ACADEMIC REGULATIONS (R18)

COURSE STRUCTURE AND DETAILED SYLLABUS

MASTER OF TECHNOLOGY
IN
COMPUTER SCIENCE & ENGINEERING

For

M.Tech.- Regular Two Year Post Graduate Degree Programe
(Applicable for the batches admitted from 2018-19)

KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING
(UGC-Autonomous)
Kadapa 516003, A.P

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 14001:2004 & 9001: 2015 Certified Institution)

E-mail: principal@ksrmce.ac.in **Website:** www.ksrmce.ac.in

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Vision

To produce globally competitive and self- disciplined Computer Engineers with innovative skills, moral values and societal concern by providing education of global standards and research in the field of Computer Science and Engineering.

Mission

M1: To produce globally competent and qualified computer professionals.

M2: To impart high quality professional training with emphasis on basic principles of Computer Science and Engineering and to foster leading edge research in the fast-changing field.

M3: To facilitate the students to work with recent tools and technologies and train the students by inculcating the spirit of ethical values contributing to societal ethics.

Programme Educational Objectives

A graduate of the K.S.R.M.C.E, C.S.E should have a successful career in CSE or a related field, and within three to five years, should

PEO1 - Technical Competence: To disseminate inclusive knowledge of fundamentals of engineering and modern computing practices, through advanced curriculum, enabling the graduates to synthesize novel ideas.

PEO2 - Learning Environment: To sensitize the graduates with the efficacy of continuous learning reinforced through student-centric pedagogy that inculcates creative talents to survive and thrive in the profession.

PEO3 - Sustainable Skills: To nurture professional behavior and industry-specific acumen in the students to effectively operate and sustain in heterogeneous work environments.

PEO4 - Ethical Behavior: To help the students understand the ramifications of emerging computing technologies and ethical application of technical expertise to resolve contemporary challenges for the welfare of the nation.

Programme Outcomes

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predication and modeling to complex engineering activities with an understanding of the limitations.

PO6 - The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes

PSOs are statements that describe what the graduates of a specific engineering program should be able to do:

PSO1 - Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2 - Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3 - Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

KSRM College of Engineering, Kadapa-516003, AP

Regulations, Curriculum and Syllabus for M. Tech

KSRM College of Engineering, Kadapa-516003, AP

Regulations for PG Programs in Engineering (R18 PG)

1.0 Nomenclature

1.1 *Academic Term*: Extent of time during which academic instructions are initiated and completed

1.2 *Academic Year*: Academic Term of, approximately, one year duration that usually starts in June/July and ends in April/May next

1.3 *Semester*: Either of two Academic Terms that make up an Academic Year

1.4 *Major*: A specific field of study

1.5 *Minor*: An area outside of, or complementary to, a Major

1.6 *Subject*: An area of knowledge that is studied as part of a Course

1.7 *Core*: A subject that is mandatory for a Major course of study

1.8 *Elective*: A subject that is selected for study to suit one's individual needs

1.9 *Audit Subject*: A subject that is studied to meet certain requirements but has no credits assigned to it

1.10 *Humanities*: Subjects that describe and interpret human achievements, problems and historical changes at individual and societal levels covering the disciplines of literature, history, and philosophy

1.11 *Social Sciences*: Subjects that describe the mental and behavioural activities of individuals, groups, organizations, institutions, and nations covering the disciplines of anthropology, economics, linguistics, political science, and psychology

1.12 *Exam*: A test to measure one's progress, knowledge, or ability in a subject

1.13 *Credit*: A numerical weight given to a subject

1.14 *Grade*: A numerical or alphabetic designation measuring the level of achievement in an exam

1.15 *Attendance*: Physical presence of oneself in a classroom/laboratory for purpose of a scheduled academic instruction

1.16 *Course*: A series of subjects that constitute a Major field of study

1.17 *Branch*: Same as Course

1.18 *Program*: Same as Course

1.19 *Specialization*: Same as branch

1.20 *Degree*: An academic title conferred to honour distinguished achievement

2.0 Short Title and Application

2.1 These rules and regulations may be called as R18 PG and come into force from Academic Year 2018-19 and exist until superseded by new regulations

2.2 These rules and regulations are applicable to all post graduate courses in engineering and technology leading to Master's Degree in Technology (M. Tech)

2.3 The Specializations offered, at present, are:

2.3.1 Geotechnical Engineering

2.3.2 Electrical Power Systems

2.3.3 CAD & CAM

2.3.4 Digital Electronics and Communication Systems

2.3.5 Computer Science and Engineering

2.4 The Institute may offer new Specializations in future to which these rules and regulations will be applicable

3.0 Suspension and Amendment of Rules

3.1 Academic Council has the authority to suspend a rule temporarily

3.2 Academic Council has the authority to amend a rule

3.3 For affirmative action on any suspension or amendment of a rule, an affirmative vote of three-fifths of the members present and voting shall be required in Academic Council

4.0 Requirements for Admission

4.1 At present, admissions into first semester of various Specializations are governed by Government and the Affiliating University. The eligibility criteria and procedure for admission are prescribed by Government and Affiliating University

4.2 A student is not allowed change of Specialization after admission

4.3 A student must fulfil medical standards required for admission

4.4 The selected students are admitted into first semester after payment of the prescribed fees

5.0 Structure of the M. Tech course

5.1 *Duration*: The duration of M. Tech degree course is four semesters

5.2 *Working Days*: Calendar for any semester shall be announced at least four weeks before its commencement. Minimum number of working days is 90 per semester

5.3 *Curriculum*: Each Specialization shall have core, elective and audit subjects. The curriculum for each Specialization shall be approved by its corresponding Board of Studies and then by the Academic Council

5.4 *Credits*: All subjects that are assessed for marks have credits assigned to them. The credits assigned to subjects shall be given in curriculum. The total number of credits for entire course is 68 for all Specializations. The distribution of total credits semester-wise is given in Table 1

Table 1 Semester-wise Total Credits

Semester	Total Credits
First Semester	18
Second Semester	18
Third Semester	16
Fourth Semester	16
Total for entire course	**68**

5.5 The curriculum and syllabus is given in Annexure-1 and Annexure-2 respectively

5.6 Responsibility and Advising: It is the responsibility of the student to understand and know the regulations and requirements to earn the degree. Each student admitted in to the degree programs is assigned to a Faculty Advisor who assists the student in designing an effective program of study. Students should consult their Faculty Advisors for selection of electives and for general advice on academic program

6.0 Registration and Enrolment

6.1 Prior to opening of each semester, every student shall register for all the credit-bearing and audit subjects listed in curriculum of the term. Excepting first semester, the registration for a semester shall be done during a specified week after end examinations of previous semester. In first semester, the registration shall be done within six working days from date of opening. Recommendation of Faculty Advisor is needed for registration

6.2 Late registration will be permitted with a fine, decided from time to time, up to six working days from the last date specified for registration

6.3 A student will be eligible for registration for a semester if she or he i) is promoted to that semester, ii) has cleared all fees to the Institute, library and hostel of previous term, and iii) is not disqualified for registration by a disciplinary action of the Institute

6.4 A student will be enrolled and allowed to attend the classes on successful registration and payment of necessary fees to Institution, library, and hostel

6.5 Registration and enrolment will be controlled by the Office of the Controller of Examinations

7.0 Assessment Procedure – Internal Tests and End Examinations

7.1 Performance of students in all subjects is assessed continuously through internal assessment tests and an End examination

7.2 Allocation of internal assessment and End examination marks

7.2.1 For theory subjects, the allocation is 40 marks for internal assessment and 60 marks for End examination totalling 100 marks

7.2.2 For laboratory/project work subjects, the allocation is 50 marks for internal assessment and 50 marks for End examination totalling 100 marks

7.2.3 For mini-project/mini-project with seminar total 100 marks are allocated for internal assessment. There shall be no end examination for this mini-project

7.2.4 For all audit subjects the allocation is 40 marks for internal assessment and no allocation for End examination

7.3 Internal Assessment Examinations

7.3.1 Internal assessment means performance evaluation of students by faculty members who teach the subjects

7.3.2 For theory subjects, including audit subjects, the internal assessment shall be done by midterm tests. For each subject, two midterm tests will be conducted for 40 marks each and the internal assessment mark is the better of two marks. If any student abstains for any midterm test, she or he will be awarded zero marks for that midterm test.

7.3.3 For laboratory/practical subjects, the internal assessment will be based on regular laboratory work over full term. The assessment will be done by the faculty concerned. The students shall be informed sufficiently early of the procedure to be followed for internal assessment

7.3.4 For subjects like seminar, project-work, industrial training, and comprehensive viva-voce, the internal assessment will be done by a concerned Department Committee consisting of two senior faculty members and faculty guide of concerned student. The assessment procedure will be informed sufficiently early to the students

7.4 End examinations

7.4.1 End examinations shall be conducted after completion of coursework in each term

7.4.2 The question papers for theory subjects shall be set by faculty members outside of the Institute. The external faculty members for question paper setting will be selected by the Principal

7.4.3 Evaluation of answer scripts shall be done by faculty members from outside of the Institute selected by the Principal

7.4.4 For laboratory subjects, end examination shall be conducted by a committee consisting of two internal examiners. One examiner shall be recommended by Head of Department of concerned Major, and the other examiner shall be appointed by the Principal

7.4.5 For project work viva-voce, End examination shall be conducted by a committee consisting of one internal examiner, one external examiner, and the concerned guide of the student. Internal examiner shall be appointed by Head of Department of concerned Major, and the external examiner shall be appointed by the Principal

7.4.6 If a student abstains from End examination of any subject, for any reason, she or he shall be awarded zero marks in that subject

7.4.7 There is no end examination for audit subjects.

8.0 Method of Assigning Letter Grades and Grade Points

8.1 For all credit-bearing subjects, performance of a student in a subject is indicated by a letter grade that corresponds to absolute marks earned in that subject. Each letter grade is assigned a numeric Grade Point that is used to compute Grade Point Average on a scale of 0 to 10

8.2 Performance of a student in both internal assessment and End examination will be considered for awarding grades for credit bearing subjects. Total marks earned in a subject is the sum of marks obtained in internal and End examinations in that subject

8.3 Pass grade A+ to D- is assigned to a subject based on total marks earned in that subject provided that a student earns at least i) 35% of marks in End examination marks and ii) 40% of marks in internal and End examination marks put together; otherwise fail grade F will be assigned to that subject

