N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY
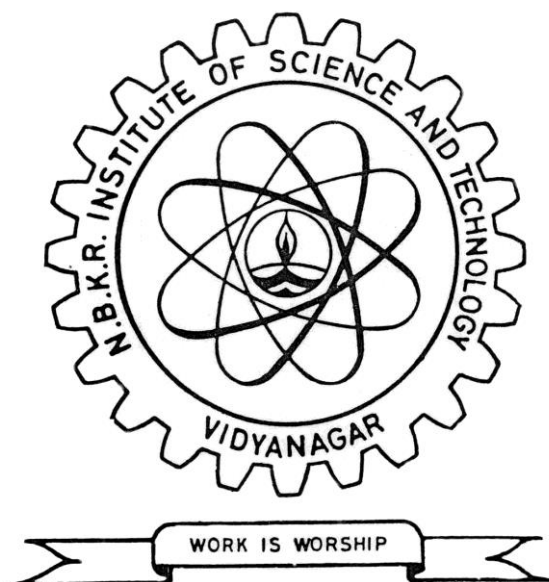
(AUTONOMOUS)
COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)
Affiliated to JNTUA, Anantapuramu
Re-Accredited by NAAC with 'A' Grade
B.Tech. Courses Accredited by NBA under TIER-I

SYLLABUS

B.TECH.

COMPUTER SCIENCE & ENGINEERING

(With effect from the batch admitted in the academic year 2019-2020)

VIDYANAGAR - 524413
SPSR Nellore-Dist. Andhra Pradesh

www.nbkrist.org

Vision and Mission of the INSTITUTE

Vision:

To emerge as a comprehensive Institute that provides quality technical education and research thereby building up a precious human resource for the industry and society.

Mission:

- To provide a learner-centered environment that challenges individuals to actively participate in the education process.
- To empower the faculty to excel in teaching while engaging in research, creativity and public service.
- To develop effective learning skills enabling students to pick up critical thinking thus crafting them professionally fit and ethically strong.
- To reach out industries, schools and public agencies to partner and share human and academic resources.

Vision and Mission of the Department

Vision:

The department is committed to continually improve its educational environment in order to develop graduates with the strong academic and technical backgrounds needed to get distinction in the discipline globally and to achieve academic excellence by imparting in-depth knowledge to the students, facilitating research activities and cater to the ever-changing industrial demands and societal needs.

Mission:

M1: To encourage students to become self-motivated, problem-solving individuals who can find and understand of the knowledge needed to be successful in their profession.

M2: To provide intellectual inputs to knowledge-based industries in the form of qualified and trained manpower.

M3: To attain self-sustainability and overall development through Research and Consultancy.

M4: To produce best quality Computer Science Professionals by imparting quality training, hands on experience and value education.

M5: Providing an environment in which students are given the essential resources to address and solve real-world problems, participating in interdisciplinary and multidisciplinary research and its applications.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To produce graduates having strong fundamental knowledge in basic sciences and engineering, along with sound principles of computer programming with exposure to Computer Science and Engineering concepts that lead to problem solving techniques.

PEO2: To produce employable graduates who will be placed in various engineering positions in the computational world in firms of international repute.

PEO3: To produce graduates with strong communication skills and work effectively on team-based software development projects and will practice the ethics of their profession consistent with a sense of social responsibility.

PEO4: To pursuit of advanced degrees in engineering at different levels of research and consultancy. They get exposed to several other domains resulting in lifelong learning to broaden their professional knowledge.

PROGRAMME OUTCOMES (POs)

An Engineering Graduate will be able to:

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

PO2: 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 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: 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: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: 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: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

PO10: 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: 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: 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.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

COMPUTER SCIENCE & ENGINEERING – OVERALL SCHEME OF INSTRUCTION (With effect from the academic year 2019-20)

S.No	I B.Tech — I Sem	L	T	P	C	II B.Tech — I Sem	L	T	P	C	III B.Tech — I Sem	L	T	P	C	IV B.Tech — I Sem	L	T	P	C
1	BSC- Functional English (FE) - 19SH1101	2	-	-	2	BSC-Numerical Methods, Probability and Statistics (NMPS) -19SH2102	3	-	-	3	PCC- Compiler Design(CD) - 19CS3101	3	1	-	4	PCC-Machine Learning (ML) - 19CS4101	3	-	-	3
2	BSC- Applied Physics (AP) - 19SH1102	2	1	-	3	ESC-Computer Organization (CO) - 19CS2101	3	-	-	3	PCC- Object Oriented Analysis and Design(OOAD) - 19CS3102	3	-	-	3	PCC- Data Analytics (DA) - 19CS4102	3	-	-	3
3	BSC-Engineering Mathematics –I (EM-I) - 19SH1104	3	1	-	4	PCC- Object Oriented Programming through JAVA (OOPJ) - 19CS2102	3	-	-	3	PCC-Cryptography and Network Security (CNS) - 19CS3103	3	-	-	3	PCC-Web Technologies (WT) - 19CS4103	3	-	-	3
4	ESC- Programming for Problem Solving (PPS)** - 19CS1101	3	-	-	3	PCC-Operating Systems (OS) - 19CS2103	3	-	-	3	PCC-Advanced Database Systems(ADBS) - 19CS3104	3	-	-	3	**Professional Elective –3** Service Oriented Architecture-19CS41E1 Embedded Systems-19CS41E2 Image Processing and Visualization-19CS41E3 Adhoc & Sensor Networks-19CS41E4	3	-	-	3
5	ESC-Basic Electrical Sciences (BES) - 19EE1101	2	1	-	3	PCC-Software Engineering (SE) - 19CS2104	3	-	-	3	**Professional Elective–1** Software Architecture-19CS31E1 Distributed systems-19CS31E2 Pattern Recognition-19CS31E3 Cloud Computing-19CS31E4	3	-	-	3					
6	BSC - Functional English Lab - 19SH11P1	-	-	2	1	MC :: Environmental Sciences - 19MC2101	2	-	-	-										
7	BSC - Engineering Physics Lab - 19SH11P2	-	-	3	1.5	PCC - Object Oriented Programming through JAVA Lab - 19CS21P1	-	-	3	1.5						Open Elective – 1	3	-	-	3
8	ESC - Programming for Problem Solving Lab - 19CS11P1	-	-	3	1.5	PCC - Operating System Lab - 19CS21P2	-	-	3	1.5	PCC - Object Oriented Analysis and Design Lab - 19CS31P1	-	-	3	1.5	PCC– Machine Learning Lab-19CS41P1	-	-	3	1.5
9	ESC - Engineering Workshop - 19ME11P2	-	-	2	1	PCC – Database and IT Essentials Lab - 19CS21P3	-	-	4	2	PCC- Cryptography and Network Security Lab - 19CS31P2	-	-	3	1.5	PCC – Data Analytics Lab - 19CS41P2	-	-	3	1.5
	TOTAL	12	3	10	**20**		17	0	10	**20**		15	1	6	**19**		15	0	6	**18**
	II Sem	L	T	P	C	**II Sem**	L	T	P	C	**II Sem**	L	T	P	C	**II Sem**	L	T	P	C
1.	BSC- Professional English (PE) - 19SH1201	2	-	-	2	PCC-Discrete Mathematical Structures (DMS) - 19CS2201	3	1	-	4	BSC-Management Science (MS)	3	-	-	3	**Professional Elective – 4** Software Testing and Quality Assurance - 19CS42E1 Intelligent Software Agents-19CS42E2 Mobile Application Development-19CS42E3 Natural Language Processing-19CS42E4	3	-	-	3
2.	BSC- Engineering Chemistry (EC) - 19SH1203	2	1	-	3	PCC- Design and Analysis of Algorithms(DAA)-19CS2202	3	-	-	3	PCC- Internet of Things (IOT) - 19CS3201	3	-	-	3					
3.	BSC- Engineering Mathematics – II (EM-II) - 19SH1204	3	1	-	4	HSM- Engineering Economics and Financial Accounting (EE&FA) - 19SH2202	2	-	-	2	PCC- Artificial Intelligence (AI) - 19CS3202	3	1	-	4					
4.	PCC- Python and Data Structures (PDS) - 19CS1201	3	-	-	3	PCC- Formal Languages and Automata Theory (FLAT) - 19CS2203	3	1	-	4	PCC-Data Warehousing and Mining (DWM) - 19CS3203	3	-	-	3					
5.	PCC- Database Management Systems (DBMS) - 19CS1203	3	-	-	3	PCC- Computer Networks (CN) - 19CS2204	3	-	-	3	**Professional Elective-2** Software Project Management-19CS32E1 R Programming-19CS32E2 High Performance Computing-19CS32E3 Wireless Networks-19CS32E4	3	-	-	3	Open Elective –2	3	-	-	3
6.	ESC - Computer Aided Engineering Drawing Lab - 19ME12P1	-	-	6	3	MC : Technical English & Soft Skills - 19MC2202	2	-	2	-	AC-Universal Human Values(UHV)	2	-	-	-	Internship - 19CS42IS	-	-	-	2
7.	BSC - Engineering Chemistry Lab - 19SH12P3	-	-	3	1.5	PCC - Design and Analysis of Algorithms Lab - 19CS22P1	-	-	3	1.5	PCC - Internet of Things Lab - 19CS32P1	-	-	3	1.5	Massive Open Online Courses -19CS42MO	-	-	-	3
8.	PCC - Python and Data Structures Lab-19CS12P1	-	-	3	1.5	PCC - Computer Networks Lab - 19CS22P2	-	-	3	1.5	PCC – Data Warehousing and Mining Lab - 19CS32P2	-	-	3	1.5	Project - 19CS42PR	-	-	-	11
											Mini Project - 19CS32MP	-	-	-	2					
	TOTAL	13	2	12	**21**		16	2	8	**19**		17	1	6	**21**		6	-	-	**22**

III - I	III - II	IV - I	IV - II
PROFESSIONAL ELECTIVE – 1 - Software Architecture (SA) - Distributed systems (DS) - Pattern Recognition (PR) - Cloud Computing (CC)	***PROFESSIONAL ELECTIVE – 2*** - Software Project Management (SPM) - R Programming (RP) - High Performance Computing (HPC) - Wireless Networks (WN)	***PROFESSIONAL ELECTIVE – 3*** - Service Oriented Architecture (SOA) - Embedded Systems (ES) - Image Processing and Visualization (IPV) - Adhoc & Sensor Networks (ASN)	***PROFESSIONAL ELECTIVE – 4*** - Software Testing and Quality Assurance (STQA) - Intelligent Software Agents (ISA) - Mobile Application Development (MAD) - Natural Language Processing (NLP)

OPEN ELECTIVES offered by

ECE	CE	CSE	
- VLSI design - DSP Processors and Architecture - Neural Networks and Fuzzy Logic - Telecommunication and Switching Networks - Microprocessors And Micro Controllers - Optoelectronics - Embedded Systems - Cellular Mobile Communication	- Remote Sensing - Building Planning and Construction Techniques - Environmental Impact and Management - Disaster Management - Basics of Transportation Engineering - Water resources Management -	- Advanced Python Programming (APP) - Data Analytics (DA) - Artificial Intelligence (AI) - Java Programming (JP) - Software Engineering (SE) - Web Design and Management (WDM) - R-Programming (RP) - Machine Learning (ML)	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
I YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – I SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	L	T	D/P	Credits	Sessional Test-I Duration In Hours	Sessional Test-I Max. Marks (24+6+10)	Sessional Test-II Duration In Hours	Sessional Test-II Max. Marks (24+6+10)	Total Sessional Marks (Max. 40)	End Semester Examination Duration In Hours	End Semester Examination Max. Marks	Max. Total Marks (100)
		THEORY												
1	19SH1101	Functional English	2	-	-	2	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	19SH1102	Applied Physics	2	1	-	3	2	40	2	40		3	60	100
3	19SH1104	Engineering Mathematics-I	3	1	-	4	2	40	2	40		3	60	100
4	19CS1101	Programming for Problem Solving	3	-	-	3	2	40	2	40		3	60	100
5	19EE1101	Basic Electrical Sciences	2	1	-	3	2	40	2	40		3	60	100
		PRACTICALS												
6	19SH11P1	English Language Lab	-	-	2	1	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	19SH11P2	Applied Physics Lab	-	-	3	1.5				40		3	60	100
8	19CS11P1	Programming for Problem Solving Lab	-	-	3	1.5	-	-	-	40		3	60	100
9	19ME11P2	Engineering Workshop	-	-	2	1	-	-	-	40		3	60	100
		TOTAL	**12**	**3**	**10**	**20**		**200**		**360**		**-**	**540**	**900**

19SH1101 - FUNCTIONAL ENGLISH

(Common to all branches)

Course Category:	Basic Science	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practical:	2-0-0
Prerequisite:	Basic Level of LSRW Skills	**Sessional Evaluation:** 40 **Univ. Exam Evaluation:** 60 **Total Marks:** 100	
Objectives:	Students undergoing this course are expected: 1. To develop basic writing skills in English. 2. To learn writing paragraphs effectively with unity and coherence 3. To achieve specific linguistic and communicative competence. 4. To acquire relevant skills and use them effectively in realistic working context. 5. To learn writing simple and analytical essays. 6. To inculcate the habit of reading.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Improve syntactical knowledge and use of phrases and clauses in sentences and encourage their appropriate use in writing.
	CO2	Obtain effective writing skills in practicing different types of formal letters.
	CO3	Attain both public speaking skills and writing skills by practicing drafting of speeches
	CO4	Acquire data interpretation and summarizing skills
	CO5	Acquire effective strategies for good writing and demonstrate the same in summarizing, writing well-organized essays, record and report the useful information.
	CO6	Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
Course Content	**UNIT-I** **WRITING:** Paragraph Writing: Sentence Structures: use of phrases and clauses in sentences- importance of proper punctuation- The Five Parts: introducing the topic, logical order, creating coherence, unity and summarizing the main idea. **GRAMMAR:** Parts of Speech: Nouns, Pronouns, Verbs, Adjectives and Adverbs; Nouns: Countable and Uncountable, Singular and Plural; Pronoun-Agreement; Subject-Verb Agreement. **UNIT-II** **WRITING:** Letter Writing: Parts of a Letter - Formats of Letters- Types of Letters-Formal letter Writing (enquiry, complaints, seeking permission, seeking internship etc.) **GRAMMAR:** Use of Articles and Zero Article, Prepositions, basic sentence structures; simple question form - wh-questions; word order in sentences **UNIT-III** **WRITING:** Drafting of Public Speech: Ideas / Content Generation, Structure		

	GRAMMAR: Tenses- Active Voice & Passive Voice; Conditional Sentences ### UNIT-IV **WRITING:** Information transfer; comprehend, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **GRAMMAR:** Degrees of Comparison; Question Tags, Non-finite Verbs (infinitives, gerunds & participles) ### UNIT-V **WRITING:** Essay Writing: Writing structured essays on specific topics- Introducing, analyzing and arguing an issue-creating coherence-Usage of proper punctuation-importance of conclusion **GRAMMAR:** Direct and Indirect Speech, Modifiers ### UNIT-VI **READING:** Comprehension: Different Reading Strategies- Skimming-Scanning-Inferring, Predicting and Responding to Content - Guessing from context and vocabulary extension. **GRAMMAR:** Common Errors: Identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, parallelism, subject verb agreement, pronoun agreement etc.)
Text Books & References Books	**REFERENCE BOOKS** 1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018. 3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. 5. Murphy, Raymond. English Grammar in Use, 4th ed, CUP

19SH1102 - APPLIED PHYSICS

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	2-1-0
Prerequisite:	Fundamental concepts of Physics	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives:	Students undergoing this course are expected: 1. To understand various phenomena exhibited by light and describe the characteristics, construction & working of lasers along with applications in Science & Technology. 2. To acquire knowledge of crystal systems and their analysis using X-rays. 3. To apply principles of Quantum Mechanics to various atomic phenomena and understand the electrical behaviour of solids. 4. To explain and provide the knowledge about semiconductors and their use in electronic devices. 5. To understand basic properties of dielectric &magnetic materials and their uses in Science & Technology. 6. To understand the behaviour of superconductors, nano materials, quantum phenomena and the limitations of basic physical laws.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the utilization of laser technology in various disciplines.
	CO2	Understand the structure of Crystalline solids and their applications in x-ray diffraction.
	CO3	Understand the basic concepts of quantum physics applicable to solids.
	CO4	Know the properties of semiconductor materials by projecting the view of energy bands.
	CO5	Understand the concept of polarization& magnetization and also applications of dielectric& magnetic materials in various disciplines.
	CO6	Recognize basic ideas about superconductors and nano materials with their uses in various fields of Science & Technology
Course Content	**UNIT-I** **WAVE OPTICS**: Introduction (Interference of light) - Interference of light by wave front splitting (Young's double slit experiment) and amplitude splitting (Newton rings) – Fraunhoffer diffraction from a single slit, double slit - Diffraction grating & its resolving power. **LASERS**: Spontaneous & stimulated emission of radiation - Population inversion - Pumping methods – Properties of lasers (monochromacity, coherence, directionality, brightness) – Types of lasers: solid state (Ruby), gas (He–Ne) – Applications of lasers in science, engineering & medicine.	

UNIT-II

CRYSTALLOGRAPHY: Introduction – Space lattice – Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of S.C., B.C.C., F.C.C. – Planes in crystal: Miller indices – Inter planar spacing in cubic crystals.

X-RAY DIFFRACTION: X – Ray diffraction in crystals – Bragg's law of diffraction – X- ray diffraction techniques: Laue method – Powder method (Debye – Scherrer method).

UNIT-III

INTRODUCTION TO QUANTUM MECHANICS: Wave nature of particles (deBroglie hypothesis) – Uncertainty principle – Schrodinger time independent wave equation - Significance of wave function (Born interpretation) – Solution of stationary state Schrodinger equation for one dimensional problems (particle in a box)

FREE ELECTRON THEORY: Introduction (classical & quantum: postulates, success& drawbacks) – Fermi–Dirac distribution function and its temperature dependence – Fermi level – Density of states (qualitative) – Statement of Bloch's theorem for a particle in a periodic potential – Kronig–Penny model (non mathematical treatment) - Origin of energy bands.

UNIT-IV

SEMICONDUCTOR PHYSICS: Intrinsic Semiconductors – Intrinsic conductivity – P&N type semiconductors - Variation of Fermi level with temperature –Law of mass action – Drift & diffusion –Einstein relation – Hall effect and its applications.

SEMICONDUCTOR DEVICES: Formation of P-N junction – V-I Characteristics of P-N junction diode (forward & reverse bias) - Diode equation – Direct & indirect bandgap semiconductors – Light emitting diodes (construction, working, materials & applications) – Photo detectors – Solar cells

UNIT-V

DIELECTRIC PROPERTIES: Basic definitions – Electronic, ionic (quantitative) and orientation (qualitative) polarizations – Internal fields in solid dielectrics – Clausius – Mossotti equation.

MAGNETIC PROPERTIES: Introduction and basic definitions – Origin of magnetic moment – Classification of magnetic materials into dia, para, ferro, anti-ferro & ferri magnetics –Hysteresis – Soft & hard magnetic materials – Applications of magnetic materials.

UNIT-VI

SUPERCONDUCTORS: Introduction – Effect of temperature and magnetic field – Meissner effect – Types of superconductors – BCS theory - Josephson effect (DC & AC) Applications of superconductors

NANOMATERIALS: Introduction – Significance of nanoscale – Types of nanomaterials – Properties of nanomaterials: physical, mechanical, magnetic and optical Synthesis of nanomaterials: top-down-Ball milling, bottom up – Chemical vapour deposition – Applications of nanomaterials.

Text Books & References Books	**TEXT BOOKS:** 1. Engineering Physics by Palanisamy, Scitech. 2. Engineering Physics by K.Thyagarajan, McGraw Hill. 3. Engineering Physics by Maninaidu, Pearson. **REFERENCE BOOKS:** 1. Solid State Physics, by Kittel, Wiley 2. Engineering Physics by Gaur and Gupta, Dhanpatrai Publications

19SH1104 - ENGINEERING MATHEMATICS - I

(Common to all branches)

Course Category:	Basic Science	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisite:	Intermediate Mathematics	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives:	Students undergoing this course are expected to understand: 1. The concepts of Newton's law of cooling, Law of natural growth and decay. 2. Solutions of higher order linear differential equations with RHS of the different types. 3. The concepts of first shifting theorem, change of scale property, Laplace transformation of multiplied by t and division by t and transformation of derivatives and integrals. 4. The concepts of Inverse Laplace transform and their applications. 5. The solution of system of linear equations by matrices. 6. Taylor's and Maclaurin's series, Maxima and Minima of the functions of two and three variables.		

	Upon successful completion of the course, the students will be able to:	
	CO1	Attains skills in solving first order differential equations and its applications.
	CO2	Solve the linear differential equations related to various engineering fields.
	CO3	Acquire basic knowledge in Laplace transforms and their applications.
Course Outcomes	CO4	Develop analytical skills in solving the ordinary differential equations by using the Laplace transform technique.
	CO5	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
	CO6	Attains skills in analyzing the Taylor's and Maclaurin's series and maxima and minima of the functions of two and three variables.
Course Content	**UNIT-I** **FIRST ORDER DIFFERENTIAL EQUATIONS**: Differential equations of first order and first degree - exact, linear and Bernoulli – Applications to Newton's law of cooling – Law of natural growth and decay. **UNIT-II** **HIGHER ORDER DIFFERENTIAL EQUATIONS:** Homogeneous linear differential equations of second and higher order with constant coefficients with R.H.S. of the type e^{ax} , $\sin ax$ or $\cos ax$, x^n , e^{ax} V and $x^n v(x)$. **UNIT-III** **LAPLACE TRANSFORMATION:** Laplace transformations of standard functions – Region of convergence – First shifting theorem – Change of scale property – Laplace transformation of multiple by t and division by t – Transformation of derivatives and integrals.	

	UNIT-IV **INVERSE LAPLACE TRANSFORMATION:** Inverse Laplace transform – Method of partial fractions – Shifting property – Inverse Laplace transform of multiple by s and division by s – Inverse Laplace transform of derivatives and integrals – Convolution theorem – Application to solutions of ordinary differential equations. **UNIT-V** **MATRICES:** Rank of Matrix by Echelon form – System of homogenous and non-homogenous linear equations – Cayley-Hamilton theorem (without proof)-Eigen values and Eigen vectors and their properties. **UNIT-VI** **DIFFERENTIAL CALCULUS:** Taylor's and Maclaurin's series of single variable – Maxima and minima of function of two variables – Lagrangian method of multipliers with three variables only.
Text Books & References Books	**TEXT BOOKS** 1. Higher Engineering Mathematics – B.S.Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics – B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS** 1. Higher Engineering Mathematics – H.K. Dass, Er. Rajnish Verma, S.Chand Publication, New Delhi. 2. Advanced Engineering Mathematics – N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Advanced Engineering Mathematics – Erwin Kreyszig, Wiley, India

19CS1101 - PROGRAMMING FOR PROBLEM SOLVING

(Common to all branches)

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	3-0-0
Prerequisite:	Knowledge on computer fundamentals and basic mathematics.		**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	Students undergoing this course are expected: 1. To learn the procedure how to develop algorithms, representations and programming development steps 2. To learn the basic building blocks of C language. 3. To understand the usage of C constructs (arrays, structures, pointers and file management) to develop various programs 4. To create better awareness how effectively utilize the concepts of C for application development			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Learn the fundamentals of programming development, structure of C and basic data types
	CO2	Find the usage of operators in expression evaluation and construction of I/O Statements.
	CO3	Acquire knowledge on various control structures to develop simple programs
	CO4	Explore the concept of arrays, strings and its effective utilization
	CO5	Understand the concepts of Pointers and Functions for exploring the dynamic memory usage
	CO6	Explore the basics of Structures, Unions, File operations and supporting implementations
Course Content	**UNIT-I** **INTRODUCTION:** Algorithms, Flow charts, Program development steps. **FUNDAMENTALS OF C:** History, Structure of a C program, Programming rules and execution. Character set, Delimiters, C keywords, Identifiers, Constants, Variables, Rules for defining Variables, Data types, Declaration and Initialization of Variables. **UNIT-II** **OPERATORS AND EXPRESSIONS:** Introduction, Operator Precedence and Associativity, Operator Types **INPUT AND OUTPUT IN C:** Formatted and Unformatted functions, Commonly used library functions. **UNIT-III** **DECISION STATEMENTS:** Introduction, Types of If statements, switch statement, break, continue, goto.	

	ITERATIVE STATEMENTS: while, do-while and for loops. **UNIT-IV** **ARRAYS**: Definitions, Initialization, Characteristics of an array, Array Categories. **STRINGS:** Declaration and Initialization of strings, String handling functions. **STORAGE CLASSES**: Automatic, External, Static and Register Variables. **UNIT-V** **POINTERS:** Fundamentals, Declaration and initialization of Pointers, Arithmetic Operations, Pointers and Arrays. **FUNCTIONS:** Definition, Function Prototypes, Types of functions, Call by Value and Call by Reference, Recursion. **UNIT-VI** **STRUCTURES:** Definition, Declaration and Initialization of Structures. **UNIONS:** Definition, Declaration and Initialization of Union. **FILES:** Introduction, File Types, Basic operations on Files, File I/O, Command Line Arguments.
Text Books & References Books	**TEXT BOOKS** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007 **REFERENCE BOOKS** 1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999 2. Let Us C by Yashavant Kanetkar, BPB Publications. 3. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19EE1101 - BASIC ELECTRICAL SCIENCES

(Common to EEE, CSE & IT)

Course Category:	Professional core		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	2-1-0
Prerequisite:	Fundamental concepts of Electricity and Electromagnetic induction.		**Sessional Evaluation:**	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Objectives:	Students undergoing this course are expected to understand: 1. Basic characteristics of R, L, C parameters and network reduction techniques. 2. The concept of form factor, Crest factor and j notation. 3. The concept of power triangle, series and parallel connection of R, L & C elements with sinusoidal Excitation. 4. Concepts of Graph theory and application of KCL and KVL. 5. Concept of inductance & mutual inductance, Dot convention and coefficient of coupling. 6. Concept of Series, parallel resonance and current locus diagrams			

	Upon successful completion of the course, the students will be able to:	
	CO1	Find the equivalent resistance by using network reduction Techniques.
	CO2	Calculate average, RMS, form factor & crest factor for a given periodic waveform.
	CO3	Determine the real power, reactive power, power factor and response for a given circuit and Excitation.
Course Outcomes	CO4	Understand the concepts of graph theory and apply nodal and mesh analysis for the given circuit.
	CO5	Perform the calculation of coefficient of coupling (K) and equivalent inductance for a given coupled coil.
	CO6	Accomplish the computation of Quality factor, band width and current locus diagram for a given electrical circuit.
Course Content	**UNIT-I** **Concept of Electric Circuits**: Introduction, Active and passive elements, V-I Characteristics of R, L and C elements, Ideal & Practical Sources, Source Transformation, Kirchhoff's laws, Network reduction techniques, Star-Delta transformation. **UNIT-II** **Fundamentals of AC circuits:** R.M.S, Average values, form factor and crest factor for different periodic wave forms, Sinusoidal Alternating Quantities - Phase and Phase Difference, Complex and Polar Forms of Representations, j-Notation. Concept of Reactance, Impedance, Susceptance and Admittance.	

UNIT-III

Single Phase AC Circuits: Concept of Active and reactive power, power factor –power triangle. Examples Steady state Analysis of R, L and C elements (in series, parallel and series parallel combinations) –with sinusoidal Excitation - Phasor Diagrams-Examples.

UNIT-IV

Graph Theory: Network topology, Cut set and Tie set matrices – Incident matrices – Problems.

Analysis of Electrical Circuits: Mesh and Nodal analysis of DC and AC circuits concept of super mesh and Super node with only independent sources.

UNIT-V

Coupled Coils: Faraday's Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention in coupled coils, Equivalent inductance of series and parallel connection coupled coils, Coefficient of Coupling.

UNIT-VI

Resonance: Series and parallel Resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies- Bandwidth – Quality factor.

Locus Diagrams: Locus diagrams of Series and parallel combinations of R-L, R-C with variation of parameters.

Text Books & References Books	**TEXT BOOKS** 1. "Engineering Circuit Analysis", by Hayt & Kemmerly, Fourth edition,TMH publishers 2. "Network Analysis", by M.E Van Valkenburg, third edition, PHI learning private Limited, 2006. 3. "Fundamentals of Electric circuits", by Charles k Alexander, Mathew N O Sadiku, Tata McGraw Hill Education Private Limited, sixth edition,2017. **REFERENCE BOOKS** 1. "Circuits & Networks", by A.Sudhakar and Shyam Mohan , Fifth edition(2015),TMH 2. "Circuit Theory", by A.Chakrabarti , Dhanpat Rai publishers, sixth edition 2014. 3. "Circuits & Systems", by Dr K.M.Soni, S.K.Kataria& sons Publication, Eleventh edition, Reprint 2016.
E-Resources	1. http://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. http://freevideolectures.com/university/iitm

19SH11P1 - ENGLISH LANGUAGE LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Science	Credits:	1
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-2
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	Students undergoing this course are expected to understand: The students how to improve their communicative ability in English with emphasis on LSRW skills and enable them to communicate effectively in different socio- cultural and professional contexts.		

Course Outcomes		Upon successful completion of the course, the students will be able to:
	CO1	These activities practiced in the laboratory are helpful in comprehending the important language aspects which are useful for the real-life situations. These are also helpful in enhancing the language competency and communicative level of students.
Course Content		**LIST OF ACTIVITIES** **1. Listening Skills** • Listening for Identifying key terms, understanding concepts • Listening for specific information • Listening for global comprehension and summarizing • Listening to short audio texts and answering a series of questions. **2. Common Everyday Conversations:** (Asking and answering general questions on familiar topics such as home, family, work, studies and interests) • Expressions in various situations • Making requests and seeking permissions • Interrupting and apologizing • Role plays / Situational dialogues **3. Communication at Work Place:** • Introducing oneself and others • Ice breaking activity and JAM Session • Greetings • Taking leave **4. Group Discussion** • Discussion in pairs/ small groups on specific topics • Short structured talks • Debates • Reporting/ summarizing

	5. Presentations: • Pre-planning • Non- verbal communication • Formal oral presentations on topics from academic contexts **6. Giving directions** • Giving directions • Asking for directions • Specific instructions • Importance of Landmarks
Text Books & References Books	**REFERENCE BOOKS** 1. A Manual for English Language Laboratories: Dr. D. Sudha Rani, Pearson Publications 2. Techniques of Teaching English: A.L. Kohli, Dhanpat Rai Publishers, 2019 3. https://www.talkenglish.com/

19SH11P2 - APPLIED PHYSICS LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Science	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-3
Prerequisite:	Engineering Physics	Sessional Evaluation: 40 Univ. Exam Evaluation: 60 Total Marks: 100	
Objectives:	Students undergoing this course are expected to: Learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field.		

Course Outcomes	CO1	These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge.
	CO2	It helps to recognize where the ideas of the students agree with those accepted by physics and where they do not.
Course Content	**LIST OF EXPERIMENTS** 1. Determination of rigidity modulus of wire material – Torsional pendulum. 2. Melde's experiment – Transverse & longitudinal modes. 3. Resonance in LCR circuit. 4. Magnetic field along the axis of a coil (Stewart – Gee's Method). 5. Study of characteristics of LED 6. Newton rings 7. Wedge method 8. Diffraction grating - Wavelength of given source. 9. Dispersive power of prism material using spectrometer. 10. P-N- junction diode characteristics. 11. Evaluation of Numerical Aperture of given optical fiber. 12. Energy gap of a P-N junction diode material. 13. Transistor characteristics. 14. Solar cell characteristics. 15. Logic gates.	

19CS11P1 - PROGRAMMING FOR PROBLEM SOLVING LABORATORY

(Common to all Branches)

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Basic mathematical knowledge to solve problems and computer fundamentals	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	Students undergoing this course are expected to learn the C programming constructs and its implementation		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Solve problems using C programming concepts
Course Content	**LIST OF EXPERIMENTS** 1. To evaluate expressions. 2. To implement if constructs. 3. To implement Switch statement. 4. To implement all iterative statements. 5. To implement Arrays. 6. To implement operations on Strings without using Library functions. 7. To implement arithmetic operations using pointers. 8. Implement both recursive and non-recursive functions. 9. To implement parameter passing techniques. 10. To implement Structures. 11. To implement basic File operations.	
Text Books & References Books	**TEXT BOOKS** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007 **REFERENCE BOOKS** 1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999 2. Let Us C by Yashavant Kanetkar, BPB Publications. 3. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012	

19ME11P2 - ENGINEERING WORKSHOP

(Common to EEE, ECE, CSE & IT)

Course Category:	Engineering Science		Credits:	1
Course Type:	Practical		Lecture-Tutorial-Practical:	0-0-2
Prerequisite:	No Prerequisite		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100

Objectives:	Students undergoing this course are expected:
	  1. To understand the usage of work shop tools and prepare the models in the trades such as carpentry, fitting, sheet metal & foundry.
	  2. To understand and demonstrate the usage of tools of welding, black smithy and machine tools.
	  3. To understand the usage of wiring tools and to execute house wiring connections.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Identify, Distinguish and Choose the tools of various trades (carpentry, fitting, sheet metal, foundry, wiring, welding, black smithy and machine tools).
	CO2	Demonstrate and describe the usage of tools of various trades (carpentry, fitting, sheet metal, foundry, wiring, welding, black smithy and machine tools).
	CO3	Documenting the procedure adopted while preparing the model.
Course Content	1. **Carpentry**: Half Lap, Mortise and Tenon and Bridle joint. 2. **Fitting:** Square, V, half round and dovetail fittings 3. **Tin-Smithy:** Tray, cylinder, hopper, cone 4. **House-wiring:** One lamp controlled by one switch, Two lamps (bulbs) controlled by two switches independently, Stair - case connection, Two lamps controlled by one switch in series, Two lamps controlled by on switch in parallel and Water pump connected with single phase starter. 5. **Foundry**: single-piece pattern and Two- piece pattern **TRADES FOR DEMONSTRATION:** 6. Machine Tools 7. Welding 8. Black Smithy	
Text Books & References Books	**TEXT BOOKS** 1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd,2009 2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers,2004 3. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers, 2007.Classical Data Structures by Samanta debasis, Prentice Hall of India, 2nd edition	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
I YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – II SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title				Credits	Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
				Instruction Hours/Week										
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)	0.8*Best of two + 0.2*least of two	Duration In Hours	Max. Marks	
1	19SH1201	Professional English	2	-	-	2	2	40	2	40		3	60	100
2	19SH1203	Engineering Chemistry	2	1	-	3	2	40	2	40		3	60	100
3	19SH1204	Engineering Mathematics-II	3	1	-	4	2	40	2	40		3	60	100
4	19CS1201	Python and Data Structures	3	-	-	3	2	40	2	40		3	60	100
5	19CS1203	Database Management Systems	3	-	-	3	2	40	2	40		3	60	100
		PRACTICALS												
6	19SH12P3	Engineering Chemistry Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	19CS12P1	Python and Data Structures Lab	-	-	3	1.5				40		3	60	100
8	19ME12P1	Computer Aided Engineering Drawing	-	-	6	3	-	-	-	40		3	60	100
		TOTAL	13	2	12	21		200		320		-	480	800

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19SH1201 - PROFESSIONAL ENGLISH

(Common to all Branches)

Course Category:	Basic Science	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practical:	2-0-0
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	Students undergoing this course are expected: 1. To develop their basic professional writing skills in English 2. To achieve specific linguistic and verbal competence 3. To acquire relevant skills and function efficiently in a realistic professional working environment 4. To inculcate the habit of reading & writing 5. To learn writing analytical essays. 6. To acquire verbal proficiency		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Write effective descriptions on scientific/technical topics
	CO2	Draft effective business e-mails.
	CO3	Present perspective of an issue and analyze an argument.
	CO4	Write proposals and project reports for professional contexts
	CO5	Practice different techniques of note making and note taking.
	CO6	Write effective book reviews on technical & non-technical books. Equip themselves with verbal proficiency.
Course Content	**UNIT-I** **WRITING:** Descriptions: Descriptions on scientific/ technical in nature-writing introduction - defining – classifying - describing technical features – the structure of an automobile/gadget/product or the process - instruction or installation manuals. **VERBAL:** Verbal reasoning- Analogies, Homophones & Homonyms **UNIT-II** **WRITING:** E-mail Communication- Etiquette – Format- Writing Effective Business Email **VERBAL:** Idioms and Phrases, One-word substitutes **UNIT-III** **ANALYTICAL WRITING:** Presenting perspective of an issue- Compare & Contrast, Cause and Effect, Analyze an argument **VERBAL:** Affixes-prefix and suffix, root words, derivatives	

	UNIT-IV
	TECHNICAL WRITING: Writing Proposals: Significance, Structure, Style and Writing of Project Reports. **VERBAL:** Synonyms and Antonyms **UNIT-V** **WRITING:** Introduction to different kinds of materials: Technical & Non-technical-Note Taking and Note Making- Identification of important points and precise the content **VERBAL**: Words often confused **UNIT-VI** **BOOK REVIEWS**: Review of a Technical and Non-Technical - A brief written analysis including summary and appreciation **VERBAL:** Sentence Completion
Text Books & References Books	**REFERENCE BOOKS** 1. A Textbook of English for Engineers and Technologists (combined ed Vol. 1&2) Orient Black Swan 2010. 2. Word Power Made Easy, Norman Lewis, New Revised Edition, Goyal Publishers 3. A Communicative Grammar of English by Geoffrey Leech, Longman ,3rd ed 4. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw- Hill, 2011.

19SH1203 - ENGINEERING CHEMISTRY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic science		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	2-1-0
Prerequisite:	Fundamental concepts of Chemistry		Sessional Evaluation: 40 Univ. Exam Evaluation: 60 Total Marks: 100	
Objectives:	Students undergoing this course are expected: 1. To familiarize engineering chemistry and its applications 2. To train the students on the principles and applications of electrochemistry and polymers 3. To impart the concept of soft and hard waters, softening methods of hard water			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Illustrate the molecular orbital energy level diagram of different molecular species
	CO2	Apply Nernst equation for calculating electrode and cell potentials
	CO3	Demonstrate the corrosion prevention methods and factors affecting corrosion
	CO4	Explain the different types of polymers and their applications
	CO5	Explain the principles of reverse osmosis and electro dialysis
	CO6	Explain calorific values and refining of petroleum
Course Content	## UNIT – I **STRUCTURE AND BONDING MODELS:** Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. ## UNIT – II **WATER TREATMENT:** Introduction –Hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles **-** scale and sludge, Priming and foaming, caustic embrittlement, Boiler corrosion, Industrial water treatment –Lime-soda, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis. ## UNIT-III **ELECTROCHEMISTRY AND APPLICATIONS:** Electrodes – concepts, reference electrodes (Calomel electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems. Primary cells – Zinc-air battery, Fuel cells, hydrogen-oxygen– working of the cells. Secondary cells – lead acid and lithium ion batteries. Potentiometry – potentiometric titration (strong acid *vs* strong base). Conductometry – conductometric titrations (strong acid *vs* strong base & weak acid *vs* strong base)		

UNIT-IV

CORROSION: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, prevention methods of corrosion- Metallic coatings(electroplating) and Cathodic protection.

UNIT – V

POLYMER CHEMISTRY: Introduction to polymers, Polymerisation and Types of polymerisation.

Plastomers -Thermoplastics and Thermo-setting plastics- Preparation, properties and applications of PVC, Bakelite, Urea-Formaldehyde and Nylons.

Elastomers – Preparation, properties and applications of Buna N, Thiokol and Silicone rubber

UNIT-VI

FUEL TECHNOLOGY: Chemical fuels – Introduction, classification, characteristics of a good fuel, calorific value, determination of calorific value (Bomb calorimeter and Boy's gas calorimeter), numerical problems based on calorific value.
Solid Fuels - Analysis of coal.

Liquid Fuels - Refining of petroleum, knocking and anti-knock agents, Octane and Cetane values.

Gaseous Fuels- Flue gas analysis by Orsat's apparatus.

Text Books & References Books	**TEXT BOOKS** 1. Jain and Jain, Engineering Chemistry, 16 Ed., Dhanpat Rai Publishers, 2013. 2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10 Ed., Oxford University Press, 2010. **REFERENCE BOOKS** 1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1 Ed. Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016 2. J. D. Lee, Concise Inorganic Chemistry, 5 Ed., Oxford University Press, 2008. 3. Dr. S.S. Dara and Dr S.S Umare, A Text book of Engineering Chemistry, 1 4. Ed., Chand & Company Ltd., 2000. 5. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.

19SH1204 - ENGINEERING MATHEMATICS – II

(Common to All Branches)

Course Category:	Basic Science		Credits:	4
Course Type:	Theory		Lecture-Tutorial-Practical:	3-1-0
Prerequisite:	Intermediate Mathematics		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives:	Students undergoing this course are expected to understand: 1. The concepts of double integrals and its applications. 2. The basic concepts of triple integrals and its applications, Beta and Gamma functions. 3. The gradient, divergence and curl operators, Solenoidal and Irrotational vectors. 4. The basic concepts of vector integration and their applications. 5. How to express a function in Fourier series in an interval. 6. The concepts of Fourier transform.			

	Upon successful completion of the course, the students will be able to:	
	CO1	Apply double integration techniques in evaluating areas bounded by region.
	CO2	Understand effectively in analyzing the Triple integrals, Beta and Gamma functions
Course Outcomes	CO3	Interpret the physical Divergence and Curl.
	CO4	Apply Green's, Stokes and Divergence theorems in evaluation of double and triple integrals.
	CO5	Develop analytical skills in solving the problems involving Fourier Series.
	CO6	Understand effectively Fourier Sine and Cosine integral, Fourier Sine and Cosine transforms.
Course Content	**UNIT-I** **DOUBLE INTEGRALS:** Double integrals – Change of order of integration – Change to polar coordinates – Area by double integration. **UNIT - II** **TRIPPLE INTEGRALS AND SPECIAL FUNCTIONS:** Evaluation of triple integrals – Volume by triple integral – Beta and Gamma functions and their properties – Relation between Beta and Gamma functions. **UNIT - III** **VECTOR DIFFERENTIA**TION: Scalar and vector point functions – Vector differential operator – Gradient, Divergence and Curl – Solenoidal and Irrotational vectors. **UNIT - IV**	

	VECTOR INTEGRATION: Line integral-circulation-workdone – Surface integrals - flux – Volume integral – Vector integral theorems - Green's theorem, Stoke's theorem and Gauss-divergence theorem (without proof). **UNIT-V** **FOURIER SERIES:** Determination of Fourier coefficients (without proof) – Fourier series – Even and odd functions – Change of intervals. **UNIT-VI** **FOURIER TRANSFORMS:** Fourier Integral Theorem (Without proof) – Fourier Sine and Cosine integrals — Fourier Transforms – Fourier Sine and Cosine transforms.
Text Books & References Books	**TEXT BOOKS** 1. Higher Engineering Mathematics - B.S.Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics - B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd New Delhi. **REFERENCE BOOKS** 1. Higher Engineering Mathematics - H.K. Dass, Er. Rajnish Verma, S.Chand Publication, New Delhi. 2. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India

19CS1201 - PYTHON AND DATA STRUCTURES

(Common to CSE & IT)

Course Category:	Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisite:	Basic mathematical knowledge to solve problems and programming	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives:	Students undergoing this course are expected: 1. To learn the fundamentals of Python constructs 2. To develop various simple programs using Python 3. To define Python functions, exceptions and various other features 4. To explore features of data structures and its implementations using Python		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Learn the basic building blocks of Python
	CO2	Understand the flow of execution, exception handling mechanism and built-in functions for application development
	CO3	Study Dictionaries, Tuples, Sets. And their applications
	CO4	Explore different kinds of sorting and searching techniques
	CO5	Learn the essentials of stack, queue and supporting implementation.
	CO6	Implement Linked structure and Fundamentals of trees.
Course Content	### UNIT-I **Python Basics**: Identifiers,Keyword, Statements and Expressions, variables, Comments, Significance of Indentation, Dynamic and Strongly Typed Language**.** **Operators:** Basic Operators available in Python, Precedence and Associativity, type() function and Is operator. **Data Types:** Basic Data Types, Type Conversions, Strings: creating and storing strings, Basic String Operations. **Input and output**: Reading values from the user and printing the values. ### UNIT-II **Conditional Statements**: if, if…else, if..elif…else, nested if. **Loops** – while, for, continue and break statements, Exception Handling, Functions. **Slicing and Joining of Strings:** String methods, Formatting Strings. **Lists**: creation, Indexing and Slicing, Built-In functions and Methods, *del* statement. ### UNIT-III **Dictionaries**: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Methods, *del* Statement. **Tuples**: Creation, basic operations, Indexing and slicing, Built-In functions, Methods, Relation of Tuples to Lists and Dictionaries, *Zip()* Function. **Sets :**Set Methods, Frozen set.	

	UNIT-IV
	Data structures Basics: Data structures, Data structure operations. [Ref. Book-1]. **Searching:** The Linear Search, The Binary Search, **Sorting:** Bubble Sort, Selection Sort, Insertion Sort.
	UNIT-V
	Linked Structures: Introduction, The Singly Linked List-Traversing the Nodes, Searching for a Node, Prepending Nodes and removing nodes. **Binary Trees:** The Tree Structure**, The Binary Tree:** Properties, implementation, Tree Traversals.
	UNIT-VI
	Stacks: The Stack ADT**, Implementing the Stack:** Using a Python List, Using a Linked List**, Stack Applications:** Balanced Delimiters, Evaluating Postfix Expressions. **Queues:** The Queue ADT**, Implementing the Queue:** Using a Python List, Using a Linked List.
Text Books & References Books	**TEXT BOOKS** 1. Gowrishankar. S, Veena.A, " Introduction to Python Programming", CRC Press, Taylor and Francis group, 2019. 2. Rance D. Necais, Data Structures and Algorithms Using Python, Fourth Edition, JONN-WILEY& SONS INC,2011. **REFERENCE BOOKS** 1. SEYMOUR LIPCHUTZ, Data Structures with C, Tata McGraw Hill Education Private Limited,2010 2. Bradley N. Miller, David L. Ranum, Problem Solving with Algorithms and Data Structures Using Python SECOND EDITION. 3. Presis B R, Data structures and algorithms in Python.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS1203 - DATABASE MANAGEMENT SYSTEMS

(Common to CSE & IT)

Course Category:	Core		Credits:	3
Course Type:	Theory		Lecture-Tutorial-Practical:	3-0-0
Prerequisite:	Basic foundations in mathematics and preliminary fundamentals of data sets		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives:	Students undergoing this course are expected to: 1. Understand the areas of databases and composition of queries using Structured Query Language. 2. Study various database design models for building applications. 3. Evaluate a business situation while designing a database system.			

	Upon successful completion of the course, the students will be able to:
Course Outcomes	CO1 Have a general overview of the nature and purpose of database systems.
	CO2 Understand the concepts of E-R model and Relational Model.
	CO3 Learn basic SQL primitives and Relational Algebraic operations.
	CO4 Familiar with relational Data Base design techniques and Normal forms.
	CO5 Understand variety of storage devices, files, and data-storage structures.
	CO6 Identify the basic issues of query and transaction processing.
Course Content	## UNIT – I **Introduction**: Database-System Applications, Purpose of Database Systems , View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, History of Database Systems. ## UNIT – II **Entity-Relationship Model:** Overview of the Design Process, The Entity- Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams**.** **Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations. ## UNIT – III **SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database. **Other Relational Languages:** The Relational Algebra, The Tuple Relational Calculus ## UNIT – IV **Relational** Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-

	Dependency Theory, Algorithms for Decomposition, Decomposition Using Multi valued Dependencies, More Normal Forms.
	UNIT – V **Storage and File Structure:** Overview of Physical Storage Media, Magnetic Disk and Flash Storage, File Organization, Organization of Records in Files, Data- Dictionary Storage, Database Buffer. **Indexing and Hashing:** Basic Concepts, Ordered Indices, B+-Tree Index Files,B+- Tree Extensions, Static hashing, Dynamic Hashing **UNIT – VI** **Query Processing:** Overview, Measures of Query Cost, Join Operation. **Transactions:** Transaction Concept, A Simple Transaction Model, Storage Structure Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels Transactions as SQL Statements.
Text Books & References Books	**TEXT BOOKS** 1. Silberschatz A, Korth H F, and Sudarshan S, Database System Concepts, 6th edition, McGraw-Hill, 2009. **REFERENCE BOOKS** 1. Ramez Elmasri, and Shamkant B Navathe, Database Systems, 6th edition, Pearson Education 2. Ramakrishnan R, and Gehrke J, Database Management Systems, 3rd edition, McGraw-Hill, 2003. 3. Date C J, An Introduction to Database Systems, 7th edition, Pearson Education, 2000.Rob P, Database Systems – Design, Implementation, and Management, 7th edition, Thomson, 2007
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19SH12P3 - ENGINEERING CHEMISTRY LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic science		Credits:	1.5
Course Type:	Practical		Lecture-Tutorial-Practical:	0-0-3
Prerequisite:	Fundamental concepts of Chemistry		**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	The main objective is to provide students to learn about experimental techniques in chemistry with knowledge in theoretical aspects so that they can excel in that particular field.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Determine the cell constant and conductance of solutions
	CO2	Prepare advanced polymer materials
Course Content	Minimum of 8 experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Determination of total hardness of water by EDTA method 2. Determination of total alkalinity of water 3. Estimation of chlorides using potassium chromate indicator 4. Determination of cell constant and conductance of solutions 5. Conductometric titration of strong acid Vs strong base 6. Conductometric titration of weak acid Vs strong base 7. Determination of pH of unknown solution 8. Potentiometry - determination of redox potentials and emfs 9. Determination of Strength of an acid in Pb-Acid battery 10. Preparation of a polymer 11. Determination of viscosity of oils with Redwood viscometer 12. Adsorption of acetic acid by charcoal	
Text Books & References Books	**TEXT BOOKS** 1. Mendham J et al, Vogel's text books of quantitative chemical analysis, 5Ed., Pearson publications, 2012. 2. KN Jayaveera, Subba reddy & Chandra sekhar , Chemistry lab manual, 1Ed., SM Enterprises, Hyderabad, 2014 3. Chatwal & Anand, Instrumental methods of chemical analysis, 2 Ed., 4. Himalaya publications, 2006.	

19CS12P1 - PYTHON AND DATA STRUCTURES LABORATORY

(Common to CSE & IT)

Course Category:	Core	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-3
Prerequisite:	Fundamentals of Computers and basic Mathematics	Sessional Evaluation: 40 Univ. Exam Evaluation: 60 Total Marks: 10	
Objectives:	Students undergoing this course are expected: 1. To learn and practice the basic fundamental blocks of Python Programming 2. To learn the basics of data structures and its implementation		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	gain knowledge on Python basics and implement various data structures.

Course Content	1. Write a Python program for the following
	    a. Compute the GCD of two numbers.
	    b. Checking whether the given year is a leap year or not
	2. Write a Python program for the following
	    a. Finding Fibonacci series using recursion.
	    b. Palindrome checking on strings and numbers.
	3. Write a Python program to implement matrix multiplication.
	4. Write a Python program to implementation of stack.
	5. Write a Python program to implementation of queue.
	6. Write a Python program to implementation of linked list.
	7. Write a Python program to implementation of tree traversal technique.
	8. Write a Python program to implementation on searching and sorting.	

Text Books & References Books	**TEXT BOOKS** 1. Gowrishankar. S, Veena.A, "Introduction to Python Programming", CRC Press, Taylor and Francis group, 2019. 2. Rance D. Necais, Data Structures and Algorithms Using Python, Fourth Edition, JONN-WILEY& SONS INC, 2011. **REFERENCE BOOKS** 1. SEYMOUR LIPCHUTZ, Data Structures with C, Tata McGraw Hill Education Private Limited,2010 2. Bradley N. Miller, David L. Ranum, Problem Solving with Algorithms and Data Structures Using Python SECOND EDITION. 3. Presis B R, Data structures and algorithms in Python.	
E-Resources	1. https://Wiki.python.org/moin/WebProgrammingBooks 2. https://realpython.com/tutorials/web-dev/ 3. https://nptel.ac.in/courses	

19ME12P1 - COMPUTER AIDED ENGINEERING DRAWING LABORATORY

(Common to EEE, ECE, CSE and IT)

Course Category:	Engineering Science	Credits:	3
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-6
Prerequisite:	Geometrical Construction	Sessional Evaluation:	40
		Univ. Exam Evaluation:	60
		Total Marks:	100
Objectives:	Students undergoing this course are expected: 1. To enable the students with various concepts like dimensioning, construction of conic sections, polygons, cycloids and involutes. 2. To impart and inculcate proper understanding of AutoCAD fundamentals. 3. To apply the knowledge of AutoCAD for the projections of points, lines and solids. 4. To know about sections and developments of solids. 5. To improve the visualization skills with isometric projections.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the conventions and methods of engineering drawings
	CO2	Sketch the solutions to the problems on projection of points, lines, planes and solids
	CO3	Demonstrate orthographic and Isometric principles
	CO4	Understand and apply the knowledge of engineering drawing in modern CAD tools.
Course Content	**INTRODUCTION TO CAD SOFTWARE:** **Introduction:** Importance of Computer Aided Drawing, software tool environment, drawing size and scale, main menu, tool bar and menus, co-ordinate system, drafting settings. **Creation and Editing:** Points, Lines, Poly lines, Polygons, Splines, circle, ellipse, text, move, copy, off-set, pan, mirror, rotate, trim, extend, break, chamfer, fillet, curves, block, layers, line representations, dimensioning and hatching. **GEOMETRICAL CONSTRUCTIONS, AND CONIC SECTIONS:** Importance of Drawing, Drawing Instruments, Sheet layout, BIS Conventions, Types of lines, Lettering, and dimensioning methods. Geometrical Constructions: Regular Polygons. **Conic Sections:** Introduction, Construction of Ellipse, Parabola and Hyperbola using Eccentricity method and Rectangular/ Oblong methods, Rectangular hyperbola. **SPECIAL CURVES:** Construction of Cycloidal curves – Cycloid, Epi-cycloid and Hypo- cycloid. Involutes – Involutes of circle and polygons.	

	PROJECTIONS OF POINTS AND LINES: **Projections of Points:** Principles of projections, Planes of projection, Points in four quadrants. **Projections of Lines:** Line inclined to both the principal planes (first angle projection only). **PROJECTIONS OF PLANES:** **Projections of Planes:** Plane (triangle, square, rectangle, pentagon, hexagon and circular) inclined to both the principal planes. **PROJECTIONS OF SOLIDS:** **Projections of Solids:** Solids such as Prisms, Pyramids, Cylinders and Cones inclined to both the principal plane. **SECTIONS OF SOLIDS.** **Sections of Solids:** Solids such as Prisms, Pyramids, Cylinders and Cones resting on their bases on HP. **DEVELOPMENT OF SURFACES.** **Development of Surfaces:** Lateral surfaces of solids such as Prisms, Pyramids, Cylinders and Cones (cut by a plane inclined to HP). **ISOMETRIC VIEWS AND PROJECTIONS:** Isometric views of planes and solids. Isometric scale, Isometric Projections of simple objects. **ORTHOGRAPHIC PROJECTIONS:** Conversion of Pictorial views into Orthographic Views.
Text Books & References Books	**TEXT BOOKS** 1. Engineering Drawing, N.D. Bhat / Charotar Publishing House,. Gujarat, 53rd edition, 2014. 2. AutoCAD 2013 For Engineers and Designers, Sham Tickoo, Dream tech Press, 2013 **REFERENCE BOOKS** 1. Engineering Drawing and Graphics + Autocad, Venugopal K, New Age International Pvt. Ltd.New Delhi, 2007. 2. Engineering Graphics with Auto CAD, D.M. Kulkarni, A.P. Rastogi and A.K. Sarkar, PHI Learning Private Limited, Revised Edition, August 2010. 3. Engineering Drawing and Graphics Using Autocad, T Jeyapoovan, Vikas Publishing House, 3rd Edition, 2010. 4. A Textbook on Engineering Drawing, P. Kannaiah, K. L. Narayana, K. Venkata Reddy, Radiant Publishing House, 2012.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							Max. Total Marks
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks	100
1	19SH2102	Numerical Methods, Probability and Statistics	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	19CS2101	Computer Organization	3	-	-	3	2	40	2	40		3	60	100
3	19CS2102	Object Oriented Programming through Java	3	-	-	3	2	40	2	40		3	60	100
4	19CS2103	Operating Systems	3	-	-	3	2	40	2	40		3	60	100
5	19CS2104	Software Engineering	3	-	-	3	2	40	2	40		3	60	100
6	19MC2101	MC :: Environmental Science	2	-	-	-	2	40	2	40		3	60	100
		PRACTICALS												
7.	19CS21P1	Object Oriented Programming through Java Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8.	19CS21P2	Operating Systems Lab	-	-	3	1.5	-	-	-	40		3	60	100
9.	19CS21P3	Database and IT Essentials Lab	-	-	4	2	-	-	-	40		3	60	100
		TOTAL	17	-	10	20	-	240	-	360		-	540	900

MC: Mandatory Course

19SH2102 - NUMERICAL METHODS, PROBABILITY AND STATISTICS

Course Category:	Basic Sciences		Credits:	3
Course Type:	Theory		Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Intermediate Mathematics.		**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives	- To provide the numerical methods of solving the non-linear equations - To improve the student's skills in numerical methods by using the numerical differentiation and integration. - To introduce the fundamentals of numerical methods used for the solution of engineering problems like ordinary differential equations. - Fitting a curve to the given data and the correlation between two variables. - Basic concepts of Probability like Addition theorem, Multiplication theorem and Bayee's theorem. Observed the difference between Discrete and continuous random variable. - Binomial, poison and Normal distribution for analyzing probability.			

		Upon successful completion of the course, the students will be able to:
Course Outcomes	CO1	Apply numerical methods to find numerical solution of system of algebraic equations by different Methods.
	CO2	Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
	CO3	Work numerically on the ordinary differential equations using different methods through the theory of finite differences. Familiar with programming with numerical packages like MATLAB.
	CO4	Construct a function which closely fits the given n points in the plane by using Least squares method. Student observed the relation between two variables.
	CO5	A good understanding of elementary probability theory and its application. How to apply discrete and continuous probability distributions to various business problems.
	CO6	A good understanding of the concept of a statistical distributions.
Course Content	UNIT-I **Solution of Simultaneous Linear and Non-linear Algebraic Equations:** Iteration method, Gauss Jordon method, Gauss Elimination with Pivotal condensation method, Triangular Factorization method, Gauss-Seidal method and Newton-Raphson method. UNIT-II **Numerical Differentiation and Integration:** First and Second Derivatives at given points by Newton's formula - Maxima and Minima of a tabulated function. Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule.	

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UNIT-III

Numerical Solution of Ordinary Differential Equations: Taylor series Method, Euler's Method, Runge-kutta methods (only second and fourth order), Milne'sPredictor-Corrector Method.

Partial Differential equations: Solution of Laplace equation by Gauss seidal iteration method.

UNIT-IV

Curve fitting: Introduction, Method of Least Squares, Linear and Non–linear equations.

Correlation: Coefficient of correlation, Rank correlation, Regression of lines.

UNIT-V

Probability and Statistics: Introduction, Addition Theorem and Multiplication Theorem, Conditional Probability, Bayee's Theorem, Random Variables, Discrete and Continuous.

UNIT-VI

Probability Distributions: Binomial, Poisson and Normal Distributions.
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<tr><td>**Text Books and References:**</td><td>

Text Books:

1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers, New Delhi.
2. Numerical Methods by S. Arumugam, Sitech publications.
3. Probability and Statistics - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi.

Reference Books:

1. Mathematical Methods - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N. Prasad, S.Chand Publication - New Delhi.
2. Introductory Methods of Numerical Analysis by S. S. Sastry, Prentice Hall India Learning Private Limited, New Delhi.
3. Numerical Methods by E. Balagurusamy, Tata McGraw-Hill Education Pvt.Ltd, New Delhi.
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<tr><td>**E-Resources**</td><td>

1. https://nptel.ac.in/courses
2. https://freevideolectures.com/university/iitm
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19CS2101 - COMPUTER ORGANIZATION

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Basic knowledge in identifying components, structure and internals of a computer.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To learn about the number systems, gates to design digital circuits. - To optimize circuits using gate level minimization. - To design sequential and combinational logic systems. - To understand the design of control unit, memory unit, I/O and Pipelining			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Represent numbers in number systems and to perform primitive Boolean algebraic operations.
	CO2	Describe digital circuits and design Combinational circuits.
	CO3	Understand the Sequential Digital Systems and RTL concepts.
	CO4	Design a Basic Computer and know about different addressing modes.
	CO5	Understand the Control Mechanisms and Memory hierarchies.
	CO6	Acquire knowledge in I/O Organization and Parallel processing.
Course Content	**UNIT-I** **Digital Systems:** Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers. **Boolean Algebra And Logic Gates:** Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions - canonical and standard forms, Digital logic gates. **UNIT-II** **Gate - Level Minimization:** The map method, Four-variable map, Product of sums simplification, Don't-care conditions. **Combinational Logic:** Analysis Procedure, Design Procedure, Binary adder – subtractor, Decimal Adder, Binary Multiplier, Decoder, Encoder, Multiplexer. **UNIT-III** **Synchronous Sequential Logic:** Sequential circuits, latches, Flip-Flops, Analysis of clocked sequential circuits, Registers, Shift Registers, Counters. **UNIT-IV** **Basic Computer Organization and Design**: Review of Basic Structure of Computers, Digital Computers, Review of Data Representation, Instruction Codes, Computer Instructions, Instruction Cycle.	

	Central Processing Unit: Instruction Formats, Addressing Modes, RISC, CISC **UNIT-V** **Micro programmed Control:** Control Memory, Address Sequencing, Design of Control Unit and Hardwired Control. **Memory System:** Memory Hierarchy, Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Cache Memories-Mapping Functions. **UNIT-VI** **Input-Output Organization:** Peripheral Devices, Input-Output Interface, Direct Memory Access. **Pipeline Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.
Text Books and References:	**Text Books:** 1. Digital Design –Fourth Edition, M.Morris Mano, Pearson Education/PHI. 2. Computer Systems Architecture – M.Moris Mano, 3rd Edition, Pearson, PHI 3. Computer Organization – Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky **Reference Books:** 1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill. 2. Switching and Logic Design, C.V.S. Rao, Pearson Education. 3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition. 4. Fundamentals of Digital Logic & Micro Computer Design , 5TH Edition, M. Rafiquzzaman John Wiley 5. Computer Organization and Architecture– William Stallings, 7th Edition. 6. Computer Organization and Design– P Paul Chowdary, 2nd Edition. 7. Computer Systems Design and Architecture – Vincent P and Harry F Jordan, 2nd Edition.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS2102 - OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Basic knowledge of programming.	**Sessional Evaluation:** 40 **Univ. Exam Evaluation:** 60 **Total Marks:** 100	
Objectives	• Acquire knowledge on basics of Object Oriented Programming using Java • Learn the fundamental constructs in Java • Develop various applications • To explore the knowledge to create Graphical User Interfaces		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basic concepts of OOP and Java Building Blocks.
	CO2	Acquire the knowledge of Classes and Methods
	CO3	Conceptualize the techniques of inheritance and packages.
	CO4	Understand Interfaces and Exception Handling in java
	CO5	Create Multi-threaded Programs and use String handling methods.
	CO6	Understand the concept of Event Handling mechanisms and its applicability.
Course Content	**UNIT-I** **Introduction:** Object-Oriented Programming – Two paradigms, Abstraction, Three Supporting Principles, First simple program and second simple program. **Java Basics:** Buzz words, Data types, Variables and Arrays, Operators-Arithmetic, Bitwise, Relational, Boolean, Assignment, Ternary, Precedence and Associativity. **Control statements:** Selection, Iteration and Jump statements **UNIT-II** **Classes:** Fundamentals, Declaring Objects, Assigning Object Reference Variables, Methods, Constructors, this keyword and Garbage collection. **A Closer look at Methods and Classes:** Overloading of Methods, Passing Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Static, Final, Variable-length Arguments, Overloading Vararg Methods. **UNIT-III** **Inheritance:** Basics, use of super keyword, Multilevel Hierarchy, Constructor execution. Method overriding, Dynamic method dispatch, Abstract classes, Using final with Inheritance. **Packages:** Basics, Member Access, Importing Packages.	

	UNIT-IV
	Interfaces: Definitions and Implementations, Nested and Applying Interfaces, Variables in interfaces, Extending interfaces, Default and Static Interface Methods. **Exception Handling:** Fundamentals, Types, Uncaught Exceptions, Usage of try and catch clauses, Multiple catch clauses, throw, throws and finally keywords. **UNIT-V** **Thread Programming:** Thread Model, Creation of Single and multiple threads, Thread Priorities and Synchronizations, Inter Thread Communication – wait(), notify(), notifyall(). **String Handling:** Constructors, length(), Special String Operations, Character Extraction, String Comparison – equals(), equalsIgnoreCase(), startsWith(), endsWith(), Deep Vs Shallow comparisons, String Buffer – constructors, length(), capacity(), reverse() and replace(). **UNIT-VI** **Event Handling:** Delegation Event Model, Event Classes, KeyEvent Class, Listener Interfaces, Handling Mouse Events, usage of delegation model, Adapter Classes, Inner Classes, Anonymous Inner Classes.
Text Books and References:	**Text Books:** 1. Java: The Complete Reference, 10th Edition, Herbert Schildt TMH. **Reference Books:** 1. Understanding Object-oriented Programming with Java, Timothy Budd, Addison Wesley. 2. A Comprehensive Introduction to Object-Oriented Programming with Java, C. Thomas Wu, McGraw Hill Higher Education. 3. Object-Oriented Programming with Java, Second Edition, Barry J. Homes, Daniel T. Joyce, Jones and Bartlett Publishers. 4. Object-Oriented Programming and Java, Danny Poo, Derek Kiong, Swarnalatha Ashok, Second Edition, Springer. 5. Object-Oriented Programming using Java, Simon Kendal, Simon Kendal & Ventus Publication Aps.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm 3. www.javatpoint.com

19CS2103 - OPERATING SYSTEMS

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Knowledge about fundamentals of computer basics	Sessional Evaluation: 40 Univ. Exam Evaluation: 60 Total Marks: 100	
Objectives	• Learn OS operations and supporting structures. • Knowledge about the different scheduling algorithms and their evaluation. • Obtain exposure on deadlock handling, protection and security mechanisms		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Learn the Basics of Operating Systems and structures.
	CO2	Acquire knowledge about Inter process communication and scheduling algorithms.
	CO3	Study Deadlock handling mechanisms.
	CO4	Understand various Memory management techniques.
	CO5	Gain insights of File system operations and implementation methods.
	CO6	Identify Disk Structures and various goals and principles of protection.
Course Content	__	**UNIT-I** **Introduction:** What Operating Systems Do, OS Structure & Operations, Process Management, Memory and Storage Management, Protection and Security, Computing Environments, Open-Source Operating Systems. **System Structures:** OS Services, User & OS Interface, System Calls, Types of System Calls, System Programs, OS Design and Implementation, Various structures of OS, OS Debugging, System Boot. **UNIT-II** **Process Management:** Process Concept, Process Control Block, Process Scheduling, Operations on Processes, Interprocess Communication, Examples of IPC systems. **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation. **UNIT-III** **Synchronization:** The Critical-Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Classic Problems of Synchronization - Reader/Writers Problem, Dining – Philosophers Problem, Monitors. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

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UNIT-IV

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Background, Demand Paging, Copy on write, Page replacement, Frame allocation, Thrashing, Allocating Kernel Memory.

UNIT-V

File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Implementing File-System: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, and Recovery.

UNIT-VI

Mass Storage Structure: Overview, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, RAID Levels, Stable-Storage Implementation.

System Protection and Security: Goals, Principles and Domain of protection, Security Problem, Program Threats, System and Network Threats.

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Text Books and References:	**Text Books:** 1. "Operating System Concepts", Abraham Silberchatz, Peter B Galvin, Greg Gagne, 9th Edition, John Wiley & Sons Publication, 2016. **Reference Books:** 1. "Modern Operating Systems", Andrew S. Tanenbaum, Herbert Bos, 4th Edition, Pearson Education, 2016. 2. "Operating Systems – Internals and Design Principles", William Stallings, 9th Edition, Pearson Education, 2018. 3. "Operating System: A Design-oriented Approach", Charles Crowley, 1st Edition TMH Publication, 2017.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS2104 - SOFTWARE ENGINEERING

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Require the fundamental concepts of computers and basic analytical capabilities		Sessional Evaluation:	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Objectives	- To define various software engineering phases. - Explore the concepts of software products and processes. - To facilitate the environment of software development in the outside world. - To expose the importance of risk management and strive for quality assurance.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basics of software engineering layers.
	CO2	Learn the engineering principles, planning and construction of analysis models.
	CO3	Study the data modeling concepts to create a behavioral model and exposure on design concepts.
	CO4	Identify various architectural styles to get the support for designing conventional components.
	CO5	Examine different Testing Strategies for conventional software and metrics to evaluate the product.
	CO6	Study various risk strategies and improve software quality assurance.
Course Content	**UNIT-I** **Introduction to Software Engineering:** Software evolution, Software and its nature, Legacy software, Software myths. **A Generic View of Process:** Software engineering layers, Process frame work, Capability Maturity Model Integration (CMMI), Personal and team process models. **Process Models:** Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models and Unified process. **UNIT-II** **Software Engineering Practice**: Engineering Principles, Communication, Planning, Modeling and Construction practices, Deployment. **Requirements Engineering:** Requirements engineering tasks, Initiation, Eliciting requirements, developing use-cases, Building the analysis model, Negotiating and validating requirements. **UNIT-III** **Building the Analysis Model:** Analysis model, Analysis modeling approaches, Data modeling concepts, Object-oriented analysis, Scenario based modeling, Flow-oriented modeling, Class-based modeling, Creating a behavioral model.	

	Design Engineering: Design process, Design quality, Design concepts, and Design model.
	UNIT-IV
	Creating an Architectural Design: Software architecture, Data design, Architectural styles and patterns, Architectural design, Mapping data flow into software architecture.
	Modeling Component-level Design: Nature of component, Designing class-based components, Conducting component level design, Object constraint language, Designing conventional components.
	UNIT-V
	Testing strategies: A strategic approach to software testing, Test strategies for conventional software, Test strategies for object-oriented software, Validation testing, System testing, Art of debugging.
	Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.
	UNIT-VI
	Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM plan.
	Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability.
Text Books and References:	**Text Books:** 1. Pressman R S, Software Engineering-A Practitioner"s Approach, 6th edition, McGrawHill **Reference Books:** 1. Sommerville I, Software Engineering, 5th edition, Pearson Education, 1996. 2. Jawadekar W S, Software Engineering – Principles and Practice, Tata McGraw-Hill, 2004.Hill, 2005. 3. Carlo gezzi, Fundamentals of Software Engineering ,Second edition, Prentice Hall
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19MC2101 - ENVIRONMENTAL SCIENCE

Course Category:	Mandatory course		Credits:	0
Course Type:	Theory		Lecture - Tutorial - Practical:	2-0-0
Prerequisite:	Basic idea on environment, Environmental pollution causes, effects and control measures.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To know the importance of Environmental Sciences and understand the various components of environment. • To know the value of natural resources and need to protect them. • To know the value of biodiversity and it`s conservation methods. • To describe advanced methods to solve problems related to environmental pollution. • To understand the social issues and provide plans to minimize the problems. • To articulate various environmental acts in order to protect the environment.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Know the importance of Environmental sciences and understand the various components of environment.
	CO2	Understand the value of natural resources
	CO3	Summarize the function of ecosystem, values of biodiversity and conservation.
	CO4	Identify how the environment is polluted and suggest the mitigation measures.
	CO5	Understand the environmental problems in India and way to minimize the effects.
	CO6	Categorize the environmental protection laws in our country and role of information technology in environment protection.
Course Content	### UNIT-I **Multidisciplinary nature of environmental sciences:** Introduction, Definition, Scope and Importance of Environmental Sciences, Various Components of Environment, Atmosphere, Lithosphere, Hydrosphere and Biosphere, Multidisciplinary Nature of Environmental Sciences. ### UNIT-II **Natural Resources:** **Land Resources:** Importance, Land Degradation, Soil Erosion and Desertification, Effects of Modern Agriculture (Fertilizer and Pesticide Problems). **Forest Resources:** Use and Over, Exploitation, Mining and Dams, Their Effects on Forest and Tribal People. **Water Resources:** Use and Over, Utilization of Surface and Ground Water, Floods and Droughts.	

Energy Resources: Renewable and Non-Renewable Energy, Need to use of Alternate Energy Sources, Impact of Energy use on Environment.

UNIT-III

Ecosystem: Definition, Types, Structure (Biotic and Abiotic Components) and Functions of an Ecosystem, Energy Flow, Food Chain, Food Web, Ecological Pyramids and Ecological Succession.

Bio-Diversity and its Conservation: Definition-Genetic, Species and Ecosystem Diversity, Value of Biodiversity, Hotspots of Biodiversity in India, Threats to Biodiversity, In Situ and Ex Situ Conservation of Biodiversity.

UNIT-IV

Environmental Pollution: Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution and Nuclear Hazards.

Solid Waste Management: Causes, Effects and Control Measures of Urban and Industrial Waste.

Disaster Management: Floods, Earthquake and Cyclones.

UNIT-V

Social Issues and Environment: From Unsustainable to Sustainable Development, Urban Problems Related to Energy, Water Conservation, Rainwater Harvesting and Water Shed Management.

Case Studies: Silent Valley Project, Madhura Refinery and Tajmahal, Tehri Dam, Kolleru Lake Aquaculture and Fluorosis in Andhra Pradesh, Climate Change, Global Warming, Acid Rain and Ozone Depletion.

UNIT-VI

Human Population And Environment: Population Growth, Variation Among Nations and Population Explosion, Role of Information Technology in Environment and Human Health.

Environmental Acts: Water (Prevention and Control of Pollution) Act, Air (Prevention and Control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act.

Field Work: Visit to Local Area Having River/Forest/Grass Land/Hill/Mountain to Document Environmental Assets.

Text Books and References:	**Text Books:** 1. "Environmental science and Engineering" by AnubhaKaushik and C.P.Kaushik, New Age International publishers. Sixth Edition 2018. 2. "Environmental science and Engineering"by N. Arumugam,VKumaresan, Saras Publication; 2 edition (2014).

	Reference Books:
	1. "Introduction to Environmental science" by Y.Anjaneyulu, B.S Publications.2004.
	2. Perspectives in Environmental Studies, AnubhaKaushik and C.P.Kaushik, New Age International publishers, Third Edition2019.
	3. "Environmental science" by M.Chandrasekhar, Hi-Tech Publications. 2009.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS21P1 - OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Course Category:	Program Core		Credits:	1.5
Course Type:	Practical		Lecture - Tutorial - Practical:	0-0-3
Prerequisite:	Basic knowledge of programming fundamentals.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To strengthen the ability to identify and apply the suitable object oriented concept for the given real world problems. - To develop skills to design the applications in java.			

Course Outcomes	After the completion of this lab, the students will be able to learn to develop various applications using core concepts of Java.

Course Content	1. Write a Java program
	    a. To demonstrate blocks of code in java
	    b. To demonstrate the scope and life time of a variable
	    c. For matrix multiplication (Read input from the user)
	2. Write a Java program to create class called Box.
	    a. Create objects of type Box and assign values to the side. Find and print the volume of each box objects created.
	    b. Add a method (taking sides as parameters) to the above mentioned class to calculate and return the volume.
	    c. Assign value to the sides using a parameterized constructor.
	    d. Use the Box class to show how to the instance variables are hidden.
	3. Write a Java program to create Box class.
	    a. Create overloaded constructors and return the volume of the Box from a method.
	    b. Pass Box object as parameter and calculate its volume.
	4. Write a Java program for methods with Variable-Length arguments.
	5. Write a Java program
	    a. To create a multi-level hierarchy using the Box class created in question 2.
	    b. To create hierarchical Box class and access the super class attributes.
	6. Write a Java program
	    a. For dynamic dispatching of methods
	    b. To create Abstract classes and use the created abstract class
	    c. To prevent overriding of methods.
	7. Write a Java program that demonstrates
	    a. Multiple catch clauses.
	    b. Nested try statements
	8. Write a Java program that describes the exception handling mechanism.

	9. Write a Java thread that manages Inter thread communication.
	10. Write a Java program to exemplify Generic with wildcards.
	11. Write a Java program (using swing components) to obtain login name, password, programming languages known, course being done and the department studying. Display the entered details in a suitable GUI component.
Text Books and References:	**Reference Books:** 1. Java: The Complete Reference, 10th Edition, Herbert Schildt TMH, Indian Edition. 2. An introduction to java programming and object oriented application development, R A Johson-Thomson. .
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm 3. www.javatpoint.com

19CS21P2 - OPERATING SYSTEMS LABORATORY

Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	**Lecture - Tutorial - Practical:**	0-0-3
Prerequisite:	Knowledge on basic operating system concepts and programming fundamentals	**Sessional Evaluation:** 40 **Univ. Exam Evaluation:** 60 **Total Marks:** 100	
Objectives	• Use various OS concepts to implement some of the real world issues practically and to give better exposure regarding its functionality.		

Course Outcomes	Upon successful completion of the course, the students will be able to acquire knowledge on Scheduling strategies, Memory and File Allocation Techniques and Deadlock concepts
Course Content	1. Simulate the following CPU scheduling algorithms. [3 lab sessions] (a) FCFS (b) SJF (c) Priority (d) Round Robin. 2. Simulate the following file allocation strategies. [2 lab sessions] (a) Sequential (b) Indexed (c) Linked. 3. Simulate MVT and MFT. [1 lab session] 4. Simulate the following File Organization Techniques. [2 lab sessions] (a) Single level directory (b) Two level (c) Hierarchical (d) DAG 5. Simulate Bankers Algorithm for Dead Lock Avoidance. [1 lab session] 6. Simulate the following page replacement algorithms. [2 lab sessions] (a) FIFO (b) LRU (c) Optimal (d) LFU. 7. Simulate Paging Technique of memory management. [1 lab session]
Text Books and References:	**Reference Books:** 1. "Operating System Concepts", Abraham Silberchatz, Peter B Galvin, Greg Gagne, 9th Edition, John Wiley & Sons Publication, 2016. 2. "Modern Operating Systems", Andrew S. Tanenbaum, Herbert Bos, 4th Edition, Pearson Education, 2016. 3. "Operating Systems – Internals and Design Principles", William Stallings, 9th Edition, Pearson Education, 2018.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS21P3 - DATABASE and IT ESSENTIALS LABORATORY

Course Category:	Program Core	Credits:	2
Course Type:	Practical	Lecture - Tutorial - Practical:	0-0-4
Prerequisite:	Student need to have basic knowledge about fundamentals of physical organization of a computer and aware of its operations and mathematical formulae and preliminary fundamentals.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100

Course Outcomes	Upon successful completion of the course, the students will be able to identify the physical components of a computer system, assembly, execution of business problems using application software and various Database concepts to develop applications using SQL.
Course Content	1. Assembling and disassembling the system hardware components of a personal computer. 2. To Practice on basics of Networking (Wired and Wireless network connections) 3. To Practice Basic MS-Word features (like Formatting, Tables, Sorting, Sections etc.,), Spread sheet experiments using EXCEL and MS-Power Point. 4. Creating, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command. 5. Queries along with sub Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT Constraints. 6. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN) GROUP BY, HAVING, Creating and dropping of Views. 7. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date). 8. Implement the following a. Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found). 9. Develop programs using feature parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables. 10. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.
Text Books and References:	**Text Books:** 1. Peter Norton "Introduction to Computers", McGraw Hill Publishers, 7th Edition 2011. 2. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc-Graw Hill.

	Reference Books:
	1. Alex Leon and Mathews Leon "Fundamentals of Information Technology", Vikas Publishers, 2nd Edition 1999.
	2. David Cyganski & John A.Orr "Information Technology-Inside and Outside", Pearson Education, 2002.
	3. Marilyn Wolf "Computers as Components", MK publications, 3rd Edition, 2014.
	4. Oracle Database 12C Hands-on SQL and PL/SQL Paperback – Import, 29 Feb 2016 by Satish Asnani.
	5. Oracle Pl/Sql Programming:A Developer's Workbook, Steven Feuerstein , Andrew Odewahn
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION

(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation				Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks
							Sessional Test-I		Sessional Test-II					
							Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks	
		THEORY	L	T	D/P									100
1	19CS2201	Discrete Mathematical Structures	3	1	-	4	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	19CS2202	Design and Analysis of Algorithms	3	-	-	3	2	40	2	40		3	60	100
3	19SH2202	Engineering Economics and Financial Accounting	2	-	-	2	2	40	2	40		3	60	100
4	19CS2203	Formal Languages and Automata Theory	3	1	-	4	2	40	2	40		3	60	100
5	19CS2204	Computer Networks	3	-	-	3	2	40	2	40		3	60	100
6	19MC2202	MC : Technical English and Soft Skills	2	-	2	-	2	40	2	40		3	60	100
		PRACTICALS												
7.	19CS22P1	Design and Analysis of Algorithms Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8.	19CS22P2	Computer Networks Lab	-	-	3	1.5	-	-	-	40		3	60	100
		TOTAL	16	2	8	19	-	240	-	320		-	480	800

MC: Mandatory Course

19CS2201 - DISCRETE MATHEMATICAL STRUCTURES

Course Category:	Program Core		Credits:	4
Course Type:	Theory		Lecture - Tutorial - Practical:	3-1-0
Prerequisite:	Basic mathematical structures and Identification of simple notations.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To understand the concepts of predicates and proofs. - To get the basic view on mathematical structures. - To provide generic view on counting techniques. - To explore the fundamental concepts of graphs trees and algebraic systems.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Learn the basics of logical connectives, rules of inference and normal forms.
	CO2	Review the basic mathematical topics useful to provide base for other areas.
	CO3	Study various algorithms based on integers and division.
	CO4	Identify different recurrence relations and their usage.
	CO5	Provide a generic view on the fundamentals of graphs and trees.
	CO6	Understand the basic structure of algebras and a specific view on coding theory.
Course Content	**UNIT-I** **Logic and Proofs:** Propositional logic and equivalences, Predicates and Quantifiers, Nested quantifiers, Rules of Inference, Introduction to proofs, Normal forms, Proof methods and strategy. **UNIT-II** **Basic Structures:** Sets and operations, Functions, Recursive functions, Sequences and summations, Cardinality of Sets. **UNIT-III** **Counting Principles:** Basics of counting, Permutations and Combinations, Binomial Coefficients, Generalized permutations and combinations. **Recurrence Relations:** Introduction and Definitions, Solving Linear recurrence relations. **UNIT-IV** **Recurrence Relations:** Generating functions, Inclusion - Exclusion. **Relations:** Relations and their properties, n-ary Relations and their applications, Representation and closures of relations, Equivalence relations and partial orderings. **UNIT-V** **Graphs:** Introduction, graph models, Graph terminology and special types of graphs, Representing graphs and graph isomorphism, Graph connectivity, Euler and Hamilton paths, Planar graphs and Graph coloring.	

	Trees: Introduction, Applications, Tree traversals. **UNIT-VI** **Algebraic Structures:** Introduction, Structure of algebras, Semi groups, Monoids, Groups, Homomorphisms, Normal sub-groups and Congruence relations, Rings, Integral domains and fields.
Text Books and References:	**Text Books:** 1. Discrete mathematics and its applications with combinatorics and graph theory, Kenneth H.Rosen, 7th Edition, TMH. **Reference Books:** 1. Discrete mathematics for computer scientists and mathematicians, Joe L Mott., Abraham Kandel, Theodore P Baker, 2nd Edition PHI, 2012. 2. An Introduction to data structures and applications, Trembley and Sorenson, PHI. 3. Discrete mathematical structures with applications to computer science, J.P. Tremblay R. Manohar McGraw-Hill.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS2202 - DESIGN AND ANALYSIS OF ALGORITHMS

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Knowledge on concept of preparing algorithms for basic problems, elementary data structures and their associated operations.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To understand the design and performance issues of an algorithm. - To be familiar with the kinds of design techniques. - To compare the design methods for producing optimal solution for real world problems. - To understand the various computational models for an effective design. - To learn to design the solutions for NP hard and NP complete problems.			

	Upon successful completion of the course, the students will be able to:	
	CO1	Analyze the time and space complexity of an algorithms.
	CO2	Design and analysis of algorithms using greedy strategy.
	CO3	Identify dynamic programming design methodology to solve problems involving principle of optimality.
Course Outcomes	CO4	Perform operations on sets and tree structures and also to understand their applications.
	CO5	Solve problems by constructing a state space tree with branch and bound and backtracking.
	CO6	Analyze the classes P, N and NP Complete and be able to prove that a certain problem is NP complete.
Course Content	**UNIT-I** **Introduction:** Algorithm analysis, Performance analysis, Space complexity and time complexity, Big „O‟ notation, Omega notation, Theta notation, Different mathematical approach‟s for solving Time complexity of Algorithms. **Divide and conquer:** General method, Binary search, Merge sort, Quick sort, Strassen‟s matrix multiplication. **UNIT-II** **Greedy method:** General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Optimal storage on tapes, Single source shortest paths. **UNIT-III** **Dynamic programming:** General method, Multistage graphs, All pairs shortest paths, Single source shortest paths. 0/1 Knapsