ BS&H):** BS & H
COURSE AREA/DOMAIN: Applications of Complex, Probability and Statistics for Engineering	**PERIODS:** 6 Per Week

COURSE PRE-REQUISITES

C.CODE	COURSE NAME	DESCRIPTION	SEM
R20CC1102	LINEAR ALGEBRA & CALCULUS	1. Basic concepts of matrices. 2. Applications in partial differentiation.	I - I

COURSE OUTCOMES

S.NO.	COURSE OUTCOMES STATEMENT
CO1	**Apply** mathematical reasoning and the theory of complex variables to solve theoretical and applied problems. **[Apply–K3]**
CO2	**Evaluate** integrals using Cauchy's integral and residue theorems and constructing Taylor's and Laurent's series expansions of complex function. **[Evaluating–K5]**
CO3	**Apply** discrete and continuous probability distributions to solve various engineering problems. **[Apply–K3]**
CO4	**Determine** maximum error and sample size, Interval Estimation (large sample and small sample), Bayesian Estimation. **[Evaluating–K5]**
CO5	**Formulate** and apply statistical methods for analyzing for testing of Hypothesis. **[Apply-K3]**

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SYLLABUS

UNIT	DETAILS
I	**FUNCTIONS OF A COMPLEX VARIABLE** Limit and Continuity of f(z), Derivative of f(z), Cauchy-Riemann equations, Analytic functions, Harmonic functions, Orthogonal system. Application: Flow problems
II	**COMPLEX INTEGRATION** Integration of complex functions, Cauchy theorem (without proof), Cauchy integral formula (without proof), Series of complex terms, Taylor's series, Laurent's series, Zeros and singularities of analytic functions, Residues and residue theorem (without proof), Calculation of residues. Applications: Evaluation of real definite integrals (Integration around the semi-circle and unit circle)
III	**PROBABILITY AND RANDOM VARIABLES** Probability axioms, Addition law and multiplicative law of probability, Conditional probability, Baye's theorem, Random variables (discrete and continuous), Binomial, Poisson approximation to the binomial distribution and normal distribution and their properties.
IV	**SAMPLING DISTRIBUTION** Estimation: Point estimation, Interval estimation, Bayesian estimation
V	**TESTING OF HYPOTHESIS** Formulation of null hypothesis, Critical regions, Level of significance Large sample tests: Test for single proportion, Difference of proportions, Test for single mean and difference of means. Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers
T2	S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e (Reprint) 2019, Sultan Chand & Sons Publications
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008
R2	T. K. V. Iyenger, Probability and Statistics, S. Chand & Company Ltd, 2015
R3	Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS

S.NO.	DESCRIPTION	ASSOCIATED PO & PSO
1	Isometrics in the complex plane	PO1, PO3, PO5 & PSO1
2	Generalized Linear Models (Eg: Negative Binomial, Gamma & Beta models)	PO1, PO3, PO5 & PSO1

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WEB SOURCE REFERENCES

1	https://nptel.ac.in/courses/111107056/module2/lecture6/lecture6.pdf
2	https://nptel.ac.in/courses/122101003/downloads/Lecture-27.pdf https://nptel.ac.in/courses/115103036/module6/lec39.pdf https://nptel.ac.in/courses/111107056/module6/lecture5/lecture5.pdf https://nptel.ac.in/courses/115103036/module6/lec38.pdf
3	https://nptel.ac.in/downloads/111104032/ https://nptel.ac.in/courses/111104032/module5/lecture20.pdf
4	https://nptel.ac.in/courses/105105138/M7L35.pdf https://nptel.ac.in/courses/105108128/pdf/Mod4/Basics_M4.pdf
5	http://nptel.ac.in/courses/111105041/ http://nptel.ac.in/courses/111105035/ http://nptel.ac.in/noc/individual_course.php?id=noc16-ma03

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
C401.1	3	3	2	2	3	-	-	-	-	-	-		-	-	-
C401.2	3	3	3	2	3	-	-	-	-	-	-		-	-	-
C401.3	3	3	2	2	2	-	-	-	-	-	-		-	-	-
C401.4	3	3	2	2	2	-	-	-	-	-	-		-	-	-
C401.5	3	3	3	2	2	--		-	-	-	-		-	-	-
Average	3.00	3.00	2.40	2	2.40	-	-	-	-	-	-		-	-	-

MAPPING COURSE WITH POs & PSOs

COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C401	3.00	3.00	2.40	2	2.40	-	-	-	-	-	-		-	-	-

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Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Instructor 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.

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(B) PROGRAM SPECIFIC OUTCOMES (PSOs)

I. The students will be able to apply knowledge of modern tools in manufacturing enabling to conquer the challenges of Modern Industry.

II. The students will be able to design various thermal engineering systems by applying the principles of thermal sciences.

III. The students will be able to design different mechanisms and machine components of transmission of power and automation in modern industry.

CONITIVE 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

COURSE OUTCOMES: Students are able to

CO1: Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems. **[Apply–K3]**

CO2: Evaluate integrals using Cauchy's integral and residue theorems and constructing Taylor's and Laurent's series expansions of complex function. **[Evaluating–K5]**

CO3: Apply discrete and continuous probability distributions to solve various engineering problems. **[Apply–K3]**

CO4: Determine maximum error and sample size, Interval Estimation (large sample and small sample), Bayesian Estimation. **[Evaluating–K5]**

CO5: Formulate and apply statistical methods for analyzing for testing of Hypothesis. **[Apply-K3]**

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UNIT WISE SAMPLE ASSESSMENT QUESTIONS

S.NO	QUESTIONS	CO	KNOWLEDGE LEVEL
	UNIT I		
1	**Prove** that $f(z) = z^3$ is analytic for all z.	CO-1	Evaluating (K_4)
2	**Identify** whether $f(z) = sinx\ siny - i\ cosx\ cosy$ is analytic or not.	CO-1	Apply (K_3)
3	**Prove** that the function $f(z)$ defined by $f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & if\ z \neq 0 \\ 0 & if\ z = 0 \end{cases}$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.	CO-1	Evaluating (K_4)
4	**Prove** that $u = e^{-x}(x\ siny - y\ cosy)$ is harmonic.	CO-1	Evaluating (K_4)
5	**Prove** that $u(x,y) = x^3 - 3xy^2$ is harmonic and find its harmonic conjugate and the corresponding analytic function $f(z)$ in terms of z.	CO-1	Evaluating (K_4)
	UNIT 2		
1	**Evaluate** $\int_c (2y + x^2)\,dx + (3x - y)dy$ along the parabola $x = 2t,\ y = t^2 + 3$ joining (0, 3) and (2, 4).	CO-2	Evaluating (K_5)
2	**Evaluate** using Cauchy's integral formula $\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$, where C is the circle $\|z\| = 3$.	CO-2	Evaluating (K_5)
3	**Evaluate** $\int_c (y - x - 3x^2 i)dz$, where C consists of the line segment from $z = 0$ to $z = i$ and the other from $z = i$ to $z = 1 + i$.	CO-2	Evaluating (K_5)
4	**Construct** the Laurent's series expansion of $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ about the point $z = -1$ in the region $1 < \|z + 1\| < 3$.	CO-2	Applying (K_3)
5	**Determine** the poles of the function $\frac{z+1}{z^2(z-2)}$ and the residues at	CO-2	Evaluating

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	these poles.		(K_5)
	UNIT 3		
1	Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, then **determine** the probability that they are both of same colour.	CO-3	Evaluating (K_5)
2	Out of 800 families with 5 children each, **identify** how many have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) at least one boy? Assume equal probabilities for boys and girls.	CO-3	Applying (K_3)
3	A distributor of bean seeds determines from extensive tests that 5% of large batch of seeds will not germinate. He sells the seeds in packets of 200 and guarantees 90% germination. **Determine** the probability that a particular packet will violate the guarantee.	CO-3	Evaluating (K_5)
4	If X is a normal variate with mean 30 and standard deviation 5. **Determine** the probabilities that (i) $26 \leq X \leq 40$ (ii) $X \geq 45$	CO-3	Evaluating (K_5)
5	The marks obtained in statistics in a certain examination found to be normally distributed. If 15% of the students ≥ 60 marks and 40% < 30 marks. **Determine** the mean and standard deviation.	CO-3	Evaluating (K_5)
	UNIT 4		
1	**Determine** the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence.	CO-4	Evaluating (K_5)
2	It is desired to estimate the mean number of hours of continuous use until a certain computer will first require repairs. If it can be assumed that $\sigma = 48$ hours, **identify** how large sample be needed so that one will be able to assert with 90% confidence that the sample mean is off by at most 10 hours.	CO-4	Applying (K_3)
3	In a study of an automobile insurance a random sample of 80 body repair costs had a mean of Rs.472.36 and the standard deviation of Rs.62.35. If $\bar{x}$ is used as a point estimate to the true average repair costs, **determine** the confidence that the maximum error doesn't exceed Rs.10?	CO-4	Evaluating (K_5)
4	A random sample of size 100 has a standard deviation of 5.	CO-4	Evaluating (K_5)

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	Determine the maximum error with 95% confidence.		
5	The mean and standard deviation of a population are 11, 795 and 14, 054 respectively. If n = 50, **determine** 95% confidence interval for the mean.	CO-4	Evaluating (K_5)
	UNIT 5		
1	A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. **Test** whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population	CO-5	Creating (K_6)
2	The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. **Test** whether the samples be regarded as drawn from the same population of standard deviation 2.5 inches.	CO-5	Creating (K_6)
3	A manufacturer claims that only 4% of his products are defective. A random sample of 500 were taken among which 100 were defective. **Test** the hypothesis at 0.05 level.	CO-5	Creating (K_6)
4	Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. **Test** the hypothesis that proportions of men and women in favour of the proposal are same at 5% level.	CO-5	Creating (K_6)
5	A die is tossed 960 times and it falls with 5 upwards 184 times. **Test** whether the die is unbiased at a level of significance of 0.01.	CO-5	Creating (K_6)

