
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS
M.Tech for
COMPUTER SCIENCE & ENGINEERING PROGRAMME



Academic Regulations (R24) for M.Tech. (Regular)
(Effective for the students admitted into I year from the Academic Year 2024-2025 onwards)



NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

ACADEMIC REGULATIONS R24 FOR M.Tech. (REGULAR) DEGREE COURSE

Applicable for the students of M.Tech. Course from the Academic Year 2024-25 onwards. The M.Tech Degree of Narasaraopeta Engineering College(Autonomous) affiliated to Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test (GATE/PGECET) conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M.Tech. DEGREE

- 2.1 A student shall be declared eligible for the award of the M.Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years.
- 2.2 **The student shall register for all 68 credits and secure all the 68 credits.**
- 2.3 The minimum instruction days in each semester are 90.

3.0 PROGRAMME OF STUDY

The following specializations are offered at present for the M.Tech. Programme of study.

Departments offering M.Tech. Programmes with specializations are noted below:

Civil Engg.	M.Tech. - Structural Engineering
EEE	M.Tech- Power And Industrial Drives
ME	1. M.Tech- Thermal Engineering 2. M.Tech- Machine Design
ECE	1. M.Tech- Digital Electronics and Communication Systems 2. M.Tech- Digital Systems And Computer Electronics 3. M.Tech- VLSI And Embedded Systems
CSE	1. M.Tech- Computer Science And Engineering

4.0 ATTENDANCE

- 4.1 A student shall be eligible to write end semester examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects/courses, and with minimum 50% in each and every course including practicals.
- 4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Committee.
- 4.3 Shortage of Attendance **below** 65% in aggregate shall not be condoned and not eligible to write their end semester examination of that class.
- 4.4 A prescribed fee shall be payable towards Condonation of shortage of attendance.
- 4.5 A student shall not be promoted to the next semester unless, he satisfies the attendance requirement of the present semester, as applicable. They may seek re-admission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same class.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practical, on the basis of Internal Evaluation and End Semester Examination.

- 5.1 For the theory subjects **60 marks** shall be awarded based on the performance in the End Semester Examination and **40 marks** shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the **weighted average(80% best + 20% of least)** of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with 4 questions

(without choice) each question for 10 marks. Three questions from three units and 4th question may be from any of the three units. End semester examination is conducted for **60 marks**. Six questions (one question from each unit) to be answered (either or).

- 5.2 For practical subjects, **60 marks** shall be awarded based on the performance in the End Semester Examinations and **40 marks** shall be awarded based on the day-to-day performance as Internal Marks. The internal evaluation based on the day to day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-20, Experimentation-20, Results-10, Viva-voce-10.
- 5.3 For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.
- 5.4 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of **40% of marks** in the End semester Examination and a minimum aggregate of **50% of the total marks** in the End Semester Examination and Internal Evaluation taken together.
- 5.5 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to re-appear for the End semester Examination in that subject. A candidate shall be given **one** chance to re-register for each subject provided the internal marks secured by a candidate **are less than 50% and has failed in the end examination**. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt shall stands cancelled. For re-registration the candidates have to apply by paying the requisite fees and get approval from the Principal before the start of the semester in which re-registration is required.
- 5.6 In case the candidate secures less than the required attendance in any re-registered subject(s), he shall not be permitted to write the End Examination in that subject. He shall again re-register the subject when next offered.
- 5.7 Laboratory examination for M.Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be external from the other reputed institutions.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- 6.1 A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members in the department.
- 6.2 Registration of Dissertation/Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.
- 6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).
- 6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- 6.5 Continuous assessment of Dissertation-I and Dissertation-II during the Semester(s) will be monitored by the PRC.
- 6.6 A candidate shall submit his status report in two stages to the PRC, at least with a gap of 3 months between them.
- 6.7 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.
- 6.8 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.
- 6.9 The thesis shall be adjudicated by one examiner selected by the Principal. For this, the HOD shall submit a panel of 3 examiners, eminent in that field, with the help of the guide concerned.
- 6.10 If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re- register for the project and complete the project within the stipulated time after taking the approval from the Principal.

- 6.11 The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.
- 6.12 If the report of the examiner is favorable, Viva - Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the Examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for a maximum of 100 marks.
- 6.13 If the report of the Viva -Voce is unsatisfactory (i.e., <50 % of marks), the candidate shall retake the Viva-Voce examination, only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Principal.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range Theory/ Laboratory (Max – 100)	Marks Range Mini Project/ Project Work or Dissertation (Max – 100)	Letter Grade	Level	Grade Point
≥ 90	≥ 90	A	Excellent	10
≥80 to <90	≥80 to <90	B	Very Good	9
≥70 to <80	≥70 to <80	C	Good	8
≥60 to <70	≥60 to <70	D	Fair	7
≥50 to <60	≥50 to <60	E	Satisfactory	6
<50	<50	F	Fail	0
		AB	Absent	0

Computation of SGPA

- The following procedure is to be adopted to compute the Semester Grade Point Average(SGPA) and Cumulative Grade Point Average(CGPA):
- The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e
- **SGPA (Si) = $\sum (Ci \times Gi) / \sum Ci$**
- Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a Programme, i.e.
- **CGPA = $\sum (Ci \times Si) / \sum Ci$**
- Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = (CGPA – 0.75) x 10

8.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M.Tech.. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 68 Credits.
First Class	≥ 6.75	
Second Class	≥ 6.0 to < 6.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

9.0 WITHHOLDING OF RESULTS

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

10.0 TRANSITORY REGULATIONS (for R24)

- 10.1 Discontinued or detained candidates are eligible for readmission (within the duration as mentioned in item 2.1) as and when next offered.
- 10.2 The readmitted students will be governed by the regulations under which the candidate has been admitted.

11.0 GENERAL

- 11.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- 11.2 The academic regulation should be read as a whole for the purpose of any interpretation.
- 11.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
- 11.4 The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct <i>If the candidate</i>	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work)

		already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case

		will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

M. Tech. (CSE) I SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	R24MCS101	Program Core-1 Mathematical Foundations of Computer Science	PC	3	0	0	3
2	R24MCS102	Program Core-2 Advanced Data Structures & Algorithms	PC	3	0	0	3
3	R24MCS103 R24MCS104 R24MCS105 R24MCS106	Program Elective-1 1. <u>Big Data Analytics</u> 2. Digital Image Processing 3. Advanced Operating Systems 4. Computer Graphics	PE	3	0	0	3
4	R24MCS107 R24MCS108 R24MCS109 R24MCS110	Program Elective-2 1. Advanced Computer Networks 2. <u>Internet of Things</u> 3. Object Oriented Software Engineering 4. Artificial Intelligence	PE	3	0	0	3
5	R24MCS111	Research Methodology and IPR	CC			0	2
6	R24MCS1L1	Laboratory-1 Advanced Data Structures & Algorithms Lab	LB	0	0	4	2
7	R24MCS1L2	Laboartory-2 Advanced Computing Lab	LB	0	0	4	2
8	R24MCS1NMC	Audit Course-1*	AC	2	0	0	0
Total Credits							18

M. Tech. (CSE) II SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	R24MCS201	Program Core-3 Machine learning	PC	3	0	0	3
2	R24MCS202	Program Core-4 Digital marketing	PC	3	0	0	3
3	R24MCS203 R24MCS204 R24MCS205 R24MCS206	Program Elective-3 1. Databases and Mining 2. Ad Hoc & Sensor Networks 3. Soft Computing 4. <u>Cryptography and Network Security</u>	PE	3	0	0	3
4	R24MCS207 R24MCS208 R24MCS209 R24MCS210	Program Elective-4 1. Cloud Computing 2. Principles of computer security 3. High Performance Computing 4. <u>E-Commerce</u>	PE	3	0	0	3
5	R24MCS2L1	Laboratory-3 Machine Learning with python lab	LB	0	0	4	2
6	R24MCS2L2	Laboratory-4 Tableau and Power BI Lab	LB	0	0	4	2
7	R24MCS2MP	Mini Project with Seminar	MP	2	0	0	2
8	R24MCS2NMC	Audit Course-2 *	AC	2	0	0	0
Total Credits							18

Student has to choose any one audit course listed below.

Audit Course 1 & 2:

1. English for Research Paper Writing

5. Constitution of India

2. Disaster Management

6. Pedagogy Studies

3. Sanskrit for Technical Knowledge

7. Stress Management by Yoga

4. Value Education

8. Personality Development through Life

Enlightenment Skills

M. Tech. (CSE) III SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	R24MCS301 R24MCS302 R24MCS303 R24MCS304	Program Elective-5 1. Deep Learning 2. Social Network Analysis 3. MOOCs (NPTEL/SWAYAM) 4. <u>Human Computer Interaction</u>	PE	3	0	0	3
2	R24MCS304 R24MCS305 R24MCS306	Open Elective 1. <u>Devops</u> 2. Software Testing Methodologies 3. MOOCs (NPTEL/SWAYAM)	OE	3	0	0	3
3	R24MCS3PW	Dissertation-I/ Industrial Project-I #	PJ	0	0	20	10
Total Credits							16

#Students going for Industrial Project/Thesis will complete these courses through MOOCs

M. Tech. (CSE) IV SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	R24MCS4PW	Project-II	PJ	0	0	32	16
Total Credits							16

Open Electives offered by the Department of CSE

1. Python Programming
2. Principles of Cyber Security
3. Internet of Things
4. Machine Learning
5. Digital forensics
6. Next Generation Databases

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE						

COURSE OBJECTIVES

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

COURSE OUTCOMES

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

CO1: Apply the logical statements, connectivity among the statements and different types of normal forms.[K3]

CO2: Analyze the operations, properties and functions of sets.[K4].

CO3: Solve mathematical problems with recurrence relations using different methods. [K3].

CO4: Classify the types of graphs to formulate and solve computational problems.[K4].

UNIT-I: Mathematical Logic:

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT-II: Set Theory:

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatory and Recurrence Relations:

Basics of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations:

Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, and Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT-IV: Graph Theory:

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

Unit-V: Multi Graphs:

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

TEXTBOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India publishers.
2. Discrete Mathematics, S. K. Chakraborty and B. K. Sarkar, Oxford press, 2011.
3. Discrete Mathematics and its Applications with Combinatorics and GraphTheory, K.H. Rosen, 7th Edition, Tata McGraw Hill.

I.M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS102	ADVANCED DATA STRUCTURES & ALGORITHMS						

COURSE OBJECTIVES

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

COURSE OUTCOMES

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

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: Construct greedy algorithms and dynamic programming techniques to solve problems.[K3]

CO4: Utilize backtracking and branch and bound algorithms to solve combinatorial problems K3]

CO5: Classify computational problems into NP, NP-Hard, and NP-Complete.[K4]

UNIT – I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees – Creation, Insertion, Deletion operations and Applications

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

UNIT – II:

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication

UNIT – III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths,

Dynamic Programming: General Method, All pairs shortest paths.0/1 Knapsack, String Editing, Travelling Salesperson problem,Optimal Binary Search Trees

UNIT – IV:

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V:

NP Hard and NP Complete Problems: Basic Concepts,

NP Hard Graph Problems: Clique Decision Problem (CDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Job Shop Scheduling

TEXTBOOKS

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N. Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

ONLINE LEARNING RESOURCES

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. <http://peterindia.net/Algorithms.html>
3. Abdul Bari, [Introduction to Algorithms \(youtube.com\)](#)

I.M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS103	BIG DATA ANALYTICS						

COURSE OBJECTIVES:

- Introducing Java concepts required for developing map reduce programs.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop ecosystem.

COURSE OUTCOMES:

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

CO 1: Interpret the architectural elements of big data and Hadoop framework. [K2]

CO 2: Analyse various big data applications using map reduce programming module. [K4]

CO 3: Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell. [K4]

CO 4: Summarize Spark's powerful built-in libraries, including Spark SQL, Spark Streaming. [K2]

CO 5: Analyze Hadoop data with PIG and Hive. Interpret the applications and architecture of Mobile Computing and multiplexing techniques. [K4]

SYLLABUS:

UNIT– I

Starting Hadoop: -Google File System, -The building blocks of Hadoop: Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker. -Setting up SSH for a Hadoop cluster: Define a common account, Verify SSH installation, Generate SSH key pair, Distribute public key and validate logins. - Running Hadoop: Local (standalone) mode, Pseudo-distributed mode, Fully distributed mode.

UNIT–II

MapReduce: -A Weather Dataset: Data Format, -Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce: A test run, The old and the new Java MapReduce APIs.

Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

UNIT–III

Programming with RDDs: What Is Apache Spark, RDD Basics, Creating RDDs, RDD Operations, Passing Functions to Spark, Common Transformations and Actions, Persistence (Caching).

UNIT-IV

Pig: Hadoop Programming Made Easier: -Admiring the Pig Architecture, -Going with the Pig Latin Application Flow, -Working through the ABCs of Pig Latin: Uncovering Pig Latin structures, Looking at Pig data types and syntax. -Evaluating Local and Distributed Modes of Running Pig Scripts, -Checking out the Pig Script Interfaces, -Scripting with Pig Latin

UNIT-V

Applying Structure to Hadoop Data with Hive: -Saying Hello to Hive, -Seeing How the Hive is Put Together, -Getting Started with Apache Hive, -Examining the Hive Clients: The Hive CLI client, The web browser as Hive client, SQuirreL as Hive client with the JDBC Driver. -Working with Hive Data Types, -Creating and Managing Databases and Tables: Managing Hive databases, Creating and managing tables with Hive. -Seeing How the Hive Data Manipulation Language Works: LOAD DATA examples, INSERT examples, Create Table As Select (CTAS) examples. Querying and Analyzing Data: Joining tables with Hive, Improving your Hive queries with indexes, Windowing in HiveQL, Other key HiveQL features.

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide" 3rd Edition, O'Reilly Media.
2. Matei Zaharia, Holden Karau, Andi Konwinski, Patric Wendell, Learning Spark, O'Reilly Media, 2015.
3. by Chuck Lam, "Hadoop in Action" MANNING Publ.
4. Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss, "Hadoop for Dummies"

REFERENCE BOOKS:

1. Alex Holmes, "Hadoop in Practice", MANNING Publ.
2. Srinath Perera, "Hadoop MapReduce Cookbook", Thilina Gunarathne

WEB REFERENCES:

1. <https://www.edx.org/learn/big-data>
2. <https://www.edureka.co/big-data-and-hadoop>

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS104	DIGITAL IMAGE PROCESSING						

COURSE OBJECTIVES:

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

COURSE OUTCOMES:

After the completion of the course, student will be able to

- Demonstrate the components of image processing
- Explain various filtration techniques.
- Apply image compression techniques.
- Discuss the concepts of wavelet transforms.
- Analyze the concept of morphological image processing.

UNIT I: Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques:** Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT II: Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. **Image Restoration & Reconstruction:** Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT III: Image Compression: Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT IV: Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.

UNIT V: Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology-erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition. **Digital Image Watermarking:** Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

Text Books:

1. Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education, (2009)

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, (2001)
2. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjana, S. (2009), Tata McGraw-Hill

I.M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS105	ADVANCED OPERATING SYSTEMS						

COURSE OBJECTIVES: This course is aimed at enabling the students to

- To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and Database Operating System and to cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock, Agreement Protocol, Security, Recovery and fault tolerance.

COURSE OUTCOMES:

After the completion of the course, student will be able to

- Illustrate on the fundamental concepts of distributed operating systems, its architecture and distributed mutual exclusion.
- Analyze on deadlock detection algorithms and agreement protocols.
- Make use of algorithms for implementing DSM and its scheduling.
- Apply protection and security in distributed operating systems.
- Elaborate on concurrency control mechanisms in distributed database systems.

UNIT-1: Architectures of Distributed Systems, System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks, casual ordering of messages, global state, cuts of a distributed computation, termination detection. Distributed Mutual Exclusion, introduction, the classification of mutual exclusion and associated algorithms, a comparative performance analysis.

UNIT-2: Distributed Deadlock Detection, Introduction, deadlock handling strategies in distributed systems, issues in deadlock detection and resolution, control organizations for distributed deadlock detection, centralized and distributed deadlock detection algorithms, hierarchical deadlock detection algorithms. Agreement protocols, introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, and applications of agreement algorithms. Distributed resource management: introduction-architecture, mechanism for building distributed file systems design issues, log structured file systems.

UNIT- 3: Distributed shared memory, Architecture, algorithms for implementing DSM, memory coherence and protocols, design issues. Distributed Scheduling, introduction, issues in load distributing, components of a load distributing algorithm, stability, load distributing algorithm, performance comparison, selecting a suitable load sharing algorithm, requirements for load distributing, task migration and associated issues. Failure Recovery and Fault tolerance: introduction, basic concepts, classification of failures, backward and forward error recovery, backward error recovery, recovery in concurrent systems, consistent set of check points, synchronous and asynchronous check pointing and recovery, check pointing for distributed database systems, recovery in replicated distributed databases.

UNIT- 4: Protection and security, preliminaries, the access matrix model and its implementations.-safety in matrix model, advanced models of protection. Data security, cryptography: Model of cryptography, conventional cryptography modern cryptography, private key cryptography, data encryption standard public key cryptography, multiple encryptions, authentication in distributed systems.

UNIT-5: Multiprocessor operating systems, basic multiprocessor system architectures, inter connection networks for multiprocessor systems, caching hypercube architecture. Multiprocessor Operating System, structures of multiprocessor operating system, operating system design issues, threads, process synchronization and scheduling. Database Operating systems: Introduction, requirements of a database operating system Concurrency control :Theoretical aspects, introduction, database systems, a concurrency control model of database systems, the problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms, introduction, basic synchronization primitives, lock based algorithms, timestamp based algorithms, optimistic algorithms, concurrency control algorithms, data replication.

Text Books:

1. "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", Mukesh Singhal, Niranjana and G.Shivaratri, TMH, 2001

Reference Books:

1. "Modern operating system", Andrew S.Tanenbaum, PHI, 2003
2. "Distributed operating system-Concepts and design", Pradeep K.Sinha, PHI, 2003
3. "Distributed operating system", Pearson education, AndrewS.Tanenbaum, 2003

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS106	COMPUTER GRAPHICS						

COURSE OBJECTIVES:

- Provide foundation in graphics applications programming
- Introduce fundamental concepts and theory of computer graphics
- Give basics of application programming interface (API) implementation based on graphics pipeline approach

COURSE OUTCOMES:

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

- CO 1:** Summarize graphics applications, architectures, and open GL program structure. [k2]
CO 2: Apply basic transformations on objects. [k3]
CO 3: Apply line and polygon clipping algorithms. [k3]
CO 4: Identify different projections. [k3]
CO 5: Design interactive programs using OpenGL. [k6]

SYLLABUS:

UNIT- I

Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; the synthetic camera model; the programmer's interface; Graphics architectures. Graphics Programming: The Sierpinski gasket; Programming two- dimensional applications. The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program.

UNIT- II

Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; Animating interactive programs; Logic operations..

UNIT- III

Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices.

UNIT- IV

Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Parallel-projection matrices; Perspective projection matrices.

UNIT- V

Implementation: Basic implementation strategies; Clipping; Cohen-Sutherland Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon rasterization.

TEXT BOOKS:

1. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, 5th Edition, Pearson, 2009.
2. Computer Graphics through OpenGL: From Theory to Experiments, Sumantha Guha, Chapman and Hall/CRC, 2011 (For OpenGL and related examples).

REFERENCE BOOKS:

1. Computer Graphics with OpenGL, Hearn & Baker, 3rd Edition, Pearson 2004.
2. Computer Graphics Using OpenGL, F.S. Hill, Jr, and M. Kelley, Jr., 3rd Edition, Pearson/PHI, 2009.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/106/103/106103224/>
2. <http://www.svecw.edu.in/Docs%5CCSECGLNotes2013.pdf>
3. <https://www.ncertbooks.guru/computer-graphics-notes/>

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS107	ADVANCED COMPUTER NETWORKS						

COURSE OBJECTIVES: This course is aimed at enabling the students to

- The course is aimed at providing basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
- Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing.
- Provide the mathematical background of routing protocols.
- Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks.

COURSE OUTCOMES:

After the completion of the course, student will be able to

- Illustrate reference models with layers, protocols and interfaces.
- Describe the routing algorithms, Sub netting and Addressing of IP V4 and IPV6.
- Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
- Describe the emerging trends in networks-MANETS and WSN

Unit-I: Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, **congestion control algorithms** : Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets

Unit-II: Internetworking and IP protocols: How networks differ, How net works can be connected, internetworking, tunneling, The network layer in the internet, IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, network address translation (NAT), IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP

Unit-III: Transport Layer Protocols: Introduction, Services, Port numbers, User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, **SCTP:** SCTP services SCTP features, packet format, An SCTP association, flow control, error control.

Unit- IV: Wireless LANS: Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers **Other Wireless Networks:** WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites.

Unit-V: Emerging trends in Computer networks:

Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security. **Wireless Sensor Networks:** WSN functioning, Operating system support in sensor devices, WSN characteristics, sensor network operation, Sensor Architecture: Cluster management, Wireless Mesh Networks: WMN design , Issues in WMNs, Computational Grids, Grid Features, Issues in Grid construction design, Grid design features, P2P Networks: Characteristics of P2P Networks, Classification of P2P systems, Gnutella, BitTorrent, Session Initiation Protocol(SIP) , Characteristics and addressing, Components of SIP, SIP establishment, SIP security.

Text Books:

1. Data communications and networking 4th edition Behrouz A Fourzan, TMH
2. Computer networks 4th edition Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE

Reference Books:

1. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS108	INTERNET OF THINGS						

COURSE OBJECTIVES:

- To understand this fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

COURSE OUTCOMES:

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

CO 1: Outline the concepts of Internet of Things. [K2]

CO 2: Analyze the requirements, specifications to design IoT applications. [K4]

CO 3: Analyze domain specific applications using Arduino and Raspberry pi. [K4]

CO 4: Interpret cloud storage models and communication APIs for IoT. [K2]

SYLLABUS:

UNIT - I

FUNDAMENTALS OF IoT INTRODUCTION: Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoT vs M2M.

UNIT - II

IoT DESIGN METHODOLOGY: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.

UNIT - III

PROTOTYPING EMBEDDED DEVICE WITH ARDUINO: Sensors, Actuators, Embedded Computing Basics- Micro Controllers, System on Chips, Choosing your Platform, Arduino – Developing on the Arduino.

PROTOTYPING EMBEDDED DEVICE WITH RASPBERRY PI: Raspberry PI – Introduction, cases and Extension Boards, Developing on the Raspberry PI.

UNIT – IV

IOT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.

UNIT – V

DOMAIN SPECIFIC APPLICATIONS OF IoT: Home Automation, Agriculture Applications, Smart City applications.

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Adrian McEwen & Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications – 2014.

REFERENCE BOOKS:

1. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
4. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
5. Charalampos Doukas “Building Internet of Things with the Arduino”.
6. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
7. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

WEB REFERENCES:

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

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS109	OBJECT ORIENTED SOFTWARE ENGINEERING						

Course Objectives:

- To elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.
- To understand the what software life cycle is, how software projects are planned and managed, types of resources involved in software development projects, risks are identified and assessed, predictions and assessments are made.
- To identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements

Course Outcomes:

After the completion of the course, student will be able to

- Apply the Object Oriented Software-Development Process to design software
- Analyze and Specify software requirements through a SRS documents.
- Design and Plan software solutions to problems using an object-oriented strategy.
- Model the object oriented software systems using Unified Modeling Language (UML)
- Estimate the cost of constructing object oriented software.

UNIT I: Introduction to Software Engineering: Software, Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges. Software Processes: Software Process, Process Classification, Phased development life cycle, Software Development Process Models, Process, use, applicability and Advantages/limitations.

UNIT II: Object oriented Paradigm, Object oriented Concepts, Classes, Objects, Attributes, Methods and services, Messages, Encapsulation, Inheritance, Polymorphism, Identifying the elements of object model, management of object oriented Software projects, Object Oriented Analysis, Domain Analysis, Generic Components of OOA model, OOA Process, Object Relationship model, Object Behavior Model.

UNIT III: Object Oriented Design: Design for Object- Oriented systems, The Generic components of the OO design model, The System design process, The Object design process, Design Patterns, Object Oriented Programming.

UNIT IV: Object Oriented testing: Broadening the view of Testing, Testing of OOA and OOD models, Object-Oriented testing strategies, Test case design for OO software, testing methods applicable at the class level, Interclass test case design.

UNIT V: Technical Metrics for Object Oriented Systems: The Intent of Object Oriented metrics, The distinguishing Characteristics, Metrics for the OO Design model, Class-Oriented metrics, Operation-Oriented Metrics, Metrics for Object Oriented testing, Metrics for Object Oriented projects. CASE Tools.

Text Books:

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH.
2. Object oriented and Classical Software Engineering, Timothy Lethbridge, Robert Laganiere, TMH
3. Software Engineering by Roger S Pressman, Tata McGraw Hill Edition.

Reference Books:

1. Component based software engineering: 7th International symposium, ivicaCrnkovic, Springer, CBSE 2004

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS110	ARTIFICIAL INTELLIGENCE						

COURSE OBJECTIVE:

- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
- The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

COURSE OUTCOMES:

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

CO1: Summarize the characteristics of AI that make it useful to real-world problems. [K2]

CO2: Analyse 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: Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]

SYLLABUS:

UNIT - I

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

UNIT - II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. Knowledge Representation Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

UNIT - III

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

Weak slot-and-filler structures: Semantic Nets, Frames, Strong slot-and-filler structures: Conceptual dependency, Scripts.

UNIT - IV

Learning: Rote learning, learning by taking advice, learning in problem solving,

Reinforcement Learning: Markov Decision Problem, Q-Learning, Q-Learning Algorithm, temporal difference Algorithm

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural language Processing, Spell Checking.

TEXT BOOKS:

1. Elaine Rich & Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill Edition, 3rd Edition, Reprint 2008.
2. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
3. Carl Townsend, “Introduction to TURBO PROLOG”, BPB Publications. 2011
4. Tom M Mitchell, “Machine Learning”, McGraw-Hill Science/Engineering/Math, 1997.

REFERENCE BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Patrick Henry Winston, ‘Artificial Intelligence’, Pearson Education, 2003
3. Russel and Norvig, ‘Artificial Intelligence’, Pearson Education, PHI, 2003

WEB 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. <http://nptel.ac.in/courses/106105152>

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	0	40	60	100	2
SUBJECT CODE: R24MCS111	RESEARCH METHODOLOGY AND IPR						

COURSE OBJECTIVES:

1. To develop the skills required for defining research problems.
2. To develop skills required for effective literature studies.
3. To develop Mathematical and statistical knowledge to research.
4. To impact knowledge about different kinds of IPR.

COURSE OUTCOMES:

After the completion of the course, student will be able to

CO1: Understand the fundamentals of research design

CO2: Identify and formulate research problems

CO3: Understanding various statistics concepts related to research..

CO4: Understanding various IPRs

CO5: Evaluate patent Laws and industry designs

UNIT 1:

Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable.

Research Process, Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.

UNIT 2:

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

UNIT 3:

Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

UNIT 4:

Introduction: Introduction to Intellectual Property Rights, types of intellectual property, importance of intellectual property rights, Evolution of IP acts and treaties.

Trade Marks: Purpose and function of trademarks, Acquisition of trade mark rights, transfer of rights, Selecting and evaluating trademark, registration of trademarks, claims.

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation.

UNIT 5:

Geographical Indication of Goods: **Basic aspects and need for the registration**

Copyrights: Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright.

Patents: Foundation of patent law, patent searching process, Basic Criteria of Patentability

Industrial Designs: **Kind of protection provided in Industrial design**

Text Books.

1. Research Methodology – C.R.Kothari
2. Intellectual property rights by P. Radhakrishnan.

REFERENCES:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
4. Mayall, “Industrial Design”, McGraw Hill, 1992.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
6. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008
7. Intellectual property right by Deborah E Bouchoux
8. Cyber law, Text and cases South western special topics collection.
9. Intellectual property rights by N.K Acharya
10. Fundamentals of IPR for engineers, BY komal bansal

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
SUBJECT CODE: R24MCS1L1	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB						

COURSE OBJECTIVES

The objectives of the course is to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

COURSE OUTCOMES

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

CO1: Analyze different operations of tree traversal techniques. [K4]

CO2: Analyze time complexity of algorithms to solve problems on graph [K4]

CO3: Apply divide and conquer approaches for sorting the given elements [K3]

CO4: Analyze the complexity of algorithms to evaluate the efficiency and effectiveness of greedy, dynamic programming, backtracking branch and bound techniques. [K4]

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
a) Adjacency Matrix b) Adjacency Lists
5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).

7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

REFERENCE BOOKS:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Virtual Lab:

1. <https://ds2-iiith.vlabs.ac.in/>
Any three programs must be submitted with the result from the above link

ONLINE LEARNING RESOURCES:

1. <http://cse01-iiith.vlabs.ac.in/>
2. <http://peterindia.net/Algorithms.html>

I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
SUBJECT CODE: R24MCS1L2	ADVANCED COMPUTING LAB						

COURSE OBJECTIVES:

From the course the student will learn

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

COURSE OUTCOMES:

After the completion of the course, student will be able to

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
- Development and use of s IoT technology in Societal and Industrial Applications.
- Skills to undertake high quality academic and industrial research in Sensors and IoT.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Experiment 1: Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

Experiment 2: Study and Install IDE of Arduino and different types of Arduino.

Experiment 3: Study and Implement Zigbee Protocol using Arduino / RaspberryPi.

Experiment 4: Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 5: Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that

- Transposes the original Amazon food dataset, obtaining a PairRDD of the type<user_id>→ <list of the product_ids reviewed by user_id>
- Counts the frequencies of all the pairs of products reviewed together.
- Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Experiment 6:

Write a program to Implement Bankers algorithm for Dead Lock Avoidance.

Experiment 7:

Write a program to Producer-consumer problem Using semaphores.

Experiment 8:

Write a program for an image enhancement using pixel operation.

Experiment 9:

Write a Program to enhance image using image arithmetic and logical operations.

Experiment 10:

Write a program of bit stuffing used by Data Link Layer.

Experiment 11:

Write a program to configure a Network using Distance Vector Routing protocol.

Experiment 12:

Write a program to perform the function oriented diagram: DFD and Structured chart.

Experiment 13:

Write a program to perform the system analysis: Requirement analysis, SRS.

Experiment 14:

Write a program to draw the structural view diagram: Class diagram, object diagram.

Experiment 15:

Write C programs for implementing the Demorgan's law.

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS201	MACHINE LEARNING						

COURSE OBJECTIVES:

- To understand how machine learning algorithms are evaluated.
- To be Familiar with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- To be able to implement some basic machine learning algorithms.

COURSE OUTCOMES:

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

CO 1: Summarize the characteristics of Machine Learning that make it useful to real-world Problems.

CO 2: Evaluate and compare the performance of different supervised algorithms for typical learning problems and apply them.

CO 3: Outline the need and importance of pre-processing techniques and apply them.

CO 4: Analyze the performance of Association Rules

CO 5: Evaluate and compare the performance of different unsupervised algorithms for typical learning problems and apply them.

UNIT– I

Supervised Learning: Learning a Class from Examples, Vapnik Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression: simple linear regression, multiple linear regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm, Bayesian classification

UNIT–II

Parametric Methods: Maximum Likelihood Estimation: (Bernouli density, multinomial density, gaussian density), Evaluating an Estimator: (Bias and Variance), The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures

UNIT–III

Dimensionality Reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Linear Discriminant Analysis

Association learning: Basics of Association, Apriori Algorithm, FP Growth Algorithm with examples

UNIT-IV

Unsupervised Learning: Expectation Maximization, EM algorithm, Self-Organizing Maps(SOM), learning Process in SOM, Algorithm: SOM, Adaptive Resonance Theory.

Clustering: k-Means Clustering, Expectation Maximization algorithm, Supervised Learning after Clustering, Spectral Clustering, Document Clustering example, Hierarchical Clustering, Choosing the Number of Clusters

UNIT-V

Decision Trees: Univariate Trees: (classification trees, regression trees), Pruning, Rule Extraction from

Trees, Learning Rules from Data.

Random Forest: basic Principle, Random Forest Algorithm with Example, Decision Tree vs random Forest

TEXT BOOKS:

1. Ethem Alpaydin, “Introduction to Machine Learning”, The MIT Press
2. Artificial Intelligence and Machine Learning, by Vinod Chandra PHI Learning.
3. Tom M. Mitchell “Machine Learning”, MC Graw Hill
4. Aurélien Géron, “Hands-on machine learning with scikit learn and tensorflow” O’REILLY

REFERENCE BOOKS:

1. Stephen Marsland, “Machine Learning an Algorithmic Perspective”, CRC Press, 2009.

I M.TECH	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
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II SEMESTER	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS202	DIGITAL MARKETING						

COURSE OUTCOMES:

After the completion of the course, student 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-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.

UNIT-II

Internet Marketing and Digital Marketing Mix

Internet Marketing, Opportunities and challenges, Digital marketing framework, Digital Marketing mix, Impact of digital channels on IMC Search Engine Advertising, Pay for Search Advertisements, Ad Placement, Ad Rank ,Creating Ad Campaigns, Campaign Report Generation Display marketing ,Types of Display Ads, Buying Models, Programmable Digital Marketing, Analytical Tools and examples, YouTube marketing with examples

UNIT-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.

UNIT-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.

UNIT-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

1. Seema Gupta, Digital Marketing, Mc-Graw Hill, 1st Edition- 2017
2. Ian Dodson, The Art of Digital Marketing, Wiley Latest Edition
3. Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson, 1st Edition – 2017

REFERENCE BOOKS

1. Vandana Ahuja, Digital Marketing, Oxford University Press, Latest Edition
2. Philip Kotler, Marketing 4.0: – Moving from Traditional to Digital, Wiley 2017

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS203	DATABASES AND MINING						

Course Objectives:

- This Subject deals with dealing data in the real world, maintaining data without any redundancy, several techniques involved in DBMS to recover the problems caused due to redundancy, storing data for quick insertion, manipulation and deletion operations in order to retrieve data from the database.
- This subject provides an introduction to multidisciplinary field of data mining, the general data features, techniques for data preprocessing, general implementation of data warehouses and OLAP, the relationship between data warehousing and other generalization methods
- The concepts of data clustering includes a different methods of clustering such as k-means, k-medoids, db scan algorithm, role of data mining in web mining.

Course Outcomes:

After the completion of the course, student will be able to

- Analyze on normalization techniques.
- Elaborate on concurrency control techniques and query optimization.
- Summarize the concepts of data mining, data warehousing and data preprocessing strategies.
- Apply data mining algorithms.
- Assess various classification & cluster techniques.

UNIT I: Introduction: Concepts and Definitions, Relational models, Data Modeling and Query Languages, Database Objects. **Normalization Techniques:** Functional Dependency, 1NF, 2NF, 3NF, BCNF; Multi valued Dependency; Loss-less Join and Dependency Preservation.

UNIT II: Transaction Processing: Consistency, Atomicity, Isolation and Durability, Serializable Schedule, Recoverable Schedule, Concurrency Control, Time-stamp based protocols, Isolation Levels, Online Analytical Processing,

UNIT III: Data Mining: What Is Data Mining, -Motivating Challenges, -The Origins of Data Mining, - Data Mining Tasks, -Types of Data: Attributes and Measurement, Types of Data Sets, -Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

Data processing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation

UNIT IV: Classification: Basic Concepts, Decision Trees, and Model Evaluation: -Preliminaries, - General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, -Model Overfitting: Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross Validation, Bootstrap.

UNIT V: Cluster Analysis: Basic Concepts and Algorithms: -Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, -K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, -Agglomerative

Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, -DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

Text Books:

1. Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Addison-Wesley, 6th edition-
2. Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann C.J. Date, Database Systems, Pearson, 3rd edition-

Reference Books:

1. Principles of Distributed Database Systems, Prentice Hall, P. Valduriez, M. TamerOzsu 3rd edition- 2000
2. Database systems: Design, implementation and Management, C.M. Coronel, S. Morris, P. Rob, Boston: Cengage Learning, 9th edition-2011

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS204	AD HOC & SENSOR NETWORKS						

Course Objectives:

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

After the completion of the course, student will be able to

- Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks
- Discuss the MAC protocol issues of ad hoc networks
- Enumerate the concept of routing protocols for ad hoc wireless networks with respect to TCP design issues
- Analyze & Specify the concepts of network architecture and MAC layer protocol for WSN
- Discuss the WSN routing issues by considering QoS measurements

UNIT I: Introduction : Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms ,Characteristics of the Wireless channel mobile ad hoc networks (MANETs), **Wireless Sensor Networks (WSNs):** concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks.