8.4 Grade I will be assigned to a subject if a disciplinary action is pending and is not resolved before publication of results. Office of Controller of Examinations shall resolve the pending disciplinary action within six working days from the date of publication of results and change the grade to any of A+ to D- or F

8.5 Grade X will be assigned to a subject if a student abstains for End examination of that subject

8.6 The absolute marks and corresponding letter grade and grade points are given in Table2

Table 2 Letter Grades and Grade Points

Absolute Marks	Letter Grade	Grade Points	Remark
95-100	A+	10.0	Pass
90-94	A	9.5	Pass
85-89	A-	9.0	Pass
80-84	B+	8.5	Pass
75-79	B	8.0	Pass
70-74	B-	7.5	Pass
65-69	C+	7.0	Pass
60-64	C	6.5	Pass
55-59	C-	6.0	Pass
50-54	D+	5.5	Pass
0-49	F	0.0	Fail
-	I	0.0	Result Withheld
-	X	0.0	Absent for End Exam

8.7 *SGPA*: Semester Grade Point Average indicates the performance of a student in all credit-bearing subjects of a term. SGPA is calculated as the weighted average

of Grade Points of all subjects of the term with corresponding credits of subjects as weights. Audit subjects are not considered for SGPA calculation

8.8 *CGPA*: Cumulative Grade Point Average indicates the performance of a student in all terms up to and including the current term under consideration. CGPA is calculated as the weighted average of SGPAs with total credits in each term as the weights

8.9 *Grade Card*: All students shall be issued Grade Cards after the publication of results of a term. Grade Card is a statement of performance of a student in a term. It contains information about each registered subject: type of subject, allocated credits, and letter grade earned. SGPA and CGPA will also be indicated

9.0 Requirements for Completing Subjects

9.1 A student shall complete all credit-bearing and audit subjects successfully to be eligible for award of degree

9.2 *Credit-bearing subjects*: A student is considered to have completed a credit-bearing subject successfully and earned credits if she or he obtains a pass grade from A+ to D- in that subject. If a student receives fail grade F or X in any subject, she or he must register for supplementary End examination for that subject as and when opportunity arises and improve grade to pass grade

9.3 *Audit subjects*: A student is considered to have successfully completed an audit subject if she or he earns at least 40% of marks in internal assessment marks. A student may request for makeup tests to satisfy this requirement by paying requisite fee

10.0 Requirements for taking End Examinations

10.1 A student is eligible to take regular End Examinations of current semester if she or he full fills the attendance requirement

10.2 A student shall be promoted from current term to succeeding term on satisfying the attendance requirement

10.3 A student shall complete all credit-bearing and audit subjects successfully before taking End examination for project viva-voce

10.4 Attendance Requirement

10.4.1 Attendance of students shall be recorded for credit-bearing and audit subjects as per the workload indicated in curriculum

10.4.2 Total class-periods conducted shall be reckoned from beginning to end of a term as published in academic calendar

10.4.3 Aggregate Percentage of Attendance is calculated using total number of class-periods attended as numerator and total number of class-periods conducted for the concerned subject as the denominator

10.4.4 A minimum aggregate attendance of 75% is required for promotion to succeeding term

10.4.5 A student can appeal to Academic Council for condoning deficiency in aggregate attendance if she or he gets 65% or more aggregate attendance presenting a valid reason for deficiency. Such a student will be granted

promotion if Academic Council pardons the deficiency. Academic Council has the right to reject the appeal if it is not satisfied with the performance of the student or the reason cited for deficiency of the attendance

10.4.6 A student earning less than 65% aggregate attendance will be denied promotion. A student who is not promoted on basis of attendance shall be removed from the rolls and shall register for the same term when opportunity arises. The current term record of the student is cancelled automatically

10.5 A student can forego promotion and opt to repeat the current term on written request. Recommendation of the concerned Faculty Advisor is required for cancellation of promotion. This option shall be exercised before the commencement of the End examinations of the current term

11.0 Revaluation of End Examination Scripts

11.1 Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee

11.2 A Procedure for Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination marks will be awarded for that subject

11.3 A student can apply for revaluation in a subject only once

12.0 Supplementary End Examinations

12.1 Students are eligible to take Supplementary examinations in subjects with fail grade F or X only

12.2 Supplementary examinations for even semester subjects will be conducted with regular examinations of odd semester subjects and vice versa

12.3 A student will be allowed to improve grade in any theory subject provided she or he has completed coursework of all terms but before award of provisional/final degree

13.0 Requirements for Award of M. Tech degree

13.1 Time Limit for completion of requirements for award of degree is four calendar years from the date of admission. A student who could not complete all the requirements in this time limit shall forego admission and will be removed from the rolls of the Institute

13.2 A student shall be eligible for award of degree provided she or he has:

13.2.1 Registered and successfully completed all required credit-bearing and audit subjects with a total of 68 credits

13.2.2 Secured a CGPA of 4.5 or more

13.2.3 Cleared all dues to the Institute, library and hostel

13.2.4 No disciplinary action is pending against her or him

13.2.5 Satisfied any other stipulation of the affiliating University

13.3 Award of Class: Each student will be given class in degree based on CGPA as given in Table 3

Table 3 Class of Degree

Class of Degree	Range of CGPA
Second Class	>= 5.5 but <6.5
First Class	>= 6.5 but <7.5
First Class with Distinction	>= 7.5

13.4 Consolidated Grade Card and Degree will issued under the seal of affiliating University.

14.0 Transitory Regulations

14.1 A student who initially joins the Institute in a previous Regulation and has to rejoin in an academic-term of the present Regulations, due to any reason, shall be bound by the rules of the current Regulations. Board of Studies of the concerned Major will specify, extra or otherwise, academic coursework to be undertaken by such students who rejoin the current Regulations

COURSE STRUCTURE

M.Tech. (Computer Science & Engineering)-R18 Course Structure

M.Tech SEM-I

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1855101	Program Core-I Mathematical foundations of Computer Science	3	0	0	40	60	3
2	1855102	Program Core-II Advanced Data Structures	3	0	0	40	60	3
3	1855103 1855104 1855105	Program Elective-I I. Machine Learning II. Wireless Sensor Networks III. Introduction to Intelligent Systems	3	0	0	40	60	3
4	1855106 1855107 1855108	Program Elective-II I. Data Science II. Distributed Systems III. Advanced Wireless and Mobile Networks	3	0	0	40	60	3
5	1855109	Research Methodology and IPR	2	0	0	40	60	2
6	1855110	Audit Course-I	2	0	0	40	00	0
7	1855111	Advanced Data Structures Lab	0	0	4	50	50	2
8	1855112	Software Lab-I	0	0	4	50	50	2
		Total:	16	0	8	340	400	18

M.Tech SEM-II

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1855201	Program Core-III Mobile Applications and Services	3	0	0	40	60	3
2	1855202	Program Core-IV Human Computer Interaction	3	0	0	40	60	3
3	 1855203 1855204 1855205	Program Elective-III I. Internet of Things II. Data Preparation and Analysis III. Computer Vision	3	0	0	40	60	3
4	 1855206 1855207 1855208	Program Elective-IV I. Cloud Computing II. Soft Computing III. Digital Forensics	3	0	0	40	60	3
5	1855209	Audit Course-II	2	0	0	40	00	0
6	1855210	Mobile Applications and Services Lab	0	0	4	50	50	2
7	1855211	Software Lab-II	0	0	4	50	50	2
8	1855212	Mini Project with Seminar	2	0	0	50	50	2
		Total	14	0	8	350	340	18

M.Tech SEM-III

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1855301 1855302 1855303	Program Elective-V I. Big Data Analytics II. Compiler for High Performance Computing III. Advanced Algorithms	3	0	0	40	60	3
2	1855304 1855305 1855306 1855307 1855308 1855309	Open Elective I. Business Analytics II. Industrial Safety III. Operations Research IV. Cost Management of Engineering Projects V. Composite Materials VI. Waste to Energy	3	0	0	40	60	3
3	1855310	Dissertation-I	0	0	20	100	00	10
		Total:	6	0	20	180	120	16

M.Tech SEM-IV

S.No	Subject Code	Subject	L	T	P	IM	EM	Credits
1	1855401	Dissertation-II	0	0	32	50	50	16
		Total:	0	0	32	50	50	16

Total Credits: 68

AUDIT COURSES

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

OPEN ELECTIVES

1. Business Analytics
2. Industrial Safety
3. Operations Research
4. Cost Management of Engineering Projects
5. Composite Materials
6. Waste to Energy

M.TECH.-
I- SEMESTER SYLLABUS

Course Title	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (Program Core-I)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855101	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- This course will introduce the concepts foundations of logic, rules of inference, predicates and normal forms.
- Concepts of Set theory & Relations will be explained.
- Problems on Functions, Number theory, permutations and combinations, recurrence relations will be discussed.
- Learn Number theory concepts of elementary combinatory.
- To provide an illustration of problems in graph theory.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the variations between Statement Logic and Predicate Logic.
CO 2	Illustrate the basic terminology of functions, relations, and sets and gain knowledge of their associated operations.
CO 3	Develop practical applications of basic counting principles of permutations, combinations, inclusion/exclusion principle and the pigeonhole methodology.
CO 4	Apply proof techniques towards solving recurrences and other problems in algebra and computer applications.
CO 5	Solve problems using concepts of spanning tree, Euler circuit, and chromatic numbers.

UNIT I

Foundations of Logic: Introduction, truth tables, statements and notations, propositional logic; Connectives, propositional equivalence; predicate and quantifiers; Normal forms; rules of Inference; methods of proofs.

UNIT II

Set Theory, Relations & Functions: Basics of set theory, set operations, Relations and their properties, representing relations, Properties of binary Relations, Equivalence relations, Lattice and its Properties, Partial ordering, Hasse diagram. Composition of functions, Inverse Function, types of functions, Recursive Functions.

UNIT III

Graph Theory: Graphs and graphs models, graph terminology and special types of graphs, representing graphs and graph isomorphism, connectivity, Euler and Hamiltonian paths, shortest path problems, planar graphs, graph coloring, Trees: Introduction to trees, Applications of trees, spanning trees & minimum spanning trees.

UNIT IV

Algebraic Structures & Elementary Combinatorics: Definition and elementary properties of groups, semigroups, monoids, rings, field, vector spaces. Elementary combinatorics; counting techniques, Pigeon- hole Principles and its application. Recursion, Recurrence relation.

UNIT V

Introduction to Number Theory:

Divisibility and The Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Polynomial Arithmetic, Prime numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Discrete Logarithms.

Text Books:

1. Kenneth Rosen, Discrete Mathematics and its applications, 7th edition, Tata McGrawHill Education Private Limited.

2. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.

3. Molt, Kandel, Baker ,"Discrete mathematics for computer scientists and mathematicians" , PHI.

4. J.P Trembley, R.Manohar , Discrete Mathematical Structures with Applications to computer science, TMH.

Reference Books:

1. Discrete Mathematics and Applications, Andrei M. Raigorodskii, Michael Th. Rassias, Springer.

2. Discrete Structures and Their Interactions, Josan I. Brown, CRC Press.

3. Discrete Mathematics for Computer Science, David Liben-Nowell, Wiley.

4. William Stallings, Cryptography and Network Security, 7th edition, Pearson.

Course Title	ADVANCED DATA STRUCTURES (Program Core-II)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
1855102	PCC	3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs			

Course Objectives:

- The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- Students should be able to understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the implementation of symbol table using hashing techniques.
CO 2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO 3	Develop algorithms for text processing applications.
CO 4	Identify suitable data structures and develop algorithms for computational geometry problems.

UNIT I

Overview of Data Structures: Linear and Non Linear data structures, Stacks, Queues, linked lists

Trees:

Binary Trees: Definition, Properties, Representation, ADT, Complete & Full Binary Tree

Tree Traversal Algorithms: Inorder, Preorder and Postorder

UNIT II

Binary search trees: Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

Balanced search trees: AVL, Red- Black Trees & Splay Trees.

UNIT III

Dictionaries: Definition, Dictionary ADT, Implementation of Dictionaries Linear list representation.

Skip Lists: Definition, Search, Insertion and Update operations on skip lists, Deterministic Skip lists

UNIT IV

Hashing: Review of Hashing, Hash Functions, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT V

Multiway Search Trees and B-Trees: m- way Search Trees and its operations**,** B-Trees**,** Operations on B-Trees**,** B+-Trees, Operations on B+ Trees, 2-3 Trees.

Text Books:

1. S.Sahni, Data Structures and Algorithms in C++, University Press (India) Private Limited, Second Edition.

2. Varsha H.Patil , Data Structures using C++, Oxford University Press.

3. Jean Paul Trembley and Paul G. Sorenson, An Introduction to Data Structures with applications, McGraw Hill.

4. Mark Allen Weiss, Data Structures and algorithms in C++, Pearson Education Limited, Second Edition.

Reference Books:

1. Marcello La Rocca, Advanced Algorithms and Data Structures, Manning Shelter island.

2. Dr. P. Chenna Reddy , Computer Fundamentals and C Programming, Second Edition.

3. Clifford A. Shaffer, Data Structures and Algorithmic Analysis in C++, 3rd Edition, Dover Publications.

4. Ananda Rao Akepogu and Radhika Raju Palagiri, Data Structures, Algorithms and Applications in C++, , Pearson Education.

Course Title	MACHINE LEARNING (Program Elective-I)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855103	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of reinforcement learning
- To learn aspects of computational learning theory.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design a neural network for an application of your choice
CO 2	Implement probabilistic discriminative and generative algorithms for an application of your choice and analyse the results
CO 3	Use a tool to implement typical clustering algorithms for different types of applications
CO 4	Design and implement an HMM for a sequence model type of application
CO 5	Identify applications suitable for different types of machine learning with suitable justification.

UNIT I

Introduction : Machine Learning - Machine Learning Foundations –Overview – Design of a Learning system - Types of machine learning –Applications Mathematical foundations of machine learning – random variables and probabilities - Probability Theory – Probability distributions -Decision Theory- Bayes Decision Theory - Information Theory.

UNIT II

Supervised Learning: Linear Models for Regression - Linear Models for Classification – Naïve Bayes – Discriminate Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - Classification Trees- egression Trees - Pruning. Neural Networks - Feed-forward Network Functions - Back-propagation. Support vector machines – Ensemble methods- Bagging- Boosting.

UNIT III

Unsupervised Learning : Clustering- K-means - EM Algorithm- Mixtures of Gaussians. The Curse of Dimensionality - Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA Independent components analysis.

UNIT IV

Probabilistic Graphical Models: Graphical Models - Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning Generalization - Hidden Markov Models - Conditional random fields(CRFs).

UNIT V

Advanced Learning: Sampling –Basic sampling methods – Monte Carlo. Reinforcement Learning- K-Armed Bandit Elements - Model-Based Learning- Value Iteration- Policy Iteration. Temporal Difference Learning Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting.

Text Books:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
4. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

Reference Books:

1. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
3. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014.
4. Drew Conway & John Myles White, “Machine Learning for Hackers”, O’Reilly.

Course Title	WIRELESS SENSOR NETWORKS (Program Elective-I)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855104	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To make the students to learn the basic concepts of wireless sensor networks, challenges and applications of WSNs.
- To explain the hardware component overview & modular architecture of WSN and QoS issues.
- To explain the MAC layer protocols and topology control protocols, routing protocols in WSN.
- To make the students to learn WSN platforms and tools and security related issues.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic concepts of wireless sensor networks, constraints and challenges of sensor networks, advantages and disadvantages of WSNs.
CO 2	Understand the modular architecture of WSNs, Energy model and communication topology and Quality of Service issues.
CO 3	Understand the MAC addresses in WSNs, MAC protocols, location driven protocols, Energy aware routing.
CO 4	Understand the challenges and design issues in WSNs, routing protocols, routing efficient protocols.
CO 5	Understand platforms and simulation tools for WSN and security related issues in WSNs.

UNIT I

Introduction: Sensor Definition, Sensor Node, Wireless Sensor Networks, WSN design Issues, WSN model, WSN Network model, Constraints and Challenges of Sensor Networks, Advantages and Disadvantages of Sensor Networks, Sensor Networks applications.

UNIT II

Architecture and Hardware: Node architecture, Analog-to-Digital converter, Modular Architecture for Wireless Sensor Network nodes, Hardware component overview, Hardware Platform categories, Energy consumption of Sensor nodes, Energy model and Communication Topology.

Optimization goal and merit: Quality of Service, Energy Efficiency, Scalability, Robustness.

UNIT III

Topology Control: Introduction, Location Driven Protocols, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding(GeRaF), Geographic Energy Aware Routing(GEAR), SPAN.

MAC Layer, MAC protocols for WSN, Address and Name Management, Assignment of MAC Addresses, Network addresses in Sensor networks, MAC Addresses in Sensor Networks.

UNIT IV

Routing Protocols: Challenges and Design Issues, Network-Structure-Based protocols, Routing protocols based on protocol operation

Energy efficient Routing: Data-centric Routing techniques, SPIN, Direct Diffusion, Rumour Routing, ACQUIRE, Gradient Routing, Hierarchical Routing, LEACH, PEGASIS, Location based routing techniques, MECN, GPSR, Geographic Routing.

UNIT V

Platforms and Tools: Introduction, Sensor Node Hardware, Berkeley Motes, Sensor Network Programming Challenges, Node-Level Software platforms, Node-Level Simulators Security: Secure Communication, Security Prerequisite, Security vulnerabilities, Security Attack, Intrusion Detection Techniques, Constraints in Sensor Networks.

Text Books:

1. W. Dargie and C.Poellabauer,"Fundamentals of Wireless Sensor Networks- theory and Practice", Wiley 2010
2. KazemSohraby, Daniel Minoli and TaiebZnati, “Wirelees Sensor Networks- Technology, Protocols, and Appplications”, Wiley Interscience 2007.
3. Takahiro Hara, Vladimir I.Zadorozhny and Erik Buchmann, :” Wireless Sensor Network Technologies for the Information Explosion Era”, Springer 2010.
4. Sunil Gupta, Dr Harsh K.Verma, Wireless Sensor Networks, Kataria Publishers, First Edition,2014

Reference Books:

1. Anna Forster, “Introduction to Wireless Sensor Networks”, Wiley.
2. Jung Zehng, Abbas Jamalipour, “ Wireless Sensor Networks: A Networking Perspective”, Wiley.
3. Ian F. Akyildiz, Mechmet Can Vuran, “ Wireless Sensor Networks”, Wiley.
4. Ibrahiem M.M El Emary, S. Rama Krishnan, “Wireless Sensor Networks: From Theory to Applications”, CRC Press.

Course Title	INTRODUCTION TO INTELLIGENT SYSTEMS (Program Elective-I)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855105	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- An ability to apply knowledge of computing and mathematics appropriate to discipline.
- An ability to analyse a problem and identify and define the computing requirements appropriate to its solution.
- An ability to use current techniques skills and tools necessary for computing practice.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different types of AI agents.
CO 2	Known various AI Search algorithms.
CO 3	Understand the fundamentals of knowledge representation, inference and theorem proving.
CO 4	Known how to build simple knowledge based systems.

UNIT I

Intelligent Agents: Agents and Environments, The nature of Environments, The structure of Agents.

Solving problems by Searching: Problem Solving agents, Example Problems, Searching for Solutions, Uniformed search strategies, Informed (Heuristic) search strategies, Heuristic Functions.

UNIT II

Constraint Satisfaction Problems (CSPs): Definition, Inference in CSPs, Backtraking search for CSPs, Local search for CSPs.

Logical Agents: Knowledge-based Agents, The wumpus world, Propositional Logic, Agents based on Propositional Logic.

UNIT III

First-Order Logic: Syntax and semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional Vs Fist-Order Logic, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT IV

Planning and Acting in the Real World: Time, Schedules and Resources, Hierarchical Planning, Planning and Acting in Non-deterministic domains, Multi Agent Planning.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects.

UNIT V

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees, Artificial Neural networks, Support vector machines.

Robotics: Robot Hardware, Robot Perception, Planning to move, Planning Uncertain movements, Moving, Robotic Software Architectures, Application Domains.

Text Books:

1. Russell S and Norvig P. (2009), " Artificial Intelligence: A Modern Approach", Prentice-Hall, 3rd Edition.
2. Luger G.F and Stubfield W.A. (2008), " Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Addision Wesley, 6th Edition.
3. Artificial Neural Network, Robert J. Schalkoff, McGraw Hill.
4. Artificial Intelligence: A Guide to Intelligent Systems, Michael Negnevitsky, Pearson.

Reference Books:

1. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
3. Artificial Intelligence: A New Sythesis" by Nils J Nilsson, Kindle Edition.
4. SarojKaushik. Artificial Intelligence. Cengage Learning, 2011.

Course Title	DATA SCIENCE (Program Elective-II)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855106	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Provide you with the knowledge and expertise to become a preficent data scientist.
- R-Programming code to statistically anlyse a dataset.
- Evaluating Data visualizations.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding how data is collected, managed and stored for data science.
CO 2	Understanding the key concepts in data science.
CO3	Learning R-Programming.
CO 4	Understanding social networks.

UNIT I

Introduction: What Is Data Science? Big Data and Data Science Hype, Getting Past the Hype, Why Now? The Current Landscape (with a Little History), A Data Science Profile, Thought Experiment: Meta-Definition, What Is a Data Scientist, Really?

Statistical Inference, Exploratory Data Analysis, and the Data Science Process: Statistical Thinking in the Age of Big Data, Exploratory Data Analysis, The Data Science Process, Thought Experiment: How Would You Simulate Chaos? Case Study: RealDirect

UNIT II

Algorithms: Machine Learning Algorithms, Three Basic Algorithms : Linear Regression, k-Nearest Neighbors (k-NN), k-means.

Spam Filters, Naive Bayes, and Wrangling: Learning by Example: Why Won't Linear Regression Work for Filtering Spam? How About k-nearest Neighbors? Naive Bayes: Bayes Law, A Spam Filter for Individual Words, A Spam Filter That Combines Words: Naive Bayes, Comparing Naive Bayes to k-NN, Web APIs and Other Tools.

UNIT III

Data Visualization and Fraud Detection: Data Visualization History, What Is Data Science, Redux? A Sample of Data Visualization Projects, Mark's Data Visualization Projects, Data Science and Risk, Data Visualization at Square, Ian's Thought Experiment Data Visualization for the Rest of Us.

UNIT IV

R-Programming : What is R? Why use R for analytics? How to run R? First R example, functions a short Programming example, some important R data structures, vectors, matrices, lists, R programming structures.

UNIT V

Social Networks and Data Journalism: Social Network Analysis at Morning Analytics, Social Network Analysis, Terminology from Social Networks, Thought Experiment Morningside Analytics, More Background on Social Network Analysis from a Statistical Point of View, Data Journalism.

Text Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.

2. Norman matloff ,"The art of R programming". No Starch Press, 2009.

3. Thomas A. Runkler, "Data Analytics: Models and Algorithms for Intelligent Data Analysis", Springer Science & Business Media, 2012.

4. Mark Gardener, "Beginning R- The Statistical Programming Language", John Wiley & Sons, Inc.,

Reference Books:

1. Data Science, John D. Kelleher, Brendan Tierney, MIT Press.

2. R in Action Data Analysis and Graphics with R, Robert I. Kabacoff, Manning Publications, 2011.

3. Practical Statistics for Data Scientists, Peter Bruce, Andrew Bruce, O'Reilly Meida.

Course Title	DISTRIBUTED SYSTEMS (Program Elective-II)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855107	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design trends in distributed systems.
CO 2	Apply network virtualization.
CO3	Apply remote method invocation and objects.

UNIT I

Introduction: Distributed Data Processing, What is a Distributed Database System?, Data Delivery Alternatives, Promises of DDBSs, Distributed DBMS Architecture.

Background: Overview of Relational DBMS, Review of Computer Networks.

UNIT II

Distributed Database Design: Top-Down Design Process, Distribution Design Issues, Fragmentation, Allocation, Data Directory.

Database Integration: Bottom-Up Design Methodology, Schema Matching, Schema Integration, Schema mapping, Data Cleaning, Conclusion, Bibliographic Notes.

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, Layers of Query Processing.

UNIT III

Introduction to Transaction Management: Definition of a Transaction, Properties of Transactions, Types of Transactions, Architecture Revisited.

Distributed Concurrency Control: Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-Based Concurrency Control Algorithms, Timestamp- Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, "Relaxed" Concurrency Control.

UNIT IV

Distributed DBMS Reliability: Reliability Concepts and Measures, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Dealing with Site Failures, Network Partitioning, Architectural Considerations.

Data Replication: Consistency of Replicated Databases, Update Management Strategies, Replication Protocols, Group Communication, Replication and Failures, Replication Mediator Service.

UNIT V

Parallel Database Systems: Parallel Database System Architectures, Parallel Data Placement, Parallel Query Processing, Load Balancing, Database Clusters.

Distributed Object Database Management: Fundamental Object Concepts and Object Models, Object Distribution Design, Architectural Issues, Object Management, Distributed Object Storage, Object Query Processing, Transaction Management.

Text Books:

1. M.T. Ozsu and P. Valduriez, Principles of Distributed Database Systems, 3rd Edition, Springer.

2. D. Bell and J. Grimson , "Distributed Database Systems", Addison-Wesley, 1992

3. M.T. Ozsu and P. Valduriez , "Principles of Distributed Database Systems" , Prentice-Hall, 1991.

4. Saeed K. Rahimi, Frank S. Haug, "Distributed Database Management Systems: A Practical Approach", Wiley.

Reference Books:

1. Chhanda Ray, "Distributed Database Systems", Pearson.

2. Stefano Ceri, Giuseppe Pelagatti, " Distributed Database Principles and Systems", Tata McGraw-Hill.

3. AbdeIslam A. Helal, AbdeIslam A. Heddaya, Bharat B. Bhargava, " Replication Techniques in Distributed Systems", Kluwer Academic Publishers.

Course Title	ADVANCED WIRELESS AND MOBILE NETWORKS (Program Elective-II)				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1855108	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To make the students to learn basic concepts of wireless communication technology.
- To explain the principles and generations of cellular wireless sensors.
- To make the students to learn the concepts of Mobile IP, Mobile Communications, telecommunication systems.
- To explain Infrared vs radio transmission vs Mobile Adhoc networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic concepts of wireless communication technologies.
CO 2	Understand the principles of cellular networks, generation of cellular wireless networks.
CO 3	Understand wireless application protocol, architecture, services.
CO 4	Understand the concepts of mobile telecommunications, telecommunication systems.
CO 5	Understand the concepts of Infrared vs Radio transmission vs Adhoc networks

UNIT I

Wireless Communication Technology: Introduction, Antennas, Propagation Modes, Signal

Encoding Criteria, Digital Data-Analog Signals, Analog Data,-Analog Signals, Analog Data,-Digital Signals.

UNIT II

Cellular Wireless Networks : Principles of Cellular Networks, First-Generation Analog, Second-Generation TDMA, Second-Generation CDMA, Third Generation Systems.

Cordless systems, Wireless Local Loop, Wimax and IEEE 802.16

UNIT III

Mobile IP, Wireless Application Protocol

IEEE 802 Protocol Architecture

IEEE 802.11 : Architecture and Services, Medium Access Control, Physical Layer, other standards.

UNIT-IV

Mobile Communications : Multiplexing, Modulation, Spread Spectrum

Telecommunication Systems **:** GSM, DECT, TETRA, UMTS

UNIT-V

Infrared Vs Radio Transmission, Infrared Vs Adhoc Network, HIPER LAN, Bluetooth, Mobile Adhoc Networks.

Text Books:

1. Schiller J., Mobile Communications, Addison Wesley 2000 (for I ,II and III Units)

2. Stallings W., Wireless Communications and Networks, Pearson Education 2005 (for IV and V units)

3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002.

4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000

Reference Books:

1. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200.

2. Koushik Sinha, Sathi C. Ghosh, Bhabani P. Sinha, "Wireless Networks and Mobile Computing", CRC Press.

3. Khaldoun AL Agha, Guy Pujolle, Tara Ali Yahiya, " Mobile and Wireless Networks", Wiley.

4. Andrea Goldsmith, " Wireless Communications", Cambridge.

Course Title	RESEARCH METHODOLOGY & IPR				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1855109	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	2	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Understand research technology.
- Be aware of the technical principles of research, ethical challenges and approval processes.
- Describe quantitative, qualitative and mixed methods approaches to research
- Identifying the components of a literature review process.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand research problem formulation
CO 2	Analyze research related information
CO 3	Follow research ethics
CO 4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
CO 5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO 6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. atent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners".
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

Reference Books:

1. Mayall , "Industrial Design", McGraw Hill, 1992.
2. Niebel , "Product Design", McGraw Hill, 1974.
3. Asimov , "Introduction to Design", Prentice Hall, 1962.
4. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Course Title	ADVANCED DATA STRUCTURES LAB				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1855111	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To develop skills to design and analyses simple linear and nonlinear data structures.
- To strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structure**.**

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic data structures such as arrays, linked list, stacks and queues.
CO 2	Be able to design and analyse the time and space efficiency of the data structure.
CO 3	Be capable to identify the appropriate data structure for given problem.
CO 4	Solving problems in graphs and trees.

LIST OF EXPERIMENTS

1. Write a program to implement stack operations.
2. Write a program to implement queue operations.
3. Write a program to implement singly linked list.
4. Write a program to implement doubly linked list.
5. Write a program to convert given infix expression into postfix expression.
6. Write a program to implement binary search tree
7. Write a program to count the number of nodes in the binary search tree
8. Write a program to implement skip list.
9. Write a program to implement Red-Black tree
10. Write a program to implement basic operations on AVL tree

11. Write a program to implement hashing.

12. Write a program to perform insertion operation into a B-tree.

13. Write a program for sorting of numbers using Quick sort.

14. Write a program for sorting of numbers using Merge sort.

15. Write a program for linear and binary search.

Text Books:

1. S.Sahni, Data Structures and Algorithms in C++, University Press (India) Private Limited, Second Edition.

2. Varsha H.Patil , Data Structures using C++, Oxford University Press.

3. Jean Paul Trembley and Paul G. Sorenson, An Introduction to Data Structures with applications, McGraw Hill.

4. Mark Allen Weiss, Data Structures and algorithms in C++, Pearson Education Limited, Second Edition.

Reference Books:

1. Marcello La Rocca, Advanced Algorithms and Data Structures, Manning Shelter island.

2. Dr. P. Chenna Reddy , Computer Fundamentals and C Programming, Second Edition.

3. Clifford A. Shaffer, Data Structures and Algorithmic Analysis in C++, 3rd Edition, Dover Publications.

4. Ananda Rao Akepogu and Radhika Raju Palagiri, Data Structures, Algorithms and Applications in C++, , Pearson Education.

Course Title	SOFTWARE LAB - I				R18- M.Tech CSE I Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855112	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To make students understand learn about a Big Data –R Programming , way of solving problems.
- Working with R Studio tool.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Installation of R-Studio
CO 2	Getting Knowledge in R-Programming.
CO 3	Using R-Data Structures
CO 4	R-Programming using functions

LIST OF EXPERIMENTS

1. Write an R program to evaluate the following expression ax+b/ax-b.

2. Write an R program to read input from keyboard(hint: readLine()).

3. Write an R program to find the sum of n natural numbers: 1+2+3+4+….n

4. Write an R program to read n numbers.

   (i) Sum of all even numbers

   (ii) Total number of even numbers.

5. Write an R program to obtain

   (i)sum of two matrices A and B

   (ii) subtraction of two matrices A and B

   (iii) Product of two matrices.

6. Write an R program for “declaring and defining functions “

7. Write an R program that uses functions to add n numbers reading from keyboard
8. Write an R program uses functions to swap two integers.

9. Write an R program that use both recursive and non-recursive functions for implementing the Factorial of a given number, n .

10. Write an R program to reverse the digits of the given number .{ example 1234 to be written as 4321}

11. Write an R program to implement

(i)Linear search (ii) Binary Search.

12. Write an R program to implement

(i)Bubble sort (ii) selection sort .

13. Write a R program to implement the data structures

(i) Vectors (ii) Array (iii) Matrix (iv) Data Frame (v) Factors

14. Write a R program to implement the data structures

(i) Vectors (ii) Array (iii) Matrix (iv) Data Frame (v) Factors

15. Write a R program to implement scan(),merge(), read.csv() and read.table() commands.

16. Write an R program to implement " Executing Scripts" written on the note pad, by calling to the R console.

17. Write a R program, Reading data from files and working with datasets

(i) Reading data from csv files, inspection of data. (ii) Reading data from Excel files.

18. Write a R program to implement Graphs

(i) Basic high-level plots (ii) Modifications of scatter plots (iii) Modifications of histograms, parallel box plots.

Text Books:

1. Tilman M. Davies, "The Book of R:A First Course in Programming and Statistics", no starch press.
2. Michael J Crawley, "The R Book", Wiley.
3. Richard Cotton, "Learning R", O'Reilly.
4. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley.

Reference Books:

1. Dr.Sandip Rakshit, "Statistics with R Programming", McGraw Hill.
2. Mark Gardner, "Beginning R:The Statistical Programming Language", Wiley.
3. Kun Ren, "Learning R Programming", Packt>

M.TECH.-
II- SEMESTER SYLLABUS

Course Title	MOBILE APPLICATIONS AND SERVICES (Program Core-III)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855201	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- This course presents the Android platform and its ecosystems.
- It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smartphones and tablets.
- It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Installing and using Android Studio.
CO 2	Identify the target platform and users and be able to define and sketch a mobile application.
CO 3	Understand the fundamentals, frameworks and development lifecycle of mobile application platforms.
CO 4	Design and develop a mobile application prototype in one of the platform.

UNIT I

What is Android? Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market.

Obtaining the Required Tools: Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application.

UNIT II

Activities and Intents: Understanding Activities, Linking Activities Using Intents, Calling Built-in Applications Using Intents, Display Notifications.

Android User Interface: Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Creating the User Interface Programmatically, Listening for UI Notifications.

UNIT III

Designing User Interface using Views: Basic Views, Picker Views, List Views.

Displaying Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views, Some Additional Views.

UNIT IV

Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

Messaging and Networking: SMS Messaging, Sending E-Mail, Networking

UNIT V

Location Based Services: Displaying Maps, Getting Location Data.
Developing Android Services: Creating Your Own Services, Communicating between a Service and an Activity, Binding Activities to Services.

Text Books:

1. Wei-Meng Lee, Beginning Adroid Application Development, 2012 by John Wiley & Sons.
2. Android Programming for Beginners, John Horton, 2nd Edition, Packt.
3. Android App Development for Dummies, Michael Burton, 3rd Edition, Wiley.
4. Android Programming by B.M Harwani, Pearson Education, 2013.

Reference Books:

1. T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Android application Development for Java Programmers, James C Sheusi, Cengage Learning.
3. Android In Action by W.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.

Course Title	HUMAN COMPUTER INTERACTION (Program Core-IV)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855202	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities.
- Be aware of mobile Human Computer interaction.
- Learn the guidelines for user interface.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the structure of models and theries of human computer interaction and vision.
CO 2	Design an interactive web interface on the basis of models studied
CO 3	Understanding Software Process and Designing rules
CO 4	Understanding Communication and Collaborations in HCI

UNIT I

The Human: Introduction, Input-output channels, Human Memory, Thinking: reasoning and problem solving.
The Computer: Introduction, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning, Memory, Processing and networks.

UNIT II

The Interaction: Introduction, Model of interaction**,** Framework and HCI**,** Ergonomics**,** Interaction styles**,** Elements of the WIMP interface**,** Interactivity.
Interaction design basics: Introduction**,** What is design**,** the process of design**,** Scenarios**,** Navigation design**,** Screen design and layout**,** Iteration and prototyping.

UNIT III

HCI in the software process: Introduction, The software life cycle**,** Usability engineering**,** Iterative design and prototyping**,** Design rationale.
Design rules: Introduction**,** Principles to support usability**,** Standards**,** Guidelines**,** Golden rules and heuristics.

UNIT IV

Evaluation techniques: What is evaluation?, Goals of evaluation, Evaluation through expert analysis**,** Evaluation through user participation**,** Choosing and evaluation method.
Universal design: Introduction**,** Universal design principles**,** Multi-modal interaction.

UNIT V

Cognitive models: Introduction**,** Goal and task hierarchies, Linguistic models**,** The challenge of display-based systems**,** Physical and device models**,** Cognitive architectures
Socio-organizational issues and stakeholder requirements: Introduction, Organizational issues**,** capturing requirements.
Communication and collaboration models: Introduction**,** Face-to-face communication**,** Conversation**,** Text based communication**,** Group working.

Text Books:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russel Beale, "Human- Computer Interaction". 3rd Edition, Pearson Education.
2. Helen Sharp, "Interaction Design", John Wiley & Sons.
3. Gerard Jounghyun Kim, "Human-Computer Interaction: Fundamentals and Practice", CRC Press.

Reference Books:

1. Samit Bhattacharya, "Human Computer Interaction: User-Centric Computing for Design", McGraw Hill.
2. Jonathan Lazar, Jinjuan Heidi Feng, Harry Hachheiser, "Research Methods in Human-Computer Interaction", Mogran Kaufmann.
3. Christopher Reid Becker, "Learn Human Computer Interaction", Packt Publishing.

Course Title	INTERNET OF THINGS (Program Elective-III)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855203	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To introduce the terminology, technology and its applications.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Python Scripting Language which is used in many IoT devices.
- To introduce the Raspberry PI platform, that is widely used in IoT applications.
- To introduce the implementation of web based services on IoT devices.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding IoT technology
CO 2	Learning basic IoT System Management.
CO3	Understanding basics of python programming.
CO 4	Working with Raspberry pi board.

UNIT I

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT II

IoT and M2M: Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER.

UNIT III

Introduction to Python: Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib.

UNIT IV

IoT Physical Devices and Endpoints: Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API.

Text Books:

1. Matt Richardson & Shawn Wallace , Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.
2. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015.
3. Gaston C. Hillar, "Internet of Things with Python", Packet Publishers.
4. Gary Smart, "Practical Programming for IOT", Packet Publishers.

Reference Books:

1. Veena S. Chakravarthi, "Internet of Things and M2M Communication Technologies", Springer.
2. Raj Kamal, "Internet of Things", McGraw Hill, 1st Edition, 2016.
3. The Internet of Things, Michael Miller, Pearson.
4. The Internet of Things, Samuel Greengard, The MIT Press Ltd.

Course Title	DATA PREPARATION AND ANALYSIS (Program Elective-III)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855204	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To make the students learn source of data and describing data.
- To explain the cleaning data and preparing the data tables.
- To explain the relationships between variables, and calculating metrics about relationships.
- To explain about identifiers and understanding groups and building models from data.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the source of data and describing data.
CO 2	Understand preparing data table and relationships
CO3	Understand clustering, association rules, and decision trees
CO 4	Understand building models from data.

UNIT I

Introduction: Overview, Sources of Data, Process of making sense of data.

Describing data: Overview, Observations and Variables, Types of variables, Central Tendency, Distribution of data, Hypothesis tests.

UNIT II

Preparing Data Tables: Overview, Cleaning the data, Generating Consistent Scales across variables, Converting text to numbers, Converting continuous data to categories, Combining variables, Generating groups.

UNIT III

Understanding Relationships: Overview, Visualizing relationships between variables, Calculating metrics about relationships.

UNIT IV

Identifying and Understanding Groups: Overview, Clustering, Association rules, Learning decision trees from data.

UNIT V

Building Models From Data: Overview, Linear regression, Logistic regression, k-Nearest Neighbors, Classification and Regression trees.

Text Books:

1. Glenn J. Myatt, Making Sense of Data: A Practical Guide to Exploratory Data Analysis and Data Mining.
2. Tamrapani Dasu, Theodore Johnson, "Exploratory Data Mining and Data Cleaning", Wiley.
3. John Wilder Tukey, "Exploratory Data Analysis", Addison-Wesley.

Reference Books:

1. Glenn J. Myatt, Making Sense of Data: A Practical Guide to Exploratory Data Analysis and Data Mining.
2. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packet Publishers.
3. Patrricia Cerrito, " Exploratory Data Analysis".

Course Title	COMPUTER VISION (Program Elective-III)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855205	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Be familiar with both the theoretical and practical aspects of computing with images
- Have described the foundation of image formation, measurment and analysis.
- Understand the geometric relationships between the 2D and the 3D world.
- Grasp the principles of state-of-the-art deep neural network.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding Fundamentals of image formation, camera imaging geometry.
CO 2	Basic methods for finding known models in images, depth recovery from stereo.
CO3	Understanding splitting and merging images.
CO 4	Use low to middle level algorithms to 3D based algorithms**.**

UNIT I

Introduction to Computer vision, Image formation : Geometric primitives and transformations , Photometric image formation , The digital camera 3 Image processing :Point operators ,Linear filtering , More neighborhood operators , Fourier transforms ,Geometric transformations

UNIT II

Feature detection and matching: Points and patches-Feature detectors, Feature matching, Feature tracking. Edges-Edge Detection, Edge linking, edge editing and enhancement. Lines-Hough transform, vanishing points, rectangle detection.

UNIT III

Segmentation: Active contours, Split and merge, Mean shift and mode finding Normalized cuts ,Graph cuts and energy-based methods

UNIT IV

Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation Geometric intrinsic calibration.

UNIT V

Recent trends in Activity Recognition, Biometrics

Text Books:

1. Richard Szeliski,"Computer Vision: Algorithms and Applications".,Springer.

2. Goodfellow, Bengio, and Courville, "Deep Learning"., United Press..

3. Fisher et al , "Dictionary of Computer Vision and Image Processing"., Wiley.

4. Jan Erik Solem, "Programming Computer Vision with Python", O'Reilly.

Reference Books:

1. Simon J.D. Prince, "Computer Vision: Moldels, Learning & Inference", Cambridge University Press.

2. E.R. Davies, "Computer Vision: Principles, Algorithms, Applications and Learning", Academic Press.

3. Krishnudu Kar, " Mastering Computer Vision with TensorFlow 2.x", Packet.

Course Title	CLOUD COMPUTING (Program Elective-IV)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855206	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To explain the cloud paradigms.
- To introduce the various levels of services that can be achieved by cloud.
- To know about service providers of cloud.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the evolution of cloud computing paradigm and its architecture.
CO 2	Explain and characterize different cloud deployment models and service models.
CO3	Understanding different cloud applications.
CO 4	Identify the service providers in cloud computing.

UNIT I

Computing Paradigms:

High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Cloud Computing Fundamentals:

Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Computing Is a Service, Cloud Computing Is a Platform. Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

UNIT II

Cloud Computing Architecture and Management: Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT III

Cloud Deployment Models: Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models

UNIT IV

Programming Models in Cloud : Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka

Cloud Computing APIs: Rackspace, IBM, Intel

Software Development in Cloud : Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology.

UNIT V

Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers.

Cloud Service Providers: Introduction, EMC, Google, Amazon Web Services, Microsoft, IBM, Salesforce, Rackspace

Text Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010

2. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.

3. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015 .

4. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.

Reference Books:

1. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill.

2. Cloud Computing Theory and Practice: Dan C. Marinescu, Elsevier.

3. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing.

4. Cloud Computing and Virutualization, Dac-Nhuong Le, Raghavendra Kumar, Gia Nhu Nguyen, Jyir Moy Chatterjee, Wiley.

Course Title	SOFT COMPUTING (Program Elective-IV)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855207	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To learn the key aspects of Soft computing and Neural networks.
- To study the fuzzy logic components.
- To gain insight onto neuro fuzzy modeling and control.
- To know about the components and building block hypothesis of genetic algorithm.
- To gain knowledge in machine learning through Support Vector Machines.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Discuss on machine learning through neural networks
CO 2	Apply knowledge in developing a Fuzzy expert system
CO3	Model Neuro Fuzzy system for clustering and classification
CO 4	Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system

UNIT I

Introduction to Soft Computing: Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics.

UNIT II

Genetic Algorithms: Introduction to Genetic Algorithms (GA) – Applications of GA - Building block hypothesis- Representation – Fitness Measures – Genetic Operators-. GA based Machine Learning.

UNIT III

Neural Networks: Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

UNIT IV

Fuzzy Logic: Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

UNIT V

Neuro-Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2002.

2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.

3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall,1996.

4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

Reference Books:

1. David E.Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1989.

2. Mitchell Melanie, "An Introduction to Genetic Algorithm", MIT Press, 1996.

3. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2008 edition

Course Title	DIGITAL FORENSICS (Program Elective-IV)				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855208	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Provides an in-depth study of the rapidly changing and fascinating field of computer Forensics.
- 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: On successful completion of this course, the students will be able to

CO 1	Understand relevant legislation and codes of ethics
CO 2	Computer forensics and digital detective and various processes, policies and procedures
CO3	E-discovery, guidelines and standards, E-evidence, tools and environment.
CO 4	Email and web forensics and network forensics

UNIT I

Introduction: Introduction, Users of Digital Forensics, Locard's Exchange principle, Scientific method, Organizations of Note, Role of the Forensics Examiner in the judicial system.

Key Technical Concepts: Introduction, Bits, Bytes and Numbering schemes, File Extensions, File Signatures, Storage and Memory, Computing Environments, Data types, File Systems, Allocated and Unallocated Space.

UNIT II

Labs and Tools: Introduction, Forensic Laboratories, Policies and Procedures, Quality Assurance, Digital Forensic Tools, Accreditation.

Collecting Evidence: Introduction, Crime Scenes and Collecting Evidence, Documenting the Scene, Chain of the Study, Cloning, Live System versus Dead System, Hashing.

UNIT III

Anti-forensics: Introduction, Hiding Data, Password Attacks, Steganography, Data Destruction.

Legal: Introduction, The Fourth Amendment, Criminal Law, Searching with a warrant, Electronic Discovery.

UNIT IV

Internet and E-mail: Introduction, Internet Overview, Web Browsers, Email, Social Networking Sites.

Network Forensics: Introduction, Network Fundamentals, Network Security tools, Network Attacks, Incident Response, Network Evidence and Investigations.

UNIT V

Mobile Device Forensics: Introduction, Cellular Networks, Operating Systems, Cell phone Evidence, Cell Phone Forensic Tools, Global Positioning System (GPS).

Looking Ahead: Challenges and Concerns: Introduction, Standards and Controls, Cloud Forensics, Solid State Drives (SSD), Speed of Change.

Text Books:

1. John Sammons, The Basics of Digital Forensics, 2nd edition, Elsevier.
2. John R VACCA , Computer Forensics : Computer crime scene and investigation, First Edition, Laxmi publications.
3. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, Elsevier.
4. Eoghan Casey, “Hand Book of Digital Forensics and Investigation”, Academic Press.

Reference Books:

1. Greg Gogolin, “Digital Forensics Explained”, CRC Press.
2. Jack Wiles, Anthony Rayes, “Cyber Crime and Digital Forensics”, Elsevier.
3. Gerard Johansen, “ Digital Forensics and Incident Response”, Packt.
4. Richard Boddington, “Practical Digital Forensics”, Packt.

Course Title	MOBILE APPLICATIONS & SERVICES LAB				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1855210	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications.
- To understand fundamentals of android programming.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Create data sharing with different applications.
CO 2	Develop applications using services and publishing android applications.
CO 3	To demonstrate their skills of using Android software development tools.
CO 4	Working with text files to store data.

LIST OF EXPERIMENTS

1. Setting up the Development Environment

    1.1 Installation of JDK and Setting path

    1.2 Downloading and Installing Android Studio

2. (a) Create an Android application that shows Hello + name of the user and run it on an emulator.

(b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

3. Creating the Application by using Activity class

    i) onCreate()

    ii) onStart()

    iii) onResume()

    iv) onPause()

    v) onStop()

    vi) onDestroy()

    vii) onRestart()

4. Create the Application using the Edit Text control.

5. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.

6. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

7. Create the application for doing arithmetic operations. (Calculator)

8. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

9. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

10. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

Text Books:

1. Wei-Meng Lee, Beginning Adroid Application Development, 2012 by John Wiley & Sons.
2. Android Programming for Beginners, John Horton, 2nd Edition, Packt.
3. Android App Development for Dummies, Michael Burton, 3rd Edition, Wiley.
4. Android Programming by B.M Harwani, Pearson Education, 2013.

Reference Books:

1. T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Android application Development for Java Programmers, James C Sheusi, CengageLearning.
3. Android In Action by W.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.

Course Title	SOFTWARE LAB-II				R18- M.Tech CSE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1855211	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Student should get the knowledge of Python and Eclipse background.
- Student should get the knowledge of Control statements in python
- Student should get the knowledge of Raspberry Pi
- Be familiar with developing web services/Applications.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Student will be aware of Python and Eclipse background.
CO 2	Student will develop basic programs in python.
CO 3	Student will get knowledge on Raspberry Pi.
CO 4	Design and Implement applications on the Cloud.

LIST EXPERIMENTS:

1. Study and Install Python in Eclipse and data types in python.
2. Write a Program for arithmetic operation in Python.
3. Write a Program for looping statement in Python.
4. Study and Install IDE of Arduino and different types of Arduino.
5. Digital Output (Blinking of LED).
6. Digital Input (Push Button).
7. Analog Output (Fading).
8. Communication between Computer and Arduino.
9. Displaying messages on LCD.
10. Servo Motor Control.
11. Study and Configure Raspberry Pi.
12. Write a Program for LED blink using Raspberry Pi.
13. Create an word document of your class time table and store locally and on the cloud with doc and pdf format. (use www.zoho.com and docs.google.com).

14. Create a spread sheet which contains employee salary information and calculate gross and total salary using the formula.

DA=10% OF BASIC

HRA=30% OF BASIC

PF=10% OF BASIC IF BASIC<=3000

12% OF BASIC IF BASIC>3000

TAX=10% OF BASIC IF BASIC<=1500

=11% OF BASIC IF BASIC>1500 AND BASIC<=2500

=12% OF BASIC IF BASIC>2500

(use www.zoho.com and docs.google.com)

NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX

15. Prepare a ppt on cloud computing –introduction, models, services and architecture.

(Ppt should contain explanations, images and at least 20 pages) (use www.zoho.com and docs.google.com)

16. Create your resume in a neat format using google and zoho cloud.

Text Books:

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India.
4. Raj Kamal, "Internet of Things", McGraw Hill, 1st Edition, 2016.

Reference Books:

1. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
2. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018.
3. Getting Started with Arduino, 3rd Edition, Massimo Banzi and Michael Shiloh
4. Getting Started with Raspberry Pie, Matt Richardson & Shawn Wallace, O'Reilly-2014.

<table>
<tr><td colspan="2">Course Title</td><td colspan="4">MINI PROJECT WITH SEMINAR</td><td colspan="3">R18- M.Tech CSE II Sem</td></tr>
<tr><td colspan="2">Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td colspan="2" rowspan="2">1855212</td><td rowspan="2">PROJ</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="5">Internal Assessment</td><td colspan="4"></td></tr>
<tr><td colspan="9">Course Objectives:
• Acquire and apply new knowledge as needed, using appropriate learning strategies.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Demonstrate a technical knowledge of their selected project topic.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand problem identification, formulation and solution.</td></tr>
<tr><td>CO 3</td><td colspan="8">Design engineering solutions to complex problems utilizing a systems approach.</td></tr>
<tr><td>CO 4</td><td colspan="8">Communicate with engineers and the community at large in written an oral form.</td></tr>
<tr><td>CO 5</td><td colspan="8">Demonstrate the knowledge, skills and attitudes of a professional engineer.</td></tr>
</table>

M.TECH.-
III- SEMESTER SYLLABUS

Course Title	BIG DATA ANALYTICS (Program Elective-V)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855301	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe big data and use cases from selected business domains
CO 2	Explain NoSQL big data management
CO3	Install, configure, and run Hadoop and HDFS
CO 4	Perform map-reduce analytics using Hadoop
CO 5	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

UNIT I

Big Data in the Enterprise: Sentiment analysis, Exploratory analytics, Operational analytics, Opportunities from big data, Taming the big data. The New Information Management Paradigm: Enterprise information system, New approach to management of big data, Implications of big data to enterprise IT.

UNIT II

Big Data Implementations for Industry: Big data analytics for telecom, Big data analytics for.banking.

Emerging Database Landscape: Database evolution, Scale-out architecture, Database workloads, Database technologies for managing the workloads, Columnar databases, Requirements for next generation data warehouses, Polyglot Persistence – The next generation database architecture.

UNIT III

Application Architecture for Big Data and Analytics: Big data warehouse and analytics, Big data warehouse requirements, Hybrid architectures, Enterprise data platform ecosystem – BDW and EDW, Introduction to Hadoop – Technical components, merits and demerits, Hadoop suitability test, Additional considerations for Big Data Warehouse, Big data and Master Data Management, Data quality implications for big data, A conceptual BDW architecture.

Data Modeling – Map-Reduce Patterns, Algorithms, and Use Cases: Basic map-reduce patterns, Distributed task execution, Advanced map-reduce patterns.

UNIT IV

Data Modeling – NoSQL Data Modeling Techniques: Types of NoSQL stores, Choice of database system, JSON, Column family databases, Operations on column family databases, Understanding Cassandra data model, Designing Cassandra data structures, Schema migrationapproach using ETL.

Big Data Analytics Methodology: Challenges in big data analysis, Big data analytics methodology, Analysis and evaluation of business use case, Development of business hypotheses.

UNIT V

Extracting Value from Big Data: In-memory computing technology, Real-time analytics, CAP theorem, Use of in-memory data grid, Map-reduce and real-time processing, Real-time analysis of machine generated data, Building a recommendation system.
Data Scientist: Definition, Big data flow, Design principles for contextualizing big data, Nature of work of a data scientist.

Text Books:

1. Berman J J, Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information, Morgan Kaufmann, 2013.

2. Manoochehri M, Data Just Right: Introduction to Large Scale Data & Analytics, Pearson Education, 2014.

3. Mohanthy S, Jagadeesh M, Srivatsa H, Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics, Apress/Springer(India), 2013.

Reference Books:

1. Fung K, Numbersense: How to Use Big Data to Your Advantage, McGraw-Hill, 2013.

2. Srinivasa S, Bhatnagar V (Eds.), Big Data Analytics: First International Conference Proceedings, Bda 2012, New Delhi, India, Springer, 2012.

3. Runkler T A, Data Analytics - Models and Algorithms for Intelligent Data Analysis, Vieweg+teubner Verlag, 2012.

Course Title	COMPILER FOR HIGH PERFORMANCE COMPUTING (Program Elective-V)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855302	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- The objective of this course is to introduce structure of compilers and high performance compiler design for students. Concepts of cache coherence and parallel loops in compilers are included.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Familiar with the structure of compiler.
CO 2	Parallel loops, data dependency and exception handling and debugging in compiler.
CO3	Be autonomous in finding tools to assist with the generation of high performance code.
CO 4	Known how to write optimized code.

UNIT I

High Performance Systems: Structure of a Compiler, Programming Language Features, Languages for High Performance.

UNIT II

Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.
Scalar Analysis with Factored Use-Def Chains: Constructing Factored UseDef Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains, Constant Propagation with FUD Chains, Data Dependence for Scalars. Data Dependence Analysis for Arrays.

UNIT III

Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis.

Loop Restructuring: Simple Transformations, Loop Fusion, Loop Fission, Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations.
Optimizing for Locality: Single Reference to Each Array, Multiple References, General Tiling, Fission and Fusion for Locality.

UNIT IV

Concurrency Analysis: Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers.
Vector Analysis: Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers.

UNIT V

Message-Passing Machines: SIMD Machines, MIMD Machines, Data Layout, Parallel Code for Array Assignment, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics.
Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.

Text Books:

1. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson.
2. Utpal Banerjee, “Languages and Compilers for Parallel Computing, Springer.
3. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures, Morgan Kaufmann Publishers.

Reference Books:

1. Pen-chung Yew, Siddarta Chatterjee, Zhiyuan Li, “Languages and Compiles for Parallel Computing, Springer.
2. Keith D. Cooper, Linda Torczon, “ Engineering a Compiler, Morgan Kaufmann.

Course Title	ADVANCED ALGORITHMS (Program Elective-V)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855303	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.
- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.
- To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analysis best and worst case running times of algorithms using asymptotic analysis.
CO 2	Derive and solve recurrences describing the performance of divide-and-conquer algorithms
CO3	Synthesize greedy algorithms, and analyze them.
CO 4	Analyze graphs algorithms. Employ graphs to model engineering problems, when appropriate.

UNIT I

The Role of Algorithms in Computing: Algorithms, Algorithms as a technology, Analyzing algorithms, Designing algorithms.

Growth of Functions: Asymptotic notation Standard notations.

Sorting: Heap sort, Quick sort, Medians and Order Statistics.

UNIT II

Elementary Graph Algorithms: Representations of graphs, Breadth-first search, Depth-first search, Topological sort, strongly connected components, minimum spanning algorithms.

Single-Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm.

UNIT III

All-Pairs Shortest Paths: The Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs

Maximum Flow: Flow networks, The Ford-Fulkerson method

Matrix Multiplication and Related Operations: Stassen's matrix-multiplication algorithm, Solving systems of linear equations.

UNIT IV

Number-Theoretic Algorithms: Elementary number-theoretic notions, Greatest common divisor, Modular arithmetic, solving modular linear equations.

String Matching: The naive string-matching algorithm, The Rabin-Karp algorithm, String matching with finite automata, The Knuth-Morris-Pratt algorithm.

UNIT V

Computational Geometry: Line-segment properties, Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points.

NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-completeness proofs, NP-complete problems.

Text Books:

1. Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein", Introduction to Algorithms, Third Edition, MIT Press.
2. Aho, Hopcroft, Ullman ,The Design and Analysis of Computer Algorithms., Pearson Education.
3. Kleinberg and Tardos, Algorithm Design., Pearson Education.
4. Douglas C Montgomery , Design and Analysis of Experiments., John Wiley & Sons.

Reference Books:

1. Sara Baase, Allen Van Gelder, "Computer Algorithms: Introduction to Design & Analysis", Pearson.
2. Harsha Bhasin, "Algorithms: Design and Analysis", Oxford University Press.
3. Dexter C. Kozen, "The Design and Analysis of Algorithms", Springer.

OPEN ELECTIVES

1. Business Analytics
2. Industrial Safety
3. Operations Research
4. Cost Management of Engineering Projects
5. Composite Materials
6. Waste to Energy

Course Title	BUSINESS ANALYTICS (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855304	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data. Use decision-making tools/Operations research techniques.
- Mange business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Students will demonstrate knowledge of data analytics.
CO 2	Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
CO 3	Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
CO 4	Students will demonstrate the ability to translate data into clear, actionable insights.

UNIT I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.

UNIT II

Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Text Books:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications", Pearson FT Press.

2. James Evans, "Business Analytics", persons Education.

3. Essentials of Business Analytics: An Introduction to the Methodology and its Applications, Bhimsankarm Pochiraju, Sridhar Seshadri, Springer.

Reference Books:

1. Business Analytics: Data Analysis and Decision Making, S. Christian Albright, Wayne L. Winstone, 6th Edition, Cengage Learning.

2. An Introduction to Business Analytics, Ger Koole, MG Books.

Course Title	INDUSTRIAL SAFETY (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855305	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To Know about Industrial Safety Program, Fundamentals of Maintenance Engineering to understand Wear and Corrosion and their preventions.
- To Analyze Fault tracking, Periodic and preventive Maintenance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the Industrial Safety, Drinking water layouts, fire prevention, etc
CO 2	Understand the Wear and Corrosion and their Preventions.
CO 3	Analyze faults in machine tools and their general causes.
CO 4	Understand Periodic and preventive maintenance

UNIT I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, Electrical motors, Types of faults in machine tools and their general causes.

UNIT V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Text Books:

1. Higgins & Morrow, "Maintenance Engineering Handbook", Da Information Services.
2. H. P. Garg, S. Chand and Company, "Maintenance Engineering".
3. Audels, "Pump-hydraulic Compressors", Mcgrew Hill Publication.
4. Winterkorn, Hans, "Foundation Engineering Handbook", Chapman & Hall London.

Reference Books:

1. D.A. Crowl and J.F. Louvar, Chemical Process Safety: Fundamentals with Applications, Prentice Hall, 2011.
2. Fawcett H.H and W.S. Wood, Safety and Accident Prevention in Chemical Operations, 2nd Edition, John Wiley and Sons inc.

Course Title	OPERATIONS RESEARCH (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855306	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To Apply various optimization Techniques for Decision Making.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand Optimization Techniques.
CO 2	Define and formulate Linear programming problems.
CO 3	Solve Non-Linear programming problems.
CO 4	Understand Scheduling, Sequencing and Geometric programming.

UNIT I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

Text Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

Reference Books:

1. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008.
2. Panner selvam, Operations Research: Prentice Hall of India 2010
3. Operations Research: Principles and Applications, G. Srinivasan, PHI.

Course Title	COST MANAGEMENT OF ENGINEERING PROJECTS (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
1855307	OEC	3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs			

Course Objectives:

- Understand the concepts of Project management for planning to execution of Projects.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand project characteristics and various stages of project.
CO 2	Analyze the learning and understanding techniques for project planning, scheduling and execution control.

UNIT I

Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

UNIT III

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector.

UNIT IV

Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Text Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting

Reference Books:

1. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.
3. The Engineer's Cost Handbook, Richard E. Westney, P.E, CRC Press.

Course Title	COMPOSITE MATERIALS (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855308	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- Train student on Composite materials-definition, Advantages and classification.
- Equip students with knowledge on composite strengthening addition of components and their production rules.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify and understand the behavior of composite materials
CO 2	Apply the choices made for using certain type of composites in certain applications with reference to composite properties.
CO 3	Analyze the manufacturing of metal matrix composites and polymer matrix composites.

UNIT I

Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II

Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books:

1. R.W.Cahn, "Material Science and Technology" – Vol 13 – Composites,– VCH, West Germany.
2. Callister, Jr., Adapted by R. Balasubramaniam, "Materials Science and Engineering, An introduction". WD, John Wiley & Sons, NY, Indian edition, 2007.
3. ed-Lubin, "Hand Book of Composite Materials".
4. K.K.Chawla, "Composite Materials".

Reference Books:

1. Deborah D.L. Chung, "Composite Materials Science and Applications".
2. Danial Gay, Suong V. Hoa, and Stephen W. Tasi, "Composite Materials Design and Applications".
3. Mathews F.L and Rawlings R.D, Composite materials: Engineering and Science, Chapman and Hall, London, England, 1st Edition.
4. Mallick, P.K, Composite Materials Technology: Process and Properties, Hanser, New York.

Course Title	WASTE TO ENERGY (Open Elective)				R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855309	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3Hrs		

Course Objectives:

- To Create awareness in students of energy conservation.
- To Identify use of different types of Bio waste energy resources.
- To Understand different types of Bio waste energy conservations.
- To detect different waste conservation into different forms of energy.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different types of energy from waste to produce electrical power.
CO 2	Estimate the use of bio waste to produce electrical energy.
CO 3	Understand different types of bio waste and its energy conversions.
CO4	Analyze the bio waste utilization and to avoid the environmental pollution.

UNIT I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT V

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Text Books:

1. Biogas Technology- Transfer and Diffusion, M.M. Halwagi, Elsevier.
2. C. Y. WereKo-Brobby and E. B. Hagan, "Biomass Conversion and Technology", John Wiley & Sons, 1996.
3. Introduction to Biomass Energy Conservations, Sergio Capareda.

Reference Books:

1. Desai, Ashok V, "Non Conventional Energy", Wiley Eastern Ltd., 1990.
2. Khandelwal, K. C. and Mahdi, S. S, "Biogas Technology - A Practical Hand Book" -, Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Challal, D. S., "Food, Feed and Fuel from Biomass", IBH Publishing Co. Pvt. Ltd., 1991.

Course Title	DISSERTATION-I					R18- M.Tech CSE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1855310	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	20	10	100	--	100
Internal Assessment								

Course Objectives:

- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate a technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution.
CO 3	Communicate with engineers and the community at large in written an oral form.
CO 4	Demonstrate the knowledge, skills and attitudes of a professional engineer.

M.TECH.-
IV- SEMESTER SYLLABUS

Course Title	DISSERTATION-II				R18- M.Tech CSE IV Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855401	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	32	16	50	50	100
					External Assessment			

Course Objectives:

- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate a technical knowledge of their selected project topic.
CO 2	Design engineering solutions to complex problems utilizing a systems approach.
CO 3	Communicate with engineers and the community at large in written an oral form.
CO 4	Demonstrate the knowledge, skills and attitudes of a professional engineer.

AUDIT COURSE-I & II SYLLABUS

Course Title	ENGLISH FOR RESEARCH PAPER WRITING (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
1855110 (I Sem) 1855209 (II Sem)	Audit Course	2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

- 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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand Writing skills and level of Readability.
CO 2	Analyze what to write in each section.

UNIT I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

UNIT III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check. 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,

UNIT IV

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.

UNIT V

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Text Books:

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.

Reference Books:

1. Adrian Wallwork, English for Academic Research: Grammar Usage and Style, Springer.

<table>
<tr><td>Course Title</td><td colspan="5">DISASTER MANAGEMENT
(Audit Course)</td><td colspan="3">R18- M.Tech CSE I / II Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1855110
(I Sem)
1855209
(II Sem)</td><td rowspan="2">Audit Course</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td><td>40</td><td>--</td><td>40</td></tr>
<tr><td colspan="5">Mid Exam Duration: 2 Hours</td><td colspan="4"></td></tr>
<tr><td colspan="9">Course Objectives:
• 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.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand foundations of hazard, disasters and natural/social phenomena.</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze Repercussions of disasters and hazards.</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand key concepts in disaster risk reduction and humanitarian response.</td></tr>
</table>

UNIT I

Introduction to Disaster: Definition, Factors and Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II

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.

UNIT III

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.

UNIT IV

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.

UNIT V

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'sParticipation In Risk Assessment. Strategies for Survival.

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.

Text Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Reference Books:

1. Fundamentals of Disaster Management, Shekhawat R.S, Bhatnagar Harshul.
2. Disaster management, Ruthra, Lakshmi Publications.
3. Disaster Management and Preparedness, Nidhi Gauba Dhawan, Ambrina Sardar Khan, CBS Publishers.

Course Title	SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1855110 (I Sem) 1855209 (II Sem)	Audit Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand Sanskrit grammar and Composition.
CO 2	Understand roots of technical information about Sanskrit literature.
CO 3	Understand Technical concepts of Engineering.

UNIT I

Alphabets in Sanskrit,
Past/Present/Future Tense,
Simple Sentences

UNIT III

Order
Introduction of roots
Technical information about Sanskrit Literature

UNIT III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text Books:

1. Dr.Vishwas, "Abhyaspustakam" – Samskrita-Bharti Publication, New Delhi.

2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication.

3. Suresh Soni , "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi.

Course Title	VALUE EDUCATION (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1855110 (I Sem) 1855209 (II Sem)	Audit Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Knowledge of self-development
CO 2	Learn the importance of Human values
CO 3	Developing the overall personality

UNIT I

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

UNIT II

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

UNIT III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking.
Integrity and discipline.
Punctuality, Love and Kindness.
Avoid fault Thinking.
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

UNIT IV

Character and Competence –Holy books vs Blind faith.
Self-management and Good health.
Science of reincarnation.
Equality, Nonviolence ,Humility, Role of Women.
All religions and same message.
Mind your Mind, Self-control.
Honesty, Studying effectively

Text Books:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.
2. John Haffai, Lead on & How to win over worry, World Book Publisher.
3. Swami Vivekananda, Call to the Youth for Nation Building, Advaita Ashrama, Calcutta.
4. Swami Vivekananda, Youth and Modern India, Rama Krishna Mission, Chennai.

Reference Books:

1. M.G. Chitakra, Education and Human values, A.P.H. Publishing corporation, New Delhi.

Course Title	CONSTITUTION OF INDIA (Audit Course)					R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1855110 (I Sem) 1855209 (II Sem)	Audit Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- 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.
- 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

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Discuss the growth of the demand for civil right s in India for the bulk of Indians before the arrival of Gandhi in Indian politics
CO 2	Discuss the intellectual origins of the frame work of argument that informed the conceptualization of sociall reforms leading to revolution in India
CO 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.
CO 4	Discuss the passage of the Hindu Code Bill of 1956

UNIT I

History of Making of the Indian Constitution:

History, Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution:

Preamble, Salient Features

UNIT II

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.

UNIT III

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.

UNIT IV

Local Administration:

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Pachayati raj: Introduction, PRI: Zila Pachayat.

Elected officials and their roles, CEO Zila Pachayat: Position and role.

Block level: Organizational Hierarchy (Different departments),

Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT V

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.

Text Books:

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 Title	PEDAGOGY STUDIES (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
		L	T	P	C	Continuous Internal Assessment	End Exams	Total
1855110 (I Sem) 1855209 (II Sem)	Audit Course	2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

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

Course Outcomes: On successful completion of this course, the students will be able to

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

UNIT I

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.

UNIT II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
Curriculum, Teacher education.

UNIT III

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?
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.

UNIT IV

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

UNIT V

Research gaps and future directions

Research design
Contexts
Pedagogy
Teacher education
Curriculum and assessment
Dissemination and research impact.

Text Books:

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.

Reference Books:

1. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
2. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

Web Links:

1. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Title	STRESS MANAGEMENT BY YOGA (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1855110 (I Sem) 1855209 (II Sem)	Audit Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours								

Course Objectives:

- To achieve overall health of body and mind.
- To overcome stress

Course Outcomes: On successful completion of this course, the students will be able to

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

UNIT I

Definitions of Eight parts of yog. (Ashtanga)

UNIT II

- Yam and Niyam. Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III

- Asan and Pranayam

  i)Various yog poses and their benefits for mind & body

  ii)Regularization of breathing techniques and its effects- Types of pranayam

Text Books:

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. Swami Vivekananda, "Rajayoga or conquering the Internal Nature" .
3. Advaitashrama (Publication Department), Kolkata.
4. Acharya Yatendra, Yoga & Stress Management, Finger Print Publishing.

Course Title	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (Audit Course)				R18- M.Tech CSE I / II Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1855110 (I Sem) 1855209 (II Sem)	**Audit Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	0	0	0	40	--	40
Mid Exam Duration: 2 Hours							

Course Objectives:

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

Course Outcomes: On successful completion of this course, the students will be able to

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

UNIT I

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT II

- Approach to day to day work and duties.
- Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT III

- Statements of basic knowledge.
- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-

Verses 17, Chapter 3-Verses 36,37,42,

- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Text Books:

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.
3. Enlightenment: Personality Development and management, Sagir Ahmed, Independently Published.