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Model Question Paper 1 (R20)
II B.Tech., II Semester Regular Examinations
COMPLEX VARIABLES, PROBABILITY AND STATISTICS
Common to ME and EEE

Time: 3 hours **Sub Code: R20CC2202** **Max. Marks: 70**

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

Q.NO.	Questions	Marks
	Unit - I	
1	a) **Prove** that the function $f(z) = \|z\|^2$ is differentiable but not analytic at $z = 0$.	[7M]
	b) **Prove** that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\|\text{Real } f(z)\|^2 = 2\|f'(z)\|^2$, where $w = f(z)$ is analytic.	[7M]
	OR	
2	a) **Prove** that the function $f(z)$ defined by $f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & if\ z \neq 0 \\ 0 & if\ z = 0 \end{cases}$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.	[7M]
	b) **Construct** the analytic function whose real part is $e^{-x}(xsiny - ycosy)$.	[7M]
	Unit – II	
3	a) **Evaluate** $\int_c (2y + x^2)\,dx + (3x - y)dy$ along the parabola $x = 2t,\ y = t^2 + 3$ joining (0, 3) and (2, 4).	[7M]
	b) **Evaluate** using Cauchy's integral formula $\int_c \frac{sin^6 z}{(z-\frac{\pi}{6})^3} dz$ around the circle $\|z\| = 1$.	[7M]
	OR	
4	a) **Determine** the Taylor's series expansion of $f(z) = \frac{z}{(z-1)(z-3)}$ about the point z = 1.	[7M]
	b) Using Residue theorem, **Evaluate** $\int_c \frac{e^{2z}}{(z-1)(z-2)} dz$ where c is the circle $\|z\| = 3$.	[7M]
	Unit – III	
5	a) Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, then **determine** the probability that they are both of same colour.	[7M]
	b) For the continuous probability function $f(x) = kx^2e^{-x}$ when $x \geq 0$, **determine** 1) k 2) mean and 3) variance.	[7M]
	OR	

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6	a) The mean and variance of a binomial variable X with parameter n and p are 16 and 8. **Determine** $P(X \geq 1)$ and $P(X > 2)$.	[7M]
	b) If X is a normal variate with mean 30 and standard deviation 5, **determine** the probabilities that (i) $26 \leq X \leq 40$ (ii) $X \geq 45$ (iii) $\lvert X - 30 \rvert > 5$.	[7M]
	Unit – IV	
7	a) If we can assert with 95% that the maximum error is 0.05 and P = 0.2, **determine** the size of the sample.	[7M]
	b) A random sample of size 100 has a standard deviation of 5. **Determine** the maximum error with 95% confidence.	[7M]
	OR	
8	a) The mean and standard deviation of a population are 11,795 and 14,054 respectively. If n = 50, **determine** 95% confidence interval for the mean.	[7M]
	b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs. 48. **Determine** the degree of confidence that the average weekly salary of all teachers in the metropolitan area is between 472 to 502.	[7M]
	Unit – V	
9	a) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. **Test** whether the samples have come from a population with mean 38. Also calculate 95% confidence interval for the population.	[7M]
	b) In a sample of 500 from a village in Rajasthan, 280 are found to be wheat eaters and the rest rice eaters. **Test** whether both the articles are equally popular?	[7M]
	OR	
10	a) A sample of 26 bulbs gives a mean life of 990 hours with a SD of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. **Prove** that the sample is not up to the standard.	[7M]
	b) 1000 students at college level were graded according to their IQ and the economic conditions of their home. Use χ^2 test to **test** whether there is any association between condition at home and IQ.	[7M]

Economic condition	High	Low	Total
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

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Model Question Paper 2 (R20)
II B.Tech., II Semester Regular Examinations
COMPLEX VARIABLES, PROBABILITY AND STATISTICS
Common to ME and EEE

Time: 3 hours **Sub Code: R20CC2202** **Max. Marks: 70**

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

Q.NO.	Questions	Marks
	Unit - I	
1	a) **Identify** whether $f(z) = sinx\ siny - i\ cosx\ cosy$ is analytic or not.	[7M]
	b) **Prove** that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4\frac{\partial^2}{\partial z \partial \bar{z}}$.	[7M]
	OR	
2	a) **Prove** that the function $f(z) = \sqrt{\lvert xy \rvert}$ is not analytic at the origin although Cauchy-Riemann equations are satisfied at that point.	[7M]
	b) **Construct** the analytic function whose imaginary part is $\log(x^2 + y^2) + x - 2y$.	[7M]
	Unit – II	
3	a) **Evaluate** $\int_c z^2 dz$ where c is the straight line segment from z = 0 to z = 2 + i.	[7M]
	b) **Evaluate** $\int_c \frac{e^{2z}}{(z-1)(z-2)} dz$ where c is the circle $\lvert z \rvert = 3$.	[7M]
	OR	
4	a) **Construct** the Laurent's series expansion of $f(z) = \frac{1}{z^2-4z+3}$ for $1 < \lvert z \rvert < 3$.	[7M]
	b) **Evaluate** $\oint_c \frac{4-3z}{z(z-1)(z-2)} dz$, where c is the circle $\lvert z \rvert = \frac{3}{2}$, using residue theorem.	[7M]
	Unit – III	
5	a) Suppose 5 men out of 100 and 25 out of 10000 are colour blind. A colour blind person choose at random, **determine** the probability of the person being a male.	[7M]
	b) A random variable X has the following probability function	

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+1$

i) **Determine** K (ii) **Evaluate** $P(0 < X \leq 5)$ and $P(X \geq 6)$ (iii) **Identify** the minimum value of K such that $P(X \leq K) > \frac{1}{2}$ [7M]

OR

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6	a) Avareage number of accidents on any day on anational high way is 1.8. **Determine** the probability that the number of accidents are i) at least one ii) at most one.	[7M]
	b) 1000 students have written an examination, the mean of test is 35 and standard deviation is 5. Assuming the distribution is normal, **Determine** (i) How many students marks lies between 25 and 40 (ii) How many students get below 20 (iii) How many students get more than 40 (iv) How many students get more than 50.	[7M]
	Unit – IV	
7	a) **Determine** the size of the smallest sample required to estimate an unknown proportion within a maximum error of 0.06 with at least 95% confidence.	[7M]
	b) **Identify** the maximum error that one can expect to make with probability 0.90 when using the mean of a random sample of size n = 64 to estimate the mean of population with $\sigma^2 = 2.56$.	[7M]
	OR	
8	a) A random sample of size 81 was taken whose variance is 20.25 and mean is 32. **Construct** 98% confidence interval.	[7M]
	b) **Construct** 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14.	[7M]
	Unit – V	
9	a) The mean life time of a sample of 100 light tubes produced by a company is found to be 1560 hours with a population standard deviation of 90 hours. **Test** the hypothesis that the mean life time of the tubes produced by the company is 1580 hours.	[7M]
	b) In a big city 325 men out of 600 men were found to be smokers. **Test** whether this information support the conclusion that the majority of men in this city are smokers?	[7M]
	OR	
10	a) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, **test** hypothesis that the two variances are equal.	[7M]
	b) 4 coins were tossed 160 times and the following results were obtained. No.of heads: 0 | 1 | 2 | 3 | 4 Observed frequencies: 17 | 52 | 54 | 31 | 6 Under the assumption that coins are balanced, **determine** the expected frequencies of 0, 1, 2, 3 or 4 heads and **test** the goodness of fit ($\alpha = 0.05$).	[7M]

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Kotappakonda Road, Yellamanda (P.O), Narasaraopeta-522601, Guntur Dist, AP
II B.TECH, II-SEMESTER

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
LESSON PLAN ACADEMIC YEAR: 2022-23

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20CC2202	COMPLEX VARIABLES, PROBABILITY AND STATISTICS	II	ME	6	A&B

COURSE OUTCOMES: Students are able to

CO1: Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems. **[Apply–K3]**

CO2: Evaluate integrals using Cauchy's integral and residue theorems and constructing Taylor's and Laurent's series expansions of complex function. **[Evaluating–K5]**

CO3: Apply discrete and continuous probability distributions to solve various engineering problems. **[Apply–K3]**

CO4: Determine maximum error and sample size, Interval Estimation (large sample and small sample), Bayesian Estimation. **[Evaluating–K5]**

CO5: Formulate and apply statistical methods for analyzing for testing of Hypothesis. **[Apply-K3]**

Unit No.	Outcome		Topics/Activity	Ref Text books	Total Periods	Delivery Method
1	**CO1:** Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems **[K3]**		**UNIT-I FUNCTIONS OF COMPLEX VARIABLES**			
		1.1	Limit, Continuity and Derivative of a Complex function f(z)	T1	2	Chalk & Talk, PPT
		1.2	CR equations in Cartesian and polar form, Analytic functions	T1	3	Chalk & Talk
		1.3	Harmonic and conjugate harmonic functions, Laplace equation, Orthogonal system	T1	3	Chalk & Talk
		1.4	Milne Thomson method	T1	2	Chalk & Talk
		1.5	Flow problems	T1	2	Chalk & Talk, Tutorial
2	**CO2:** Evaluate integrals using Cauchy's integral and residue theorems and constructing Taylor's and Laurent's series expansions of complex function **[K5]**		**UNIT-II COMPLEX INTEGRATION**			
		2.1	Line Integra	T1	2	Chalk & Talk
		2.2	Cauchy's integral theorem Cauchy's integral formula Generalized cauchy's integral formula	T1	3	Chalk & Talk, NPTEL
		2.3	Taylor's and Laurent Series expansion	T1	3	Chalk & Talk, Tutorial
			MID I EXAMINATION			
		2.4	Zeros and singularities of analytic functions, Residues and calculation of residues, Residue theorem	T1	3	Chalk & Talk, NPTEL

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Student Seminars? written CIS but not reflected in Lesson Plan

		2.5	Evaluation of real definite integrals (integration around the semi-circle and unit circle)	T1	3	Chalk & Talk, Web Resources
		UNIT-III PROBABILITY AND RANDOM VARIABLES				
3	**CO3:** Apply discrete and continuous probability distributions to solve various engineering problems [**K3**]	3.1	Probability axioms, Addition and Multiplicative law of probability	T2, R1	4	Chalk & Talk, Tutorial
		3.2	Conditional probability, Baye's theorem	T2, R1	3	Chalk & Talk,
		3.3	Discrete and continuous random variables	T2, R1	3	Chalk & Talk,
		3.4	Binomial, Poisson and normal distributions and their properties	T2, R1	4	Chalk & Talk
		UNIT-IV SAMPLING DISTRIBUTION				
4	**CO4**: Determine maximum error and sample size, interval estimation (large sample and small sample), Bayesian estimation [**K5**]	4.1	Point Estimation	T2, R2	2	Chalk & Talk
		4.2	Interval Estimation	T2, R2	2	Chalk & Talk
		4.3	Bayesian Estimation	T2, R2	2	Chalk & Talk
		UNIT-V TESTING OF HYPOTHESIS				
5	**CO5**: Formulate and apply statistical methods for analyzing for testing of hypothesis [**K3**]	5.1	Formulation of null hypothesis, Critical regions, Level of significance	T2, R3	3	Chalk & Talk,
		5.2	Large sample tests: Test for single mean, Test for single proportion	T2, R3	4	Chalk & Talk,
		5.3	Small sample tests: Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test)	T2, R3	4	Chalk & Talk, Tutorial
		5.4	$\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.	T2, R3	3	Chalk & Talk,
				Total	60	
MID II EXAMINATION						

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2012.
2. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.

Reference Books:

1. T. K. V. Iyenger, Probability and Statistics, S. Chand & Company Ltd, 2015.
2. Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e (Reprint) 2019, Sultan Chand & Sons Publications.

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Narasaraopeta Engineering College
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Yallmanda(Post), Narasaraopet- 522601
Department of Mechanical Engineering

COURSE INFORMATION SHEET

PROGRAME: B.Tech Mechanical Engineering	
COURSE: **ROBOTICS AND APPLICATIONS**	Semester : **VI** CREDITS: **3**
COURSE CODE: R20ME3207 REGULATION: **R20**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **PROFESSIONAL ELECTIVE-II**
COURSE AREA/DOMAIN: **Industrial Engineering/Automation**	PERIODS: 06 Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
19BME4TH01	Kinematics of Machinery	Knowledge of links, pairs and joints	II-II
19BME4TH02	MANUFACTURING TECHNOLOGY	Knowledge of manufacturing concepts	II-II

COURSE OUTCOMES:

SNO	Course Outcome Statement
CO1	**Distinguish** between automation and robotics and **identify** various components of robot **[K4]**
CO2	**Select** appropriate type of actuators and sensors for different applications **[K3]**
CO3	**Analyze** kinematics of a robot **[K4]**
CO4	**Analyze** Dynamics of a robot **[K4]**
CO5	**Illustrate** present and future applications of robots **[K4]**

SYLLABUS:

UNIT	DETAILS
I	**FUNDAMENTALS OF ROBOTICS:** Introduction to Robotics, components of robot, Robot history, robotic controls and systems, classification, challenges and opportunities, **HOMOGENOUS COORDINATES AND TRANSFORM REPRESENTATIONS:** Vector spaces, inner products, vector norms, orthogonality, linear transformations, matrix multiplication, matrix groups, Coordinate transformations, rigid transformations, rotation matrices
II	**ACTUATORS:** Types, working principles, applications and advancements (hydraulic devices, Electric motors such as DC servomotors and stepper motors, Pneumatic devices). **SENSORS:** Basic Elements, General Classification of Sensors, types and working, use of sensors in robotics.
III	**ROBOT KINEMATICS**: The fundamentals of kinematics, differential kinematics and statics- Kinematic chains, Forward kinematics, Inverse kinematics- analytical methods.
IV	**ROBOT DYNAMICS:** Differential kinematics- Jacobian computation, singular configurations, Configuration space operation, Dynamics- Lagrange, Euler and Newton, Euler formations, Problems.
V	**ROBOT APPLICATIONS:** Material Transfer, Material handling, loading and unloading, Processing spot and continuous arc welding & spray painting, Assembly and Inspection. Path planning in robotics. Future applications of robots.

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TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Industrial Robotics, Groover M P, Pearson Edu.
T2	Robotics and Control, Mittal R K & Nagrath I J, Tata McGraw Hill.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Robotics: Fundamental Concepts and Analysis, Ashitava Ghosal, Oxford Publications.
R2	Robotic Systems: Applications, Control and Programming; Edited by Ashish Dutta, Intech Open.
R3	Robotics, Fu K S, McGraw Hill.
R4	Robotic Engineering, Richard D. Klafter, Prentice Hall.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1	Trajectory Planning	PO3, PSO3

WEB SOURCE REFERENCES:

1	https://www.intechopen.com/books/robotic-systems-applications-control-andprogramming.
2	http://planning.cs.uiuc.edu/node659.html
3	https://www.edx.org/course/robot-mechanics-and-control-part-i
4	https://www.edx.org/course/robotics-foundation-ii-robot-control
5	https://nptel.ac.in/courses/112/105/112105249/
6	http://www.robotictutorials.com/ for tutorials
7	ARC lab material – in house Dept. of Mechanical Engineering, NEC
8	http://vlabs.iitkgp.ernet.in/rislab/
9	http://www.mind.ilstu.edu/teachers/labs/robot/
10	http://vlab.amrita.edu/?sub=3&brch=271&sim=1642&cnt=3525
11	https://www.virtualroboticstoolkit.com/
12	https://www.robotlab.com/blog/robotlab-is-offering-free-online-virtual-robotics-andcoding-courses-to-those-affected-by-covid-19

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

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	-	-	-	-	-	-	-	1	-	3
CO2	1	1	1	-	1	-	-	-	-	-	-	-	1	-	3
CO3	3	3	3	3	1	-	-	-	-	-	-	-	1	-	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	1	-	3
CO5	1	1	-	1	-	-	-	-	-	-	-	-	1	-	3
Average	2.00	2.00	2.25	2.00	1	-	-	-	-	-	-	-	1	-	3

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C421	2.00	2.20	2.25	2.00	1	-	-	-	-	-	-	-	1	-	3

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test Objective Test Assignment Test	30%	90%	Final Course Outcome (100%)
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

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

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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, 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

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Unit wise Sample assessment questions

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	**Distinguish** between automation and robotics and **identify** various components of robot. **[K4]**
CO2	**Select** appropriate type of actuators and sensors for different applications. **[K3]**
CO3	**Analyze** kinematics of a robot. **[K4]**
CO4	**Analyze** Dynamics of a robot. **[K4]**
CO5	**Illustrate** present and future applications of robots .**[K4]**

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	**Discuss** the anatomy of Robot and **explain** the important parts of a robot with a neat sketch.	Evaluate (K5)	**CO1**
2	**Name** and **Explain** the four basic arm configurations that are used in robotic Manipulators.	Evaluate (K5)	**CO1**
3	**Explain** two views by **making use of sketch** to indicate the work envelope of a i) Cartesian robot. ii) Polar robot.	Evaluate (K5))	**CO1**
4	**Explain** the relationship of robotics with industrial automation and **illustrate** the same with a suitable example.	Evaluate (K5)	**CO1**
5	For the point Pxyz $=(8,3,6)^T$ perform following operations a). Rotate 60° about the Y-axis followed by translation of 4 units along x-axis? b). Rotate 30° about the Z-axis followed by rotation of 60° about X-axis? c). Translate 10 units along Z-axis followed by rotation of 45° along Z-axis?	Applying (K3)	**CO1**
	UNIT 2		
1	**Sketch** and **explain** a hydraulic drive system used for robots.	Applying (K3)	**CO2**
2	**Illustrate** different types of actuators used for robots?	Applying (K3)	**CO2**
3	**What** are the functions of sensors? **How** do you sense the positional accuracy of a robot? **Describe** the suitable type of sensor used to measure the position.	Applying (K3)	**CO2**
4	**Explain** in detail about safety sensors and safety Monitoring.	Evaluate (K5)	**CO2**
	UNIT 3		
1	**Compute** the homogeneous transformation representing a translation of 3 units along the x-axis and followed by rotation of 90° about the current z-axis followed by a translation of 1 unit along the fixed y-axis.	Applying (K3)	**CO3**
2	**Explain** and **derive** inverse kinematic solution for the variables of a cylindrical robot.	Evaluate (K5)	**CO3**
3	**Derive** the forward kinematics matrix for an articulated robot arm (3-axis) using DH convention?	Applying (K3)	**CO3**
4	**Explain** the homogeneous transformation as applicable to rotation?	Evaluate (K5)	**CO3**

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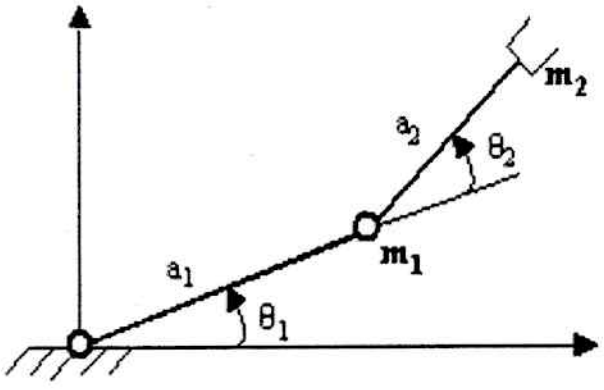
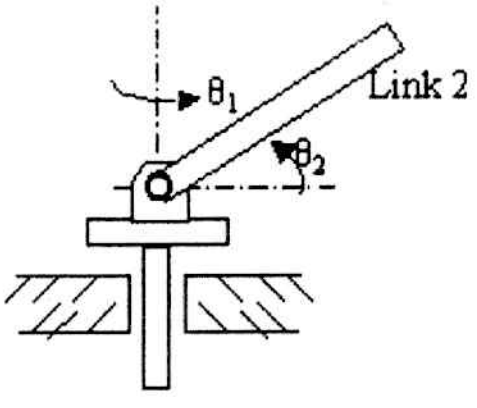
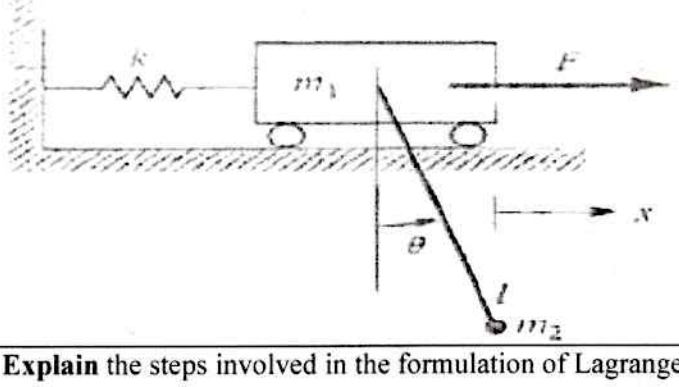
	UNIT 4		
1	**Determine** the dynamic equations for the two-link manipulator shown in Figure 1, using Lagrange-Euler formulation. Assume that the whole mass of the link can be considered as a point mass located at the outermost end of each link. The masses are m1 and m2 and the link lengths are a1 and a2. 	Applying (K3)	CO4
2	Consider a two-degree of freedom manipulator shown in Figure 1. Assuming that the inertia of the first moving link is negligible and that the second moving link is a slender homogeneous rod of mass m, **determine** the dynamic equations of motion by the Lagrangian method using θ1 and θ2 as the generalized coordinates. 	Applying (K3)	CO4
3	Using Lagrangian mechanics, **Derive** the equations of motion for the two-degreeof-freedom system shown in figure 1. 	Evaluate (K5)	CO4
4	**Explain** the steps involved in the formulation of Lagrange-Euler dynamic model.	Evaluate (K5)	CO4

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	UNIT 5		
1	**Sketch** and **explain** a hydraulic drive system used for robots.	Evaluate (K5)	**CO5**
2	**Illustrate** different types of actuators used for robots?	Applying (K3)	**CO5**
3	**What** are the functions of sensors? **How** do you sense the positional accuracy of a robot? **Describe** the suitable type of sensor used to measure the position.	Applying (K3)	**CO5**
4	**Explain** in detail about safety sensors and safety Monitoring.	Evaluate (K5)	**CO5**

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Narasaraopeta Engineering College (Autonomous)

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

Subject Code: R20ME3207

III B.Tech II Semester **Examinations,**

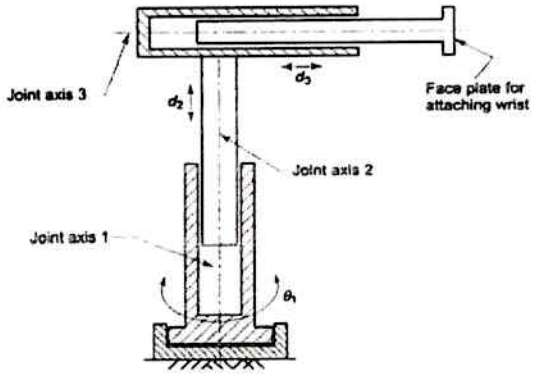
ROBOTICS AND APPLICATIONS

(ME)

Model Paper-1

Time: 3 hours **Max Marks: 70**

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

Q.No		Questions	Marks
1		**Unit - I**	
	a	**Name** and **Explain** the four basic arm configurations that are used in robotic Manipulators.	[14M]
		OR	
	b	For the point Pxyz =(8,3,6)T perform following operations a). Rotate 60° about the Y-axis followed by translation of 4 units along x-axis? b). Rotate 30° about the Z-axis followed by rotation of 60° about X-axis? c). Translate 10 units along Z-axis followed by rotation of 45° along Z-axis?	[14M]
2		**Unit - II**	
	a	**Sketch** and **explain** a hydraulic drive system used for robots.	[14M]
		OR	
	b	**Explain** the sensors, potentiometers and optical encoders.	[14M]
3		**Unit - III**	
	a	**Derive** the kinematics relationship between adjacent links of Robot Arm.	[14M]
		OR	
	b	**Formulate** the forward kinematic model of the three degree of freedom (RPP) manipulator as shown in fig 	[14M]
4		**Unit - IV**	
	a	**Determine** the equations of motion for 2DOF RR- planar manipulator arm using Lagrange-Euler Formulation.	[14M]

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		OR	
	b	**Derive** the jacobian matrix for a planar RR manipulator?	[14M]
5		**Unit - V**	
	a	**Explain** the various considerations taken into account for material handling	[14M]
		OR	
	b	**Explain** the requirements and benefits of the robot for spray-coating applications?	[14M]

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

Subject Code: R20ME3207

III B.Tech II Semester **Examinations,**

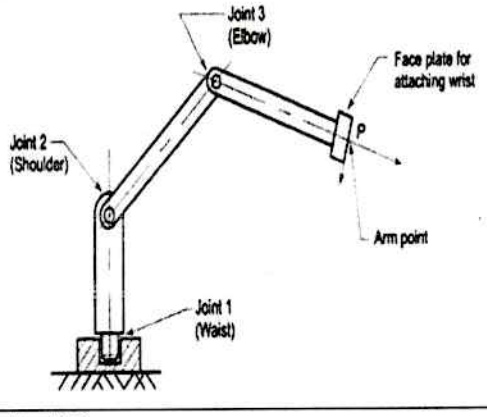
ROBOTICS AND APPLICATIONS

(ME)

Model Paper-2

Time: 3 hours **Max Marks: 70**

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

Q.No		Questions	Marks
1		**Unit - I**	
	a	**Classify** the robots based on the co-ordinate system and control system with neat diagram.	[14M]
		OR	
	b	**Explain** the Homogeneous transformation matrix and write the homogeneous matrix for Rotation and Translation.	[14M]
2		**Unit - II**	
	a	**Compare** the electric, hydraulic and pneumatic actuators used in robots.	[14M]
		OR	
	b	What are the functions of a sensor? **Explain** the suitable sensors used to measure the position	[14M]
3		**Unit - III**	
	a	**Explain** DH parameters with neat sketch.	[14M]
		OR	
	b	**Formulate** the forward kinematic model of the three degree of freedom (RRR) manipulator as shown in fig 	[14M]
4		**Unit - IV**	
	a	**Develop** algorithm for Lagrange-Euler formulation of Dynamic Equations.	[14M]
		OR	

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	b	**Derive** the jacobian matrix for a planar RRR manipulator?	[14M]
5		**Unit - V**	
	a	**Explain** the various types of material handling applications of Robots.	[14M]
		OR	
	b	**Explain** about welding operations of robot with neat sketch	[14M]

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NEC	**Narasaraopeta Engineering College** **(Autonomous)** **Yallmanda(Post), Narasaraopet- 522601**

DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/Week	Sections
R20ME3207	ROBOTICS AND APPLICATIONS	VI	Mechanical Engineering	6	A & B

COURSE OUTCOMES: Students are able to

SNO	Course Outcome Statement
CO1	**Distinguish** between automation and robotics and **identify** various components of robot. **[K4]**
CO2	**Select** appropriate type of actuators and sensors for different applications. **[K3]**
CO3	**Analyze** kinematics of a robot. **[K4]**
CO4	**Analyze** Dynamics of a robot. **[K4]**
CO5	**Illustrate** present and future applications of robots .**[K4]**

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	**CO1: Distinguish** between automation and robotics and identify various components of robot [K4]		**UNIT– I : INTRODUCTION**			
		1.1	**Fundamentals Of Robotics:** Introduction to Robotics, components of robot, Robot history,	T1, T2, R1,R3	3	Chalk, Talk & PPT
		1.2	Robotic controls and systems, classification, challenges and opportunities,	T1, T2, R1,R4	3	Chalk, Talk & PPT
		1.3	**Homogenous Coordinates And Transform Representations:** Vector spaces, inner products, vector norms,	T1, T2, R1,R3	3	Chalk, Talk & PPT
		1.4	Orthogonally, linear transformations, matrix multiplication	T1, T2, R1,R3	3	Chalk, Talk & PPT
		1.5	Matrix groups, Coordinate transformations, rigid transformations, rotation matrices	T1, T2, R1,R3	3	Chalk, Talk & PPT
2	**CO2: Select** appropriate type of actuators and sensors for different applications **[K3]**		**UNIT-II: ROBOT ACTUATORS AND SENSORS**			
		2.1	**Actuators:** Types, working principles,	T1, T2, R1	2	Chalk, Talk & PPT
		2.2	Applications and advancements (Hydraulic devices)	T1, T2, R1	2	Chalk, Talk & PPT
		2.3	Applications and advancements (Electric motors such as DC servomotors and stepper motors, Pneumatic devices).	T1, T2, R1	2	Chalk, Talk & PPT
		2.4	**Sensors:** Basic Elements, General Classification of Sensors,	T1, T2, R1	2	Chalk, Talk & PPT
		2.5	Types and working, use of sensors in robotics.	T1, T2, R1	2	Chalk, Talk & PPT

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3	**CO3: Analyze** kinematics of a robot **[K4]**	**UNIT-III: ROBOT KINEMATICS**				
		3.1	The fundamentals of kinematics,	T1, T2, R2,R4	2	Chalk, Talk & PPT
		3.2	Differential kinematics	T1, T2,	2	Chalk, Talk & PPT
		3.3	Statics- Kinematic chains	R2,R4	2	Chalk, Talk & PPT
		3.4	Forward kinematics analytical methods	T1, T2, R2,R4	3	Chalk, Talk & PPT
		3.5	Inverse kinematics- analytical methods.	T1, T2, R2,R4	3	Chalk, Talk & PPT
4	**CO4: Analyze** Dynamics of a robot **[K4]**	**UNIT-IV: ROBOT DYNAMICS**				
		4.1	Differential kinematics- Jacobian computation,	T1, T2, R2,R3	2	Chalk & Talk
		4.2	Singular configurations, Configuration space operation		2	Chalk & Talk
		4.3	Dynamics- Lagrange	T1, T2, R2,R3	2	Chalk & Talk
		4.4	Euler and Newton,		2	Chalk & Talk
		4.5	Euler formations, Problems.	T1, T2, R2,R3	4	Chalk ,Talk, NPTEL
5	**CO5: Illustrate** present and future applications of robots **[K4]**	**UNIT V: ROBOT APPLICATIONS IN MANUFACTURING**				
		5.1	Material Transfer, Material handling,	T1, T2, R3	2	Chalk, Talk & PPT
		5.2	Loading and unloading, Processing,spot and continuous arc welding & spray painting,	T1, T2, R3	2	Chalk, Talk & PPT
		5.3	Assembly and Inspection.	T1, T2, R3	3	Chalk, Talk & PPT
		5.4	Path planning in robotics.	T1, T2, R3	2	Chalk, Talk & PPT
		5.5	Future applications of robots.	T1, T2, R3	2	Chalk, Talk & PPT
				Total	60	

Text Books:

T1 Industrial Robotics, Groover M P,Pearson Edu.

T2 Robotics and Control, Mittal R K &Nagrath I J,Tata McGraw Hill.

Reference Books:

R1 Robotics: Fundamental Concepts and Analysis, Ashitava Ghosal, Oxford Publications.

R2 Robotic Systems: Applications, Control and Programming; Edited by Ashish Dutta, IntechOpen.

R3 Robotics, Fu K S, McGraw Hill.

R4 Robotic Engineering, Richard D. Klafter, Prentice Hall.

Faculty **HOD** **Principal**

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NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda(Post), Narasaraopet- 522601 Department of CSE (Artificial Intelligence)

COURSE INFORMATION SHEET

PROGRAMME: B.Tech CSE (Artificial Intelligence)	
COURSE: **SOFTWARE ENGINEERING**	Semester : **IV (2 - 2)** CREDITS: **3**
COURSE CODE: **(R20CC2204)** REGULATION: **R20**	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
-	-	NIL	-

COURSE OUTCOMES:

S.NO	Course Outcome Statement
CO1	Analyze basic software engineering models. [K4].
CO2	Demonstrate the various Object Oriented Design models [K2].
CO3	Outline the software prototyping, analysis and design [K2].
CO4	Outline the importance of software testing and project management [K4].
CO5	Understand the knowledge of software project planning.[k2]

SYLLABUS:

UNIT	DETAILS
I	**Introduction to software engineering** : Evolution and impact of software engineering, Software life cycle models, Waterfall model, Prototyping model, Evolution and spiral models, Feasibility study, Functional and non-functional requirements, Requirement gathering, Requirement analysis and specification.
II	**SRS Documentation**: Requirements Elicitation, Requirements Documentation, Use Cases, Unified Modeling Language, Introduction Conceptual Model of the UML, Architecture, **Class Diagrams**-Terms and Concepts, Common Modeling Techniques- Modeling Logical Database Schema, Forward and Reverse Engineering, **Object Diagrams**- Terms and Concepts, Common Modeling Techniques, Modeling Object Structures, Forward and Reverse Engineering, **Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.
III	**Use cases**- Terms and Concepts, **Use case Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling the Requirements of a System, Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering, **State Machines**-Terms and Concepts, **State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Reactive Objects, Forward and Reverse Engineering, **Component**-Terms and Concepts. **Deployment**- Terms and Concepts, **Component Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Executable Release, Modeling a Physical Database, Forward and

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	Reverse Engineering and **Deployment Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling an Embedded System, Modeling a Client/Server System, Forward and Reverse Engineering.
IV	**Analysis Phase**: Analysis Object Model (Domain Model), Analysis Dynamic Model, Non-Functional Requirements, Analysis Patterns. **Design Phase:** System Design Architecture, Design Principles, Design Concepts, Design Patterns, Architecture Styles, Dynamic Object Modeling, Static Object Modeling, Interface Specification, Object Constraint Language.
V	**Testing:** Fundamentals of testing, Black box testing techniques, White box testing techniques, Levels of testing, Test cases **Software project management** : Project management, Project planning and control, Cost estimation, Project scheduling using PERT and GANTT charts, Software configuration management.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Software Engineering: A Practitioner Approach By Roger Pressman, Mcgraw Hill Education
T2	Grady Booch, James Rumbaugh, Lvor Jacobson, "The Unified Modeling Language - User Guide", Addition Wesley 1999.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Software Engineering By Ian Sommerville, Pearson
R2	Fundamentals Of Software Engineering By Rajib Mall, Prentice Hall
R3	Software Engineering Fundamentals By Ali Behforooz And Fredericks J. Hudson, Oxford University Press

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

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

WEB SOURCE REFERENCES:

1	https://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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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
C322.1	2													3	
C322.2		2											3		
C322.3			2										3	3	
C322.4								2					1	1	
Average	2	2	2					2					2.33	2.33	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322	2	2	2	-	-	-	-	2	-	-	-	-	2.33	2.33	-

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COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

Course Instructor **Course Coordinator** **Module Coordinator** **HOD**

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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. PSO1: Ability to analyze and develop computer programs in the areas related to Algorithms, system software, application software, web design, big data analytics, database design and networking for efficient design of computer based systems of varying complexity.
2. PSO2: Design, Implement and evaluate a computer-based system to meet desired needs.
3. PSO3: Develop IT application services with the help of different current engineering tools.

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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	Analyses, 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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UNIT WISE SAMPLE ASSESSMENT QUESTIONS

COURSE OUTCOMES:

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

CO 1: Analyze basic software engineering models. [K4].

CO 2: Demonstrate the various Object Oriented Design models [K2].

CO 3: Outline the software prototyping, analysis and design [K2].

CO 4: Outline the importance of software testing and project management [K4].

CO 5: Understand the knowledge of software project planning.[K2].

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain about Software engineering.	K2	CO1
2	Explain about waterfall model with suitable diagram.	K2	CO1
3	What are the challenges of SE	K2	CO1
4	What is software process? Explain process classification	K2	CO1
5	Explain SDLC?	K2	CO1
	UNIT 2		
1	What are software requirements	K2	CO2
2	How to analyze the requirements	K2	CO2
3	Explain prototyping analysis	K2	CO2
4	Explain about requirements elicitation	K3	CO2
5	Explain about Requirements validation	K2	CO3
	UNIT 3		
1	What are the design principles? Explain in detail	K2	CO3
2	Explain about structured design methodologies	K2	CO3
3	Explain about functional decomposition	K2	CO3
4	Explain characteristics of good software design	K3	CO3
5	Explain about function oriented design	K3	CO3
	UNIT 4		
1	Explain about Black-Box testing	K2	CO4
2	Explain about codeing documnetaion	K2	CO4
3	Wahat are the levels of testing? Explain in detail	K2	CO4
4	Write differences between Black-box and White-box Testing	K2	CO4
	UNIT 5		

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1	Write about software metrics and measurements	K2	CO5
2	What is project management? Explain in detail	K2	CO5
3	What are effort estimation techniques	K2	CO5
4	Explain about CMM.	K3	CO5
5	Explain about Verification and validation	K3	CO5

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Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
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II B.Tech II Semester Regular Examinations, Month/Year:AUG/2022

Sub Code: R20CC2204 **SOFTWARE ENGINEERING**

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) Explain the structure of a Software.	K2	CO1	[7M]
		(ii) Explain the about Software reusability?	K2	CO1	[7M]
		OR			
	b	(i) Explain about element of software process	K2	CO1	[7M]
		(ii) Explain about Agile process model	K2	CO1	[7M]
2		**Unit – II**			
	a	(i) Explain about SRS.in detail	K2	CO2	[7M]
		(ii) Explain about Requirement engineering process?	K2	CO2	[7M]
		OR			
	b	(i) Explain about data oriented analysis	K2	CO2	[7M]
		(ii) Explain about requirement management	K2	CO2	[7M]
3		**Unit - III**			
	a	(i) Explain about structured design methodologies	K2	CO3	[14M]
		OR			
	b	(i) Explain about function oriented design?	K2	CO3	[14M]
4		**Unit - IV**			
	a	(i) Explain in detail about levels of testing	K2	CO4	[14M]
		OR			
	b	(i) Explain about Structured testing	K2	CO4	[14M]

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5		**Unit - V**			
	a	(i) Explain about COCOMO model?	**K2**	**CO5**	**[7M]**
		(ii) Explain about SQA	**K2**	**CO5**	**[7M]**
		OR			
	b	(i) Differentiate between CMM vs ISO.	**K4**	**CO5**	**[14M]**

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Model Question Paper-II

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, Month/Year:AUG/2022

Sub Code: R20CC2204 **SOFTWARE ENGINEERING**

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) Explain about waterfall model with suitable diagram?	K2	CO1	[7M]
		(ii) Explain about SDLC?	K2	CO1	[7M]
		OR			
	b	(i) What are the challenges of SE?	K1	CO1	[7M]
		(ii) What is software process? Explain process classification?	K1	CO1	[7M]
2		**Unit – II**			
	a	(i) Explain about requirements elicitation?	K2	CO2	[7M]
		(ii) Explain about Requirements validation?	K2	CO2	[7M]
		OR			
	b	(i) How to analyze the requirements?	K1	CO2	[7M]
		(ii) Explain about requirement management	K2	CO2	[7M]
3		**Unit - III**			
	a	(i) Explain characteristics of good software design?	K2	CO3	[14M]
		OR			
	b	(i) Explain about structured design methodologies?	K2	CO3	[14M]
4		**Unit - IV**			
	a	(i) Differentiate between Black-box and White-box Testing?	K4	CO4	[14M]
		OR			
	b	(i) What are the levels of testing? Explain in detail?	K2	CO4	[14M]

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5		**Unit - V**			
	a	(i) Write about software metrics and measurements?	**K1**	**CO5**	**[7M]**
		(ii) Explain about Verification and validation?	**K2**	**CO5**	**[7M]**
		OR			
	b	(i) Explain in detail about CMM?	**K2**	**CO5**	**[14M]**

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NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda (Post), Narasaraopet- 522601

DEPARTMENT OF INFORMATION TECHNOLOGY
SOFTWARE ENGINEERING LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/ Week	Section
R20CC2204	Software Engineering	II-II	Artificial Intelligence	6	-

COURSE OUTCOMES:

S. No.	Course Outcome Statement
CO1	Analyze basic software engineering models. [K4].
CO2	Demonstrate the various Object Oriented Design models [K2].
CO3	Outline the software prototyping, analysis and design [K2].
CO4	Outline the importance of software testing and project management [K4].
CO5	Understand the knowledge of software project planning.[k2]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	CO 1: Analyze basic software engineering models. [K4].		**Unit-1 Introduction to software engineering**			
		1.1	Evolution and impact of software engineering.	T1, R1	15	Chalk & Talk PPT& Tutorial.
		1.2	Software life cycle models, Waterfall model,	T1, T2, R2		
		1.3	Prototyping model,	T1, R2		
		1.4	Evolution and spiral models,	T1, T2, R1		
		1.5	Feasibility study, Functional and non-functional requirements,	T1, R1		
		1.6	Requirement gathering, Requirement analysis and specification	T1, T2, R1		
2	**CO 2: Demonstrate the various Object Oriented Design models [K2].**		**Unit-2 SRS Documentation & UML Concepts**			
		2.1	Requirements Elicitation	T1, T2, R1	15	Chalk & Talk PPT& Tutorial.
		2.2	Requirements Documentation.	T1, T2, R1		
		2.3	Use Cases, Unified Modeling Language. Introduction Conceptual Model of the UML,	T2, R2		
		2.4	UML Architecture, **Class Diagrams**-Terms and Concepts,	T2, R2		
		2.5	Common Modeling Techniques- Modeling Logical Database Schema, Forward and Reverse	T2, R2		
		2.6	**Object Diagrams**- Terms and Concepts, Common Modeling Techniques,	T1, T2, R1		

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		2.7	Modeling Object Structures, Forward and Reverse Engineering,	T2, R2		
		2.8	**Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-	T2, R2		
		2.9	Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.	T1, T2, R1		
			Unit-3 UML Concepts			
3	**CO3: Outline the software prototyping, analysis and design [K2].**	3.1	**Use cases**- Terms and Concepts, **Use case Diagrams**- Terms and Concepts,	T1, T2, R2	10	Chalk & Talk PPT& Tutorial.
		3.2	Common Modeling Techniques- Modeling the Requirements of a System,	T1, R2		
		3.3	Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts,	T1, T2, R2		
		3.3.1	Common Modeling Techniques-Modeling a Workflow, Modeling an Operation,	T1, T2, R2		
		3.3.2	Forward and Reverse Engineering, **State Machines**-Terms and Concepts,	T1, R2		
		3.4	**State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques-	T1, T2, R2		
		3.4.1	Modeling Reactive Objects, Forward and Reverse Engineering,	T1, T2, R2		
			MID I EXAMINATIONS			
			Unit-3 UML Concepts			
		3.5	**Component**-Terms and Concepts. **Deployment**- Terms and Concepts, **Component Diagrams**- Terms and Concepts,	T2, R1	10	Chalk & Talk PPT& Tutorial.
		3.5.1	Common Modeling Techniques- Modeling Executable Release	T2, R1		
		3.5.2	Modeling a Physical Database, Forward and Reverse Engineering.	T2, R1		
		3.6	**Deployment Diagrams**- Terms and Concepts, Common Modeling Techniques-	T2, R1		
		3.6.1	Modeling an Embedded System, Modeling a Client/Server System, Forward and Reverse Engineering	T2, R1		
4	**CO4: Outline the importance of software testing and project management [K4].**		**Unit-4 ANALYSIS PHASE AND DESIGN PHASE**			
		4.1	**Analysis Phase**: Analysis Object Model (Domain Model)	T1, R1	12	Chalk & Talk PPT& Tutorial.
		4.2	Analysis Dynamic Model,	T1, T2, R1		
		4.3	Non-Functional Requirements, Analysis Patterns	T1, R1		
		4.4	**Design Phase:** System Design Architecture, Design Principles,	T1, T2, R1		
		4.5	Design Concepts, Design Patterns, Architecture Styles, Dynamic Object Modeling,	T1, T2, R1		
		4.6	Static Object Modeling, Interface Specification, Object Constraint Language			

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5	CO5: Understand the knowledge of software project planning.[k2]	**Unit-5 TESTING AND SOFTWARE PROJECT MANAGEMENT**				
		5.1	**Testing:** Fundamentals of testing, Black box testing techniques, White box testing techniques,	T1, T2, R2	10	Chalk & Talk PPT& Tutorial.
		5.2	Levels of testing, Test cases	T1, T2, R2		
		5.3	**Software project management** : Project management, Project planning and control,	T1, R2		
		5.4	Cost estimation, Project scheduling using PERT and GANTT charts,	T1, R2		
		5.5	Software configuration management.	T1, T2, R2		
				Total	72	
MID II EXAMINATIONS						
END EXAMINATIONS						

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Software Engineering:A Practitioner Approach By Roger S.Pressman, Mcgraw Hill Education
T2	Grady Booch, James Rumbaugh, Lvor Jacobson, "The Unified Modeling Language - User Guide", Addition Wesley 1999.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	**BOOK TITLE/AUTHORS/PUBLISHER**
R2	Software Engineering By Ian Sommerville, Pearson
R3	Fundamentals Of Software Engineering By Rajib Mall, Prentice Hall

Faculty **HOD** **Principal**

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

COURSE INFORMATION SHEET

PROGRAMME: B.Tech Information Technology	
COURSE: **SOFTWARE ENGINEERING**	Semester : **IV (II-II)** CREDITS: **3**
COURSE CODE: **(R20CC2204)** REGULATION: **R20**	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
-	-	NIL	-

COURSE OUTCOMES

S.NO	Course Outcome Statement
CO1	Analyze basic software engineering models. [K4].
CO2	Demonstrate the various Object Oriented Design models [K2].
CO3	Outline the software prototyping, analysis and design [K2].
CO4	Outline the importance of software testing and project management [K4].
CO5	Understand the knowledge of software project planning.[k2]

SYLLABUS:

UNIT	DETAILS
I	**Introduction to software engineering** : Evolution and impact of software engineering, Software life cycle models, Waterfall model, Prototyping model, Evolution and spiral models, Feasibility study, Functional and non-functional requirements, Requirement gathering, Requirement analysis and specification.
II	**SRS Documentation**: Requirements Elicitation, Requirements Documentation, Use Cases, Unified Modeling Language, Introduction Conceptual Model of the UML, Architecture, **Class Diagrams**-Terms and Concepts, Common Modeling Techniques- Modeling Logical Database Schema, Forward and Reverse Engineering, **Object Diagrams**- Terms and Concepts, Common Modeling Techniques, Modeling Object Structures, Forward and Reverse Engineering, **Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.
III	**Use cases**- Terms and Concepts, **Use case Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling the Requirements of a System, Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering, **State Machines**-Terms and Concepts, **State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Reactive Objects, Forward and Reverse Engineering, **Component**-Terms and Concepts. **Deployment**- Terms and Concepts, **Component Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Executable Release, Modeling a Physical Database, Forward and Reverse Engineering and **Deployment Diagrams**- Terms and Concepts, Common Modeling

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	Techniques- Modeling an Embedded System, Modeling a Client/Server System, Forward and Reverse Engineering.
IV	**Analysis Phase:** Analysis Object Model (Domain Model), Analysis Dynamic Model, Non-Functional Requirements, Analysis Patterns. **Design Phase:** System Design Architecture, Design Principles, Design Concepts, Design Patterns, Architecture Styles, Dynamic Object Modeling, Static Object Modeling, Interface Specification, Object Constraint Language.
V	**Testing:** Fundamentals of testing, Black box testing techniques, White box testing techniques, Levels of testing, Test cases **Software project management** : Project management, Project planning and control, Cost estimation, Project scheduling using PERT and GANTT charts, Software configuration management.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Software Engineering: A Practitioner Approach By Roger Pressman, Mcgraw Hill Education
T2	Grady Booch, James Rumbaugh, Lvor Jacobson, "The Unified Modeling Language - User Guide", Addition Wesley 1999.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Software Engineering By Ian Sommerville, Pearson
R2	Fundamentals Of Software Engineering By Rajib Mall, Prentice Hall
R3	Software Engineering Fundamentals By Ali Behforooz And Fredericks J. Hudson, Oxford University Press

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

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

WEB SOURCE REFERENCES:

1	https://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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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
C322.1	2													3	
C322.2		2											3		
C322.3			2										3	3	
C322.4								2					1	1	
Average	2	2	2					2					2.33	2.33	

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322	2	2	2	-	-	-	-	2	-	-	-	-	2.33	2.33	-

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COURSE OUTCOME RUBRIC (ASSESMENT PER STUDENT):

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
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Note: Percentages mentioned in above rubrics can be slightly changed depending upon the complexity of your respected subject.

Course Instructor **Course Coordinator** **Module Coordinator** **HOD**

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ANNEXURE I:

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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	Analyses, 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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UNIT WISE SAMPLE ASSESSMENT QUESTIONS

COURSE OUTCOMES:

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

CO 1: Analyze basic software engineering models. [K4].

CO 2: Demonstrate the various Object Oriented Design models [K2].

CO 3: Outline the software prototyping, analysis and design [K2].

CO 4: Outline the importance of software testing and project management [K4].

CO 5: Understand the knowledge of software project planning.[K2].

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain about Software engineering.	K2	CO1
2	Explain about waterfall model with suitable diagram.	K2	CO1
3	What are the challenges of SE	K2	CO1
4	What is software process? Explain process classification	K2	CO1
5	Explain SDLC?	K2	CO1
	UNIT 2		
1	What are software requirements	K2	CO2
2	How to analyze the requirements	K2	CO2
3	Explain prototyping analysis	K2	CO2
4	Explain about requirements elicitation	K3	CO2
5	Explain about Requirements validation	K2	CO3
	UNIT 3		
1	What are the design principles? Explain in detail	K2	CO3
2	Explain about structured design methodologies	K2	CO3
3	Explain about functional decomposition	K2	CO3
4	Explain characteristics of good software design	K3	CO3
5	Explain about function oriented design	K3	CO3
	UNIT 4		
1	Explain about Black-Box testing	K2	CO4
2	Explain about codeing documnetaion	K2	CO4
3	Wahat are the levels of testing? Explain in detail	K2	CO4
4	Write differences between Black-box and White-box Testing	K2	CO4

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	UNIT 5		
1	Write about software metrics and measurements	K2	**CO5**
2	What is project management? Explain in detail	K2	**CO5**
3	What are effort estimation techniques	K2	**CO5**
4	Explain about CMM.	K3	**CO5**
5	Explain about Verification and validation	K3	**CO5**

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Model Question Paper-I

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, Month/Year:AUG/2022

Sub Code: R20CC2204 **SOFTWARE ENGINEERING**

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) Explain the structure of a Software.	K2	CO1	[7M]
		(ii) Explain the about Software reusability?	K2	CO1	[7M]
		OR			
	b	(i) Explain about element of software process	K2	CO1	[7M]
		(ii) Explain about Agile process model	K2	CO1	[7M]
2		**Unit – II**			
	a	(i) Explain about SRS.in detail	K2	CO2	[7M]
		(ii) Explain about Requirement engineering process?	K2	CO2	[7M]
		OR			
	b	(i) Explain about data oriented analysis	K2	CO2	[7M]
		(ii) Explain about requirement management	K2	CO2	[7M]
3		**Unit - III**			
	a	(i) Explain about structured design methodologies	K2	CO3	[14M]
		OR			
	b	(i) Explain about function oriented design?	K2	CO3	[14M]
4		**Unit - IV**			
	a	(i) Explain in detail about levels of testing	K2	CO4	[14M]
		OR			
	b	(i) Explain about Structured testing	K2	CO4	[14M]

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5		**Unit - V**			
	a	(i) Explain about COCOMO model?	**K2**	**CO5**	**[7M]**
		(ii) Explain about SQA	**K2**	**CO5**	**[7M]**
		OR			
	b	(i) Differentiate between CMM vs ISO.	**K4**	**CO5**	**[14M]**

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Model Question Paper-II

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech II Semester Regular Examinations, Month/Year:AUG/2022

Sub Code: R20CC2204 **SOFTWARE ENGINEERING**

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) Explain about waterfall model with suitable diagram?	K2	CO1	[7M]
		(ii) Explain about SDLC?	K2	CO1	[7M]
		OR			
	b	(i) What are the challenges of SE?	K1	CO1	[7M]
		(ii) What is software process? Explain process classification?	K1	CO1	[7M]
2		**Unit – II**			
	a	(i) Explain about requirements elicitation?	K2	CO2	[7M]
		(ii) Explain about Requirements validation?	K2	CO2	[7M]
		OR			
	b	(i) How to analyze the requirements?	K1	CO2	[7M]
		(ii) Explain about requirement management	K2	CO2	[7M]
3		**Unit - III**			
	a	(i) Explain characteristics of good software design?	K2	CO3	[14M]
		OR			
	b	(i) Explain about structured design methodologies?	K2	CO3	[14M]
4		**Unit - IV**			
	a	(i) Differentiate between Black-box and White-box Testing?	K4	CO4	[14M]
		OR			
	b	(i) What are the levels of testing? Explain in detail?	K2	CO4	[14M]

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5		**Unit - V**			
	a	(i) Write about software metrics and measurements?	**K1**	**CO5**	**[7M]**
		(ii) Explain about Verification and validation?	**K2**	**CO5**	**[7M]**
		OR			
	b	(i) Explain in detail about CMM?	**K2**	**CO5**	**[14M]**

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NEC	Narasaraopeta Engineering College (Autonomous) Yallmanda (Post), Narasaraopet- 522601

DEPARTMENT OF INFORMATION TECHNOLOGY
SOFTWARE ENGINEERING LESSON PLAN

Course Code	Course Title (Regulation)	Sem	Branch	Contact Periods/ Week	Section
R20CC2204	Software Engineering	II-II	Information Technology	6	A

COURSE OUTCOMES:

S. No.	Course Outcome Statement
CO1	Analyze basic software engineering models. [K4].
CO2	Demonstrate the various Object Oriented Design models [K2].
CO3	Outline the software prototyping, analysis and design [K2].
CO4	Outline the importance of software testing and project management [K4].
CO5	Understand the knowledge of software project planning.[k2]

Unit No	Outcome		Topics/Activity	Ref Text book	Total Periods	Delivery Method
1	**CO 1: Analyze basic software engineering models. [K4].**		**Unit-1 Introduction to software engineering**			
		1.1	Evolution and impact of software engineering.	T1, R1	15	Chalk & Talk PPT& Tutorial.
		1.2	Software life cycle models, Waterfall model,	T1, T2, R2		
		1.3	Prototyping model,	T1, R2		
		1.4	Evolution and spiral models,	T1, T2, R1		
		1.5	Feasibility study, Functional and non-functional requirements,	T1, R1		
		1.6	Requirement gathering, Requirement analysis and specification	T1, T2, R1		
2	**CO 2: Demonstrate the various Object Oriented Design models [K2].**		**Unit-2 SRS Documentation & UML Concepts**			
		2.1	Requirements Elicitation	T1, T2, R1	15	Chalk & Talk PPT& Tutorial.
		2.2	Requirements Documentation.	T1, T2, R1		
		2.3	Use Cases, Unified Modeling Language. Introduction Conceptual Model of the UML,	T2, R2		
		2.4	UML Architecture, **Class Diagrams**-Terms and Concepts,	T2, R2		
		2.5	Common Modeling Techniques- Modeling Logical Database Schema, Forward and Reverse	T2, R2		
		2.6	**Object Diagrams**- Terms and Concepts, Common Modeling Techniques,	T1, T2, R1		

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		2.7	Modeling Object Structures, Forward and Reverse Engineering,	T2, R2		
		2.8	**Interaction Diagrams-** Terms and Concepts, Common Modeling Techniques-	T2, R2		
		2.9	Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.	T1, T2, R1		
			Unit-3 UML Concepts			
3	**CO3: Outline the software prototyping, analysis and design [K2].**	3.1	**Use cases-** Terms and Concepts, **Use case Diagrams-** Terms and Concepts,	T1, T2, R2	10	Chalk & Talk PPT& Tutorial
		3.2	Common Modeling Techniques- Modeling the Requirements of a System,	T1, R2		
		3.3	Forward and Reverse Engineering, **Activity Diagrams-** Terms and Concepts,	T1, T2, R2		
		3.3.1	Common Modeling Techniques-Modeling a Workflow, Modeling an Operation,	T1, T2, R2		
		3.3.2	Forward and Reverse Engineering, **State Machines-**Terms and Concepts,	T1, R2		
		3.4	**State Chart Diagrams-** Terms and Concepts, Common Modeling Techniques-	T1, T2, R2		
		3.4.1	Modeling Reactive Objects, Forward and Reverse Engineering,	T1, T2, R2		
			MID I EXAMINATIONS			
			Unit-3 UML Concepts			
		3.5	**Component-**Terms and Concepts. **Deployment-** Terms and Concepts, **Component Diagrams-** Terms and Concepts,	T2, R1	10	Chalk & Talk PPT& Tutorial.
		3.5.1	Common Modeling Techniques- Modeling Executable Release	T2, R1		
		3.5.2	Modeling a Physical Database, Forward and Reverse Engineering.	T2, R1		
		3.6	**Deployment Diagrams-** Terms and Concepts, Common Modeling Techniques-	T2, R1		
		3.6.1	Modeling an Embedded System, Modeling a Client/Server System, Forward and Reverse Engineering	T2, R1		
4	**CO4: Outline the importance of software testing and project management [K4].**		**Unit-4 ANALYSIS PHASE AND DESIGN PHASE**			
		4.1	**Analysis Phase**: Analysis Object Model (Domain Model)	T1, R1	12	Chalk & Talk PPT& Tutorial.
		4.2	Analysis Dynamic Model,	T1, T2, R1		
		4.3	Non-Functional Requirements, Analysis Patterns	T1, R1		
		4.4	**Design Phase:** System Design Architecture, Design Principles,	T1, T2, R1		
		4.5	Design Concepts, Design Patterns, Architecture Styles, Dynamic Object Modeling,	T1, T2, R1		
		4.6	Static Object Modeling, Interface Specification, Object Constraint Language			

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5	CO5: Understand the knowledge of software project planning.[k2]	**Unit-5 TESTING AND SOFTWARE PROJECT MANAGEMENT**				
		5.1	**Testing:** Fundamentals of testing, Black box testing techniques, White box testing techniques,	T1, T2, R2	10	Chalk & Talk PPT& Tutorial.
		5.2	Levels of testing, Test cases	T1, T2, R2		
		5.3	**Software project management** : Project management, Project planning and control,	T1, R2		
		5.4	Cost estimation, Project scheduling using PERT and GANTT charts,	T1, R2		
		5.5	Software configuration management.	T1, T2, R2		
				Total	72	
MID II EXAMINATIONS						
END EXAMINATIONS						

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Software Engineering:A Practitioner Approach By Roger S.Pressman, Mcgraw Hill Education
T2	Grady Booch, James Rumbaugh, Lvor Jacobson, "The Unified Modeling Language - User Guide", Addition Wesley 1999.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	**BOOK TITLE/AUTHORS/PUBLISHER**
R2	Software Engineering By Ian Sommerville, Pearson
R3	Fundamentals Of Software Engineering By Rajib Mall, Prentice Hall

Faculty **HOD** **Principal**

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NEC

Narasaraopeta Engineering College
(Autonomous)
Yallmanda(Post), Narasaraopet- 522601
Department of MBA

COURSE INFORMATION SHEET-A.Y-2022-2023

PROGRAMME: MBA	
COURSE: **BRM**	Semester : II CREDITS: **4**
COURSE CODE: **19MBA1TH01**	COURSE TYPE (CORE /ELECTIVE / BREADTH/ S&H): **BREADTH**
REGULATION: **R19**	
COURSE AREA/DOMAIN: MANAGEMENT	PERIODS: **5** Per Week.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM

COURSE OUTCOMES:

SNO	Course Outcome Statement
	CO1: Adapt the fundamentals of Business research methodology. [K6]
	CO2: Identify research problem. [K3]
	CO3: Apply sample and census survey and measuring techniques. [K3]
	CO4: Design data collection techniques. [K6]
	CO5: Develop data processing procedures and apply tools. [K6]
	CO6: Draft thesis/report writing. [K2]

SYLLABUS:

UNIT	DETAILS
I	**INTRODUCTION TO RESEARCH:** Introduction, Meaning, Definition, purpose, motivation in research, types of research, Research process, Technique involved in Defining research problem, Important concepts relating to research design
II	**SAMPLING DESIGN:** Meaning and Definition of sample, Steps in sample design, Types of sample design (Probabilistic and Non-probabilistic sampling), errors in sampling, advantages and limitations of sampling.
III	**DATA COLLECTION-METHODS**: collection of primary data, observation method, Interview method, collection of data through Questionnaire and schedules- Collection of secondary data- selection of appropriate method for Data collection-Guidelines for developing Questionnaire, successful interviews.
IV	**MEASUREMENT AND SCALING TECHNIQUES:** Measurement in research, scales, Techniques of developing measurement tools, scale classification, Likert's scale, semantic scale, Thurston Scale, Interval Scale and multi-dimensional scaling.

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V	**PROCESSING AND ANALYSIS OF DATA:** Editing, Coding, classification, Tabulation of data; and data validation- methods of data presentation- types of data analysis: Quantitative and Qualitative – Statistics in Research; Descriptive and inferential Statistics-Descriptive statistics: measures in central tendency, Dispersion, Asymmetry, and Cross-tabulations, Limited problems on testing of hypotheses like parametric and non-parametric t-test, z-test, Anova.
VI	**RESEARCH REPORT WRITING:** Meaning of report, Types, Steps, Format of research report, Criteria of good research report, Pre-writing considerations-Final presentations of the Research Report-Idea of referencing, Bibliography, Footnotes and end notes, formats of publications in Research journals.

TEXT BOOKS	
T	**BOOK TITLE/AUTHORS/PUBLISHER**
T1	Research methodology Methods & Techniques, C.R. Kothari; 2/e, New Age international, 2004.
T2	Business Research Methods, William G. Zikmund; Cengage publications, 2006.
REFERENCE BOOKS	
R	**BOOK TITLE/AUTHORS/PUBLISHER**
R1	Research methodology Methods & Techniques, C.R. Kothari; 2/e, New Age international, 2004.
R2	Business Research Methodology, J.K. Sachdeva; Himalaya, 2009.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS:

SNO	DESCRIPTION	Associated PO & PSO
1		
2		

WEB SOURCE REFERENCES:

1	https://www.youtube.com/results?search_query=what+are+the+functions+of+management+
2	https://www.youtube.com/watch?v=tUrjAn24Zi
3	https://www.youtube.com/watch?v=4lEoyYD4SWw
4	https://www.youtube.com/watch?v=UUKAX0E4ckM
5	https://www.youtube.com/watch?v=FRprRP0nT5s
6	https://www.youtube.com/watch?v=yrbDzgfOyrM
7	https://www.youtube.com/watch?v=Hs7ei24zjbU

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

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MAPPING CO'S WITH PO'S

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C101.1	3	2	-	2	3	1	3	2	2	3	2	2	3	3
C101.2	2	2	1	1	-	1	3	3	1	3	-	3	1	3
C101.3	1	1	-	3	1	-	-	-	-	2	2	-	-	3
C101.4	1	-	-	-	3	2	2	1	2	2	2	2	3	3
C101.5	1	1	1	1	-	-	2	1	-	-	-	-	-	3
C101.6	-	-	2	-	-	-	2	-	2	3	-	2	2	3
Average	1.33	1.00	0.66	1.16	1.16	0.66	2.00	1.16	1.16	2.16	1.00	1.5	1.5	3.00

MAPPING COURSE WITH POs & PSOs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C101	1.33	1.00	0.66	1.16	1.16	0.66	2.00	1.16	1.16	2.16	1.00	1.5	1.5	3.00

Course Outcome Assessment Methods			Weightages		
Direct Assessment	Cumulative Internal Examinations (CIE)	Descriptive Test	30%	90%	Final Course Outcome (100%)
		Objective Test			
		Assignment Test			
	Semester End Examinations (SEE)		70%		
Indirect Assessment	Course End Survey			10%	

Rubrics for overall attainment of course outcomes:
If 50% of the students crossed 50% of the marks: Attainment Level 1
If 60% of the students crossed 50% of the marks: Attainment Level 2
If 70% of the students crossed 50% of the marks: Attainment Level 3

Course Coordinator

Module Coordinator

Head of the Department

ANNEXURE I:

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

PO1: Ability to apply the knowledge of business management in to practice.

PO2: Ability to apply the knowledge of areas of economics, technology, law, accounting into complex situations and provide solution.

PO3:Able to receive and give clear instructions, comprehend, write reports, prepare documentation and make effective presentations.

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PO4: Ability to work independently and also in a team in a diverse and multidisciplinary situations.
PO5: Ability to apply management principles in to practice and exhibiting leadership qualities.
PO6: Ability to keep abreast with the latest developments in the business environment by environmental scanning.
PO7: Ability to do research and apply modern statistical tools and computational tools to analyse the situations and take a right decisions.
PO8: Demonstrate IT knowledge and skills for efficient and effective business processes and develop innovative methods of applying IT and e-commerce for competitive advantage.
PO9: Ability to generate new & innovative ideas, putting it into practice by knowing the particulars of starting a business.
PO10: Demonstrate ethical conduct in personal and professional decisions and appreciation of business ethics and social responsibility and environmental concerns in the decision making process.
PO11: Ability to actively involve and understanding the importance of independent and continuous learning and research.
PO12: Formulate and communicate an original business idea to the broader business public and or formulate and communicate business plan

(B) PROGRAM SPECIFIC OUTCOMES (PSOs) :

PSO1: Equip students with necessary knowledge and managerial skills and competencies to occupy positions of management and administration in business, industry, public system and the government.

PSO2: Develop the ability to examine and analyse the impact of the changing environment and to respond appropriately at tactical and strategic level.

PSO3: Develop essential decision making, critical and creative thinking, leadership and entrepreneurial abilities.

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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Unit wise Sample assessment questions

COURSE OUTCOMES: Student is able to

CO1: Adapt the fundamentals of Business research methodology. [K6]
CO2: Identify research problem. [K3]
CO3: Apply sample and census survey and measuring techniques. [K3]
CO4: Design data collection techniques. [K6]
CO5: Develop data processing procedures and apply tools. [K6]
CO6: Draft thesis/report writing. [K2]

S NO	QUESTION	KNOWLEDGE LEVEL	CO
	UNIT I		
1	Explain the purpose and motivation of researc	K2	CO1
2	Discuss the various types of researc	K1	CO1
3	Explain the process of research	K6	CO1
	UNIT 2		
1	Discuss steps in sampling design	K6	CO2
2	Classify various the types of probabilistic sampling design	K4	CO2
3	Explain the sampling errors and advantages of sampling	K2	CO2
	UNIT 3		
1	Explain the data collection methods	K2	CO3
2	What are Guidelines for developing Questionnaire?	K1	CO3
3	Explain the various types of successful interviews.	K2	CO3
	UNIT 4		
1	Explain Likert's scale, and semantic scale	K2	CO4
2	Discuss the techniques of developing measurement tools	K6	CO4
3	classify the various scaling techniques	K4	CO4
	UNIT 5		
1	Explain the types of data analysis	K2	CO5
2	Explain the methods of data presentation	K2	CO5
3	Discuss the various steps in testing of hypotheses	K6	CO5
	UNIT 6		
1	Discuss the various types of report writing	K6	CO6
2	What are the steps in report writing?	K1	CO6

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3	Explain the Criteria of good research report	K2	CO6

Subject Code: 19MBA2TH05

MBA II Semester Regular Examinations, Model Paper-I

BUSINESS RESEARCH METHODOLOGY

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

Answer FOUR of the following
All questions carry equal marks. Part-A is compulsory

****

(PART-A)

1x12=12 M

1. Case Study

Certain manure was used on four plots of land A, B, C and D. Four beds were prepared in each plot and the manure used. The output of the crop in the beds of plots A, B, C and D is given below:

Output plots

A	B	C	D
8	9	3	3
12	4	8	7
1	7	2	8
3	1	5	2

Find out whether the difference in the means of the production of crops of the plots is significant or not.

(PART-B)

PART–B (48 Marks)
Answer any FOUR Questions

S. No	Question	Cognitive Level	CO	Marks
2	What is research? Explain different types of research	K2	1	12
3	Write about sampling? What are the steps involved in sample design?	K1	2	12
4	Enumerate different methods of data collection. With examples.	K4	3	12

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5	Explain measurement of scaling. What are the tests of sound measurement techniques	**K2**	**4**	**12**
6	Explain the following a) Simple hypothesis and composite hypothesis b) Null hypothesis and alternative hypothesis	**K1**	**5**	**12**
7	Discuss the various steps in report writing.	**K6**	**6**	**12**

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