UNIT II: MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi channel MAC - IEEE 802.11.

UNIT III: Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing (on-demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions- TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.

UNIT IV: Wireless Sensor Networks (WSNs) And Mac Protocols: Single node architecture - hardware and software components of a sensor node, **WSN Network architecture:** typical network architectures, data relaying and aggregation strategies, **MAC layer protocols:** self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15.4.

UNIT V: WSN Routing, Localization & Qos: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization.

Text Books:

1. "Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education, 2008
2. "Wireless Adhoc and Sensor Networks", Labiod. H, Wiley, 2008
3. "Wireless ad -hoc and sensor Networks: theory and applications", Li, X, Cambridge University Press, 2008.

Reference Books:

1. "Ad Hoc & Sensor Networks: Theory and Applications", 2nd edition, Carlos De Moraes Cordeiro, Dharma Prakash Agrawal ,World Scientific Publishing Company, 2011
2. "Wireless Sensor Networks", Feng Zhao and Leonides Guibas,Elsevier Publication.
3. "Protocols and Architectures for Wireless Sensor Networks", Holger Karl and Andreas Willig,Wiley, 2005 (soft copy available)
4. "Wireless Sensor Networks Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, & TaiebZnati, John Wiley, 2007. (soft copy available)

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS205	SOFT COMPUTING						

Course Objectives:

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student a hand-on experience on MATLAB to implement various strategies.

Course Outcomes:

After the completion of the course, student will be able to

- Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems.
- Make use of genetic algorithms to combinatorial optimization problems.
- Distinguish artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
- Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems.
- Evaluate and compare solutions by various soft computing approaches for a given problem

UNIT I: Fuzzy Set Theory: Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT II: Optimization: Derivative based Optimization, Descent Methods, and The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, and Random Search, Downhill Simplex Search.

UNIT III: Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent-directed Search Production System and Learning.

UNIT IV: Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum.

UNIT V: Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Coloripe Prediction.

Text Books:

1. “Neuro-Fuzzy and Soft Computing”, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education 2004
2. Artificial Intelligence by Saroj Koushik, Cengage Learning
3. “Artificial Intelligence and Intelligent Systems”, N.P.Padhy, Oxford University Press, 2006

Reference Books:

1. Artificial Intelligence, Second Edition, Elaine Rich & Kevin Knight, Tata McGraw Hill Publishing Comp., New Delhi, , 2006
2. “Fuzzy Logic with Engineering Applications”, Timothy J.Ross, McGraw-Hill, 1997

I.M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBJECT CODE: R24MCS20	CRYPTOGRAPHY & NETWORK SECURITY						

COURSE OBJECTIVES:

- The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment.
- During this course the students will gain knowledge in various kinds of software security problems, and techniques that could be used to protect the software from security threats.

COURSE OUTCOMES:

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

- CO1 :** Summarize the fundamentals of Cryptography. [K2]
- CO2 :** Analyze how security is achieved, and attacks can be countered by using symmetric/asymmetric algorithms. [K4]
- CO3 :** Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. [K3]
- CO4 :** Interpret the role of hash functions and Digital Signatures in Information Security.[K2]
- CO5 :** Compare different network security designs using available secure solutions. [k2]
- CO6 :** Illustrate the use of encryption techniques to secure data in transit across data networks. [K2]

SYLLABUS:

UNIT-I

Introduction: Security Attacks-Passive Attacks, Active Attacks, Security Services-Authentication, Access control, Confidentiality, Integrity, Availability service, Nonrepudiation, Security Mechanisms- Specific Security Mechanisms, Pervasive Security Mechanisms, model for Network Security, Basics of Cryptography - Symmetric Cipher Model, Substitution Techniques- Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, polyalphabetic Ciphers, One-Time pad. Transposition Techniques-rail fence, Block and Stream Ciphers.

UNIT-II

Symmetric Key Cryptography: Fiestel Cipher Structure, Block Cipher Design Principles- Design Criteria, Number of Rounds, Design of Function F, Data Encryption Standard (DES), Strength of DES, Triple DES, International Data Encryption algorithm(IDEA), AES- Structure, Transformation functions, Key Expansion, Block Cipher Modes of Operation- ECB, **CBC**, OFB,CFB,CTR Modes.

UNIT-III

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems-Proof and Examples, Euler's Totient Function, Primitive root and Discrete Logarithms.

Public Key Cryptography: Principles of Public key Cryptosystems-Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography, Public-Key Cryptanalysis, RSA Algorithm: Description of the Algorithm, The Security of RSA, Diffie-Hellman Key Exchange Algorithm, Elgamal encryption & decryption,

UNIT-IV

Cryptographic Hash Functions: Message Authentication Requirements and Functions-Message Encryption, Message Authentication Code, Hash Function, Message Authentication Codes (MAC)-Requirements, Hash Functions-Requirements, Applications of MAC and hash functions, Secure Hash Algorithm (SHA-512), HMAC.
Digital Signatures: Digital Signature Schemes, Authentication Protocols- Mutual Authentication, One-Way Authentication, Digital Signature Standards-The DSS Approach, The digital Signature Algorithm.

UNIT-V

Authentication Applications: Kerberos: Motivation, Version 4, X.509 Directory Authentication service, E-Mail, PGP, S/MIME.

Web Security: Web Security Considerations, Secure Sockets Layer- SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Transport Layer Security, Secure Electronic Transactions (SET), Firewalls.

TEXTBOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 6th Edition, 2011.
2. Chwan Hwa Wu, J.David Irwin, "Introduction to Computer Networks & Cyber Security", CRC Press, 2013.

REFERENCE BOOKS:

1. Eric Maiwald, "Fundamentals of Network Security", Dreamtech press.
2. Withman , Thomson, "Principles of Information Security".
3. Buchmann, Springer, "Introduction to Cryptography".
4. Bruce Schneier, Johnwiley&Sons, "Applied Cryptography", 2nd Edition.
5. Benard Menezes, "Network Security Essentials and Cryptography", Cengage Learning,2011.
6. Behrouz A.Fourouzan and Debdeep Mukhopadhyay, "Cryptography and Network, 2nd Edition", McGraw-Hill, 2010.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs07/preview
2. <https://www.coursera.org/learn/cryptography>
3. <https://www.coursera.org/specializations/computer-network-security>
4. <https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7>

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBJECT CODE: R24MCS206	CLOUD COMPUTING						

COURSE OBJECTIVES:

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

COURSE OUTCOMES:

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

CO1: Interpret various types of Virtualization.

CO2: Outline the Cloud Computing Architectures and Models.

CO3: Analyze the Cloud Infrastructure Management and Migration and Disaster Management in Cloud

CO4: Analyze AWS and MS Azure services.

SYLLABUS

UNIT-I:

Overview of Cloud Computing: Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

UNIT-II:

Introduction to virtualization and virtual machine: Types of virtualization: Server virtualization, Application/desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.

Cloud Computing Architecture: Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

UNIT-III:

Models of Cloud Computing: Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage.

UNIT-IV:

Cloud Infrastructure Management and Migration: Administrating Clouds, Cloud Management Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.

Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

UNIT-V:

What is Microsoft Azure?, Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure.

What is AWS?, History of AWS, Important AWS Services, Amazon Web Services Cloud Platform: Compute & Networking, Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management, Applications of AWS, services, Companies using AWS, Advantages of AWS, Disadvantages of AWS, Comparison between Azure and AWS.

TEXT BOOKS:

1. Cloud Computing –Shailendra Singh Oxford University Press.

REFERENCE BOOKS:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide David S. Linthicum Addison-Wesley Professional.
2. Distributed & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

ONLINE REFERENCES:

1. <http://nptel.ac.in/courses/106106129/21>
2. <https://freevideolectures.com/course/3649/cloud-computing>
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IIOCdEWINArFke4jgtlg

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS208	PRINCIPLES OF COMPUTER SECURITY						

COURSE OBJECTIVES:

In the course the student will learn

- This course provides an overview of modern cryptographic theories and techniques, mainly focusing on their application into real systems.
- Topics include Database and Cloud Security, Malicious Software, Denial-of-Service Attacks, Software Security, Operating System Security, Wireless Network Security and mobile device security.

COURSE OUTCOMES:

After the completion of the course, student will be able to

- Describe the key security requirements of confidentiality, integrity, and availability, types of security threats and attacks and summarize the functional requirements for computer security.
- Explain the basic operation of symmetric block encryption algorithms, use of secure hash functions for message authentication, digital signature mechanism.
- Discuss the issues involved and the approaches for user authentication and explain how access control fits into the broader context that includes authentication, authorization, and audit.
- Explain the basic concept of a denial-of-service attack, nature of flooding attacks, distributed denial-of-service attacks and describe how computer security vulnerabilities are a result of poor programming practices.
- List the steps used to secure the base operating system, specific aspects of securing Unix/Linux systems, Windows systems, and security in virtualized systems and describe the security threats and countermeasures for wireless networks.

Unit I: Introduction: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Fundamental Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy. **Cryptographic Tools:** Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers.

Unit II: User Authentication: Electronic User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication. **Access Control:** Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, UNIX File Access Control, Role-Based Access Control, Attribute-Based Access Control, Identity, Credential, and Access Management, Trust Frameworks.

Unit III: Database and Cloud Security: The Need For Database Security, Database Management Systems, Relational Databases, Sql Injection Attacks, Database Access Control, Database Encryption, Cloud Computing, Cloud Security Risks And Countermeasures, Data Protection In The Cloud, Cloud Security As A Service. **Malicious Software:** Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation, Infected Content, Viruses, Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, Spam E-Mail, Trojans, Payload, System Corruption, Payload, Attack Agent, Zombie, Bots, Payload, Information Theft, Key loggers, Phishing, Spyware, Payload, Stealthing, Backdoors, Root kits, Countermeasures.

Unit IV: Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial- of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack. **Software Security:** Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs.

Unit V: Operating System Security: Introduction To Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security. **Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Text Book:

1. Computer Security: Principles and Practices, 3e, William Stallings, Lawrie Brown, Pearson

Reference book:

1. Network Security Essentials, Principles and Practices, William Stallings, Pearson

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS208	HIGH PERFORMANCE COMPUTING						

Course Objectives:

The objective of the subject is to

- Introduce the basic concepts related to HPC architecture and parallel computing.
- To discuss various computational techniques for studying soft matter systems.
- To apply these concepts to examine complex bimolecular/materials systems that generally require large-scale HPC platform with hybrid CPU-GPU architectures.

Course Outcomes:

After the completion of the course, student will be able to

- Design, formulate, solve and implement high performance versions of standard single threaded algorithms.
- Demonstrate the architectural features in the GPU and MIC hardware accelerators.
- Design programs to extract maximum performance in a multicore, shared memory execution environment processor.
- Analyze Symmetric and Distributed architectures.
- Develop and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

UNIT I: Graphics Processing Units: Introduction to Heterogeneous Parallel Computing, GPU architecture, Thread hierarchy, GPU Memory Hierarchy.

UNIT II: GPU Programming: Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations, Image Processing algorithms – Image Blur, Gray scaling. Histogramming, Convolution, Scan, Reduction techniques.

UNIT III: Many Integrated Cores: Introduction to Many Integrated Cores. MIC, Xeon Phi architecture, Thread hierarchy, Memory Hierarchy, Memory Bandwidth and performance considerations.

UNIT IV: Shared Memory Parallel Programming: Symmetric and Distributed architectures, OpenMP Introduction, Thread creation, Parallel regions. Work sharing, Synchronization.

UNIT V: Message Passing Interface: MPI Introduction, Collective communication, Data grouping for communication.

Text Books:

1. Programming Massively Parallel Processors A Hands-on Approach, 3e, Wen-Mei W Hwu, David B Kirk and Morgan Kaufmann-2019
2. Intel Xeon Phi Coprocessor Architecture and Tools, Rezaur Rahman, Apress Open, 1st edition-2013
3. Using OpenMP, Barbara Chapman, Gabriele Jost, Rudd Vander Pas, MIT Press, 2008

Reference books:

1. “A Parallel Algorithm Synthesis Procedure for High-Performance Computer Architectures” by Dunn Ian N, 2003

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBJECT CODE: R24MCS208	E - COMMERCE						

COURSE OBJECTIVES:

- To introduce the fundamental principles of e-business, e-commerce, and the role of management.
- To introduce the application of tools and services to the development of small-scale e-commerce applications

COURSE OUTCOMES:

After successful completion of this course, the students will 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]

SYLLABUS:

UNIT – I

Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT – II

Consumer Oriented Electronic commerce - Mercantile Process models.

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT – III

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.

Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Digital Video and electronic Commerce

TEXT BOOKS :

1. Kalakata, Whinston, “Frontiers of electronic commerce”, Pearson.

REFERENCE BOOKS :

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, “E-Commerce fundamentals and applications”
2. S.Jaiswal – Galgotia, “E-Commerce”.
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, “E-Commerce”.
4. Gary P.Schneider, “Electronic Commerce”, Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

WEB 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/>

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	40	60	100	2
SUBJECT CODE: R24MCS2L1	MACHINE LEARNING WITH PYTHON LAB						

Course Objectives:

This course will enable students to

- To learn and understand different Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes(COs): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Experiment-1:

Exercises to solve the real-world problems using the following machine learning methods:

- Linear Regression
- Logistic Regression.

Experiment-2:

Write a program to Implement Support Vector Machines.

Experiment-3:

Exploratory Data Analysis for Classification using Pandas and Matplotlib.

Experiment-4:

Implement a program for Bias, Variance, and Cross Validation.

Experiment-5:

Write a program to simulate a perception network for pattern classification and function approximation.

Experiment-6:

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-7:

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:

Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.

Experiment-9:

Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-10:

Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-11:

Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

I M.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4	40	60	100	2
SUBJECT CODE: R24MCS2L2	TABLEAU AND POWER BI LAB						

COURSE OBJECTIVES:

- To introduce Tableau and enable to connect different data sources and prepare data for analysis.
- To introduce students to Power BI, enabling them to understand its products, install Power BI Desktop, connect to data sources, and become familiar with the user interface for data analysis and visualization.
- To equip students with the skills to transform and preprocess data effectively using Power BI, including tasks like data summarization, joining data tables.

COURSE OUTCOMES:

By completing the course the students will be able to:

CO1 : Understand the features and architecture of Tableau.[K2]

CO2 : Analyze different data sources, distinguish between live and extract connections. [K4]

CO3 : Demonstrate comprehension of different products within the Power BI Suite and will be able to install Power BI Desktop. [K3]

CO4 : Apply data transformation techniques, create calculated columns, measures, and perform data summarization, joining data tables, and data hierarchy to prepare data for analysis. [K3]

CO5 : Apply their knowledge to visualize data using various chart types, tables, and filtering methods in Power BI, allowing them to present data effectively. [K3]

EXPERIMENT-I: Introduction to Tableau

- Installation of Tableau Desktop/Public
- Understanding the Architecture and Features of Tableau, Interface of Tableau (Layout, Toolbars, Data pane, Analytics pane etc.)
- Introducing various file type
- How to create data visualization using Tableau feature “show me”
- Reorder and Remove Visualization Fields
- How to create calculated field
- How to perform operation using cross tab
- Working with workbook data and Worksheet

EXPERIMENT-II: Data Preparation

- Connecting to different Data Source
 - Excel
 - CSV

- i. SQL Server
- Live vs. Extract Connection
 - i. Creating Extract
 - ii. Refreshing Extract
 - iii. Increment Extract
 - iv. Refreshing Live
 - v. Data Source Editor
- Pivoting and splitting
- Data Interpreter: Clean Dirty Data

EXPERIMENT-I: Introduction to Power BI

- a) Understanding different types of products in the Power BI Suite
- b) Installation of Power BI Desktop
- c) Connecting to various common Data Sources
- d) Getting familiar with the user interface of Power BI Desktop

EXPERIMENT-II: Data Transformation & Pre-Processing

- a) Data Transformation
- b) Data summarization using Grouping
- c) Joining Data Tables
- d) Creating Calculated Columns
- e) Creating Measures
- f) Grouping Data Categories
- g) Applying Data Hierarchy

EXPERIMENT-III: Data Visualization using Charts Part-I

- a) Stacked column and Bar Charts
- b) Clustered column and Bar Charts
- c) Line Chart
- d) Area & Stacked Area Charts
- e) Pie & Donut Charts
- f) Stacked & Column Combined Charts

EXPERIMENT-III: Data Visualization using Charts Part-II

- a) Funnel Chart
- b) Waterfall chart
- c) Tree Map Chart
- d) Scatter Plot Chart

EXPERIMENT-IV: Presenting Data in Tables

- a) Data Table
- b) Data Presentation using Matrix Crosstab
- c) Cards & Multi Row Cards

TEXT BOOKS

1. Pro Tableau: A Step-by-Step Guide By Seema Acharya, Subhashini Chellappan
2. Communicating Data with Tableau: Designing, Developing, and Delivering Data By Ben Jone
3. **Pro Power BI Desktop:** Self-Service Analytics and Data Visualization for the Power User
3rd Edition by Adam Aspin

WEB RESOURCES

1. <https://www.tableau.com/>
2. <https://www.youtube.com/watch?v=SPB7JvU3CPY&list=PLNLDEHOJTZSiTiYy-WHFNvOhr8gPgBYeh>
3. <https://www.tutorialspoint.com/tableau/index.htm><https://www.udemy.com/course/power-bi-for-data-visualization/>
4. https://www.tutorialspoint.com/power_b/power_bi_supported_data_sources.htm
5. <https://learn.microsoft.com/en-us/power-bi/fundamentals/service-get-started>

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS301	DEEP LEARNING						

COURSE OUTCOMES:

By completing the course the students will be able to:

CO1: Understand the basic concepts of Artificial Intelligence (AI) and its history

CO2: Connect biological vision systems with machine vision

CO3: Learn the anatomy of a neural network

CO4: Understand the role of Convolutional Neural Networks (CNNs)

CO5: implement deep learning for machine vision and natural language processing (NLP):

UNIT I:

Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning:** Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting.

UNIT II

Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks.

UNIT III

Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification.

UNIT IV:

Convolutional Neural Networks: Neural Network and Representation Learning, Convolutional Layers, Multichannel Convolution Operation, **Recurrent Neural Networks:** Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch.

UNIT V:

Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversarial Networks, Deep Reinforcement Learning.

Deep Learning Research: Autoencoders, Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks.

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning

Publications, ISBN: 9781617294433

3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beylevel, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 97801351168214. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS302	SOCIAL NETWORK ANALYSIS						

Course Objectives:

- The learning objective of the course Social Network Analysis is to provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Course Outcomes:

- After the completion of the course, student will be able to
- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Analyze the experiment with small world models and clustering models.
- Compare the application driven virtual communities from social network Structure.

UNIT I: Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II: Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III: Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV: Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT V: Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Text Books:

- S. Wasserman and K. Faust. Social Network Analysis: Methods and Applications (Cambridge, Cambridge University Press, 1994)
- D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world-2010

Reference Books:

- Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman, Katherine Faust, 1994.

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS303	MOOCs (NPTEL/SWAYAM)						

IV B.TECH I SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE R20CC4102	HUMAN COMPUTER INTERACTION						

COURSE OBJECTIVES:

- The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

COURSE OUTCOMES:

- CO 1:** Outline knowledge about user interface design. [K2]
CO 2: Summarize the importance of Graphical User Interface. [K2]
CO 3: Apply the strategies used in design process. [K3]
CO 4: Summarize the importance of screen designing. [K2]
CO 5: 5.Apply the various operations of Windows. [K3]

SYLLABUS

UNIT – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

UNIT – II

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT – III

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds.

UNIT – IV

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics.

UNIT – V

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

TEXT BOOKS:

- Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, “Human Computer Interaction”, PEA, 3/e, 2004.
- Wilbert O Galitz, “The Essential guide to user interface design”, Wiley Dream tech, 2/e.

REFERENCE BOOKS:

1. Dan R.Olsan, “Human Computer”, Interaction Cengage ,2010.
2. Ben Shneidermann , “Designing the user interface”, 4/e, PEA.
3. Soren Lauesen, “User Interface Design”, PEA.
4. Prece, Rogers, Sharps, “Interaction Design”, Wiley.

WEB REFERENCES:

1. https://scholar.google.co.in/scholar?q=human+computer+interaction&hl=en&as_sdt=0&as_vis=1&oi=scholar
2. <https://www.interaction-design.org/literature/topics/human-computer-interaction>
3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction
4. https://www.tutorialspoint.com/human_computer_interface/human_computer_interface_introduction.htm

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS304	DEVOPS						

COURSE OBJECTIVES:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

COURSE OUTCOMES:

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

CO 1: Demonstrate the phases of software development life cycle. [K2]

CO 2: Outline the basic Fundamentals of DevOps. [K2]

CO 3: Adopt the DevOps technology into the project. [K6]

CO 4: Evaluate the CI/CD concepts and metrics to track CI/CD practices. [K5]

CO 5: Summarize the importance of DevOps maturity models. [K2]

SYLLABUS:

UNIT- I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT- II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

UNIT- III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT- IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT- V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model, DevOps maturity Assessment.

TEXT BOOKS:

1. Gene Kim , John Willis , Patrick Debois, “The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations” Jez Humb,O'Reilly Publications
2. Mike Loukides, “What is Devops? Infrastructure as code” O'Reilly publications.
3. Jez Humble and David Farley, “Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation”,
4. Dave Harrison, Knox Lively, “Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices. Joakim Verona , Packt, “Practical Devops”

REFERENCE BOOKS:

1. Mandi Walls, “Building a DevOps Culture”, O’Reilly publications
2. Viktor Farcic, “The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services”

WEB REFERENCES:

1. <https://www.youtube.com/watch?v=hQcFE0RD0cQ>
2. https://www.youtube.com/watch?v=YSkDtQ2RA_c
3. <https://www.svrtechnologies.video/courses/devops-training-free/lectures/10955807>
4. https://www.youtube.com/watch?v=MOZMw5_fBFA

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS305	SOFTWARE TESTING METHODOLOGIES						

COURSE OBJECTIVES:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing

COURSE OUTCOMES:

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

- CO 1:** Outline the software testing terminology. [K2]
CO 2: Compare and contrast various behavioural testing methodologies. [K2]
CO 3: Summarize various dynamic testing techniques. [K2]
CO 4: Summarize the importance of validation activities. [K2]
CO 5: Interpret software testing and quality management. [K2]

SYLLABUS:

UNIT - I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing, Software Failure Case Studies.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle.

UNIT - II

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify and validate code.

Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

UNIT - III

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

Static Testing: inspections, Structured Walkthroughs, Technical reviews

UNIT - IV

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing

UNIT - V

Efficient Test Suite Management: Test case design, why does a test suite grow, minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Software Quality Management: Software Quality metrics, SQA models

TEXT BOOKS:

1. Naresh Chauhan, “Software Testing, Principles and Practices”, Oxford
2. Aditya P Mathur, “Foundations of Software testing”, 2ed, Pearson
3. Yogesh Singh, “Software Testing”, CAMBRIDGE

REFERENCE BOOKS:

1. Baris Beizer, “Software testing techniques”, International Thomson computer press, second edition.
2. M G Limaye, “Software Testing, Principles, techniques and Tools”, TMH
3. Willian E Perry, “Effective Methods for Software testing”, 3ed, Wiley

ONLINE REFERENCES:

1. <https://www.youtube.com/watch?v=IhA-EUEjyW0>
2. <https://www.youtube.com/watch?v=goaZTAzsLMk>
3. <https://freevidelectures.com/Course/3655/Software-Testing>
4. <https://www.youtube.com/watch?v=ASzlf-av4v4>
5. <http://srsstesting.com/>

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE: R24MCS306	MOOCs (NPTEL/SWAYAM)						

I M.TECH III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	20	40	60	100	10
SUBJECT CODE:	(DISSERTATION) DISSERTATION PHASE – I						

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.

- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

Course Outcomes:

At the end of this course, students will be able to

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a written report.
4. Presenting the work in International/ National conference or reputed journals.

I M.TECH IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	32	40	60	100	16
SUBJECT CODE: R24MCS4PW	PROJECT-II						

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	PYTHON PROGRAMMING						

COURSE OBJECTIVE:

- To teach problem solving through flow charting tool-Raptor.
- To elucidate problem solving through python programming language.
- To introduce function oriented programming paradigm through python.
- To train in development of solutions using modular concepts.

COURSE OUTCOMES:

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

CO 1: Summarize the fundamental concepts of python programming. [K2]

CO 2: Interpret object oriented and event driven programming in python. [K2]

CO 3: Apply the suitable data structures to solve the real time problems. [K3]

CO 4: Apply regular expressions for many different situations. [K3]

SYLLABUS:

UNIT-I

Introduction to python: Numbers, strings, variables, operators, expressions, Indentation, String operations and functions, math function calls, Input/output statements, conditional if, while and for loops,

UNIT-II

Functions: user defined functions, parameters to functions, recursive functions, and lambda function.

Event driven programming: Turtle graphics, Turtle bar chart, Widgets, key press events, mouse events, timer events.

UNIT-III

Data structures: List- list methods & functions, Tuple-tuple methods & functions, Dictionaries-dictionary methods & functions, traversing dictionaries. Sets-methods & functions, Files.

UNIT-IV

OOP: class, object, methods, constructors, inheritance, inheritance types, polymorphism, operator overloading, abstract classes, exception handling.

UNIT-V:

Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.

3. Reema Thareja, “Python Programming using Problem Solving Approach”, ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, “Python programming : A modern approach”, ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , “Learning python”, ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, “Core python programming”, ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. <https://raptor.martincarlisle.com/>
2. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>
5. <https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
6. <https://nostarch.com/scratchplayground>
7. <http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf>

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	PRINCIPLES OF CYBER SECURITY						

Course Objectives:

- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

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

- Apply cyber security architecture principles.
- Describe risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

UNIT–I: Introduction to Cyber security- Cyber security objectives, Cyber security roles, Differences between Information Security & Cyber security, **Cyber security Principles**-Confidentiality, integrity, &availability Authentication & non- repudiation.

UNIT–II: Information Security (IS) within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities**-Basics of risk management, Operational threat environments, Classes of attacks.

UNIT–III: Incident Response- Incident categories, Incident response Incident recovery, and **Operational security protection:** Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.

UNIT–IV: Threat Detection and Evaluation (DE): Monitoring- Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances. **Analysis-** Network traffic Analysis, packet capture and analysis

UNIT–V: Introduction to backdoor System and security-Introduction to metasploit, Backdoor, demilitarized zone(DMZ),Digital Signature, Brief study on Harding of operating system.

Text Books:

1. NASSCOM: Security Analyst Student Hand Book Dec 2015.
2. Information Security Management Principles Updated Edition by [David Alexander](#), [Amanda Finch](#), [David Sutton](#) ,Published by BCS, June 2013.

Reference Books:

1. CSX- cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security.

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	INTERNET OF THINGS						

COURSE OBJECTIVES:

- To understand this fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

COURSE OUTCOMES:

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

- CO 1:** Outline the concepts of Internet of Things. [K2]
CO 2: Analyze the requirements, specifications to design IoT applications. [K4]
CO 3: Analyze domain specific applications using Arduino and Raspberry pi. [K4]
CO 4: Interpret cloud storage models and communication APIs for IoT. [K2]

SYLLABUS:

UNIT - I

FUNDAMENTALS OF IoT INTRODUCTION: Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoT vs M2M.

UNIT - II

IoT DESIGN METHODOLOGY: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.

UNIT - III

PROTOTYPING EMBEDDED DEVICE WITH ARDUINO: Sensors, Actuators, Embedded Computing Basics- Micro Controllers, System on Chips, Choosing your Platform, Arduino – Developing on the Arduino.

PROTOTYPING EMBEDDED DEVICE WITH RASPBERRY PI: Raspberry PI – Introduction, cases and Extension Boards, Developing on the Raspberry PI.

UNIT – IV

IOT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.

UNIT – V

DOMAIN SPECIFIC APPLICATIONS OF IoT: Home Automation, Agriculture Applications, Smart City applications.

TEXT BOOKS:

3. Arshdeep Bahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
4. Adrian McEwen & Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications – 2014.

REFERENCE BOOKS:

8. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
9. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
10. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
11. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
12. Charalampos Doukas "Building Internet of Things with the Arduino".
13. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
14. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

WEB REFERENCES:

5. <https://www.youtube.com/watch?v=G4-CtKkrOmc>
6. http://www.cse.wustl.edu/~jain/cse570-13/m_18iot.htm
7. <https://www.youtube.com/watch?v=9ZUFYyXhQm8>
8. <https://www.udemy.com/introduction-to-iot-using-raspberry-pi-2/>

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	MACHINE LEARNING						

COURSE OBJECTIVES:

- To understand how machine learning algorithms are evaluated.
- To be Familiar with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- To be able to implement some basic machine learning algorithms.

COURSE OUTCOMES:

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

CO 6: Summarize the characteristics of Machine Learning that make it useful to real-world Problems.

CO 7: Evaluate and compare the performance of different supervised algorithms for typical learning problems and apply them.

CO 8: Outline the need and importance of pre-processing techniques and apply them.

CO 9: Analyze the performance of Association Rules

CO 10: Evaluate and compare the performance of different unsupervised algorithms for typical learning problems and apply them.

UNIT– I

Supervised Learning: Learning a Class from Examples, Vapnik Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression: simple linear regression, multiple linear regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm, Bayesian classification

UNIT–II

Parametric Methods: Maximum Likelihood Estimation: (Bernouli density, multinomial density, gaussian density), Evaluating an Estimator: (Bias and Variance), The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures

UNIT–III

Dimensionality Reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Linear Discriminant Analysis

Association learning: Basics of Association, Apriori Algorithm, FP Growth Algorithm with examples

UNIT-IV

Unsupervised Learning: Expectation Maximization, EM algorithm, Self-Organizing Maps(SOM), learning Process in SOM, Algorithm: SOM, Adaptive Resonance Theory.

Clustering: k-Means Clustering, Expectation Maximization algorithm, Supervised Learning after Clustering, Spectral Clustering, Document Clustering example, Hierarchical Clustering, Choosing the Number of Clusters

UNIT-V

Decision Trees: Univariate Trees: (classification trees, regression trees), Pruning, Rule Extraction from Trees, Learning Rules from Data.

Random Forest: basic Principle, Random Forest Algorithm with Example, Decision Tree vs random Forest

TEXT BOOKS:

5. Ethem Alpaydin, “Introduction to Machine Learning”, The MIT Press
6. Artificial Intelligence and Machine Learning, by Vinod Chandra PHI Learning.
7. Tom M. Mitchell “Machine Learning”, MC Graw Hill
8. Aurélien Géron, “Hands-on machine learning with scikit learn and tensorflow” O'REILLY

REFERENCE BOOKS:

2. Stephen Marsland, “Machine Learning an Algorithmic Perspective”, CRC Press, 2009.

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	DIGITAL FORENSICS						

Course Objective:

- Provides an in-depth study of the rapidly changing and fascinating field of computer
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Course Outcomes: After completion of course, students would be

- Understand relevant legislation and codes of ethics
- Computer forensics and digital detective and various processes, policies and procedures
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics

Syllabus:

UNIT -I: Digital Forensics Science: Forensics science, computer forensics, and digital forensics, **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics.

UNIT -II: Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

UNIT -III: Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

UNIT -IV: Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,
Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

UNIT -V: Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008, Recent trends in mobile

forensic technique and methods to search and seizure
electronic evidence.

Text Book:

1. John Sammons, 2e, The Basics of Digital Forensics, Elsevier, 2014

Reference Books:

1. Digital Forensics: The Fascinating world of digital evidences, 1st Edition, Nilakshi Jain, Dhananjay R. kalbande, wiley- 2016

OFFRED OPEN ELECTIVES	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	NEXT GENERATION DATABASES						

Course Objectives:

- To explore the concepts of NoSQL Databases.
- To understand and use columnar and distributed database patterns.
- To learn to use various Data models for a variety of databases.

Course Outcomes: Students will be able to:

- Explore the relationship between Big Data and NoSQL databases
- Work with NoSQL databases to analyze the big data for useful business applications.
- Work with different data models to suit various data representation and storage needs.

Unit-I: Database Revolutions- System Architecture- Relational Database- Database Design Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval.

UnitII: Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Database—XML Databases- JSON Document Databases- Graph Databases.

UnitIII: Column Databases— Data Warehousing Schemes- Columnar Alternative- Sybase IQ- CStore and Vertica- Column Database Architectures- SSD and In-Memory Databases— InMemory Databases- Berkeley Analytics Data Stack and Spark.

UnitIV: Distributed Database Patterns— Distributed Relational Databases- Non-relational Distributed Databases- MongoDB - Sharing and Replication- HBase- CassandraConsistency Models— Types of Consistency- Consistency MongoDB- HBase Consistency- Cassandra Consistency.

UnitV: Data Models and Storage- SQL- NoSQL APIs- Return SQL- Advance Databases— PostgreSQL- Riak- CouchDB- NEO4J- Redis- Future Databases— Revolution RevisitedCounter revolutionaries- Oracle HQ- Other Convergent Databases- Disruptive Database Technologies.

Text Books:

1. “Next Generation Databases”,1st Edition, Guy Harrison, Apress, 2015.

References Books:

2. Database System Concepts”, Sixth Edition, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGrawHill,2010.
3. “Seven Databases in Seven Weeks”, Eric Redmond, Jim R Wilson, LLC. 2012.
4. “NoSQL for Mere Mortals”, Dan Sullivan, Addison-Wesley, 2015.
5. “NoSQL for Dummies “,Adam Fowler, John Wiley & Sons, 2015.

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	ENGLISH FOR RESEARCH PAPER WRITING						

Course objectives:

Students will be able to:

Understand that how to improve your writing skills and level of readability

Learn about what to write in each section

Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus	
Units	CONTENTS
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	DISASTER MANAGEMENT						

COURSE OBJECTIVES: -

Students will be able to:

learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Units	CONTENTS
1	Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
2	Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
3	Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics
4	Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

5	Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.
6	Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies ""New Royalbook Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall OfIndia, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	SANSKRIT FOR TECHNICAL KNOWLEDGE						

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences
2	Order Introduction of roots Technical information about Sanskrit Literature
3	Technical concepts of Engineering-Electrical,
4	Technical concepts of Engineering - Mechanical.
5	Technical concepts of Engineering - Architecture.
6	Technical concepts of Engineering – Mathematics.

Suggested reading

1. “Abhyastakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbashastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	VALUE EDUCATION						

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content
1	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements
2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature ,Discipline
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking.
4	Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature
5	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women.
6	All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Suggested reading

- 1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

Students will be able to 1. Knowledge of self-development

2. Learn the importance of Human values
3. Developing the overall personality

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	CONSTITUTION OF INDIA						

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Units	Content
1	History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)
2	Philosophy of the Indian Constitution: Preamble Salient Features
3	Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.
4	Organs of Governance: Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions
5	Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation.

	<p>Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy</p>
6	<p>Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners.State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.</p>

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	PEDAGOGY STUDIES						

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policymaking undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Units	Content
1	Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.
2	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
4	Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.
5	Professional development: alignment with classroom practices and follow-up support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes
6	Research gaps and future directions Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272-282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	STRESS MANAGEMENT BY YOGA						

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content
1	Definitions of Eight parts of yog. (Ashtanga)
2	Yam and Niyam. Do`s and Don`t`s in life. Ahinsa, satya, astheya, bramhacharya and aparigraha
3	Yam and Niyam. Do`s and Don`t`s in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
4	Asan and Pranayam Various yog poses and their benefits for mind & body
5	Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading

1. ‘Yogic Asanas for Group Training-Part-I’ : Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama(Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Audit Course 1 & 2:	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBJECT CODE:	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENTSKILLS						

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)
2	Neetisatakam-Holistic development of personality Verses- 52,53,59 (don't's) Verses- 71,73,75,78 (do's)
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18
6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

Suggested reading

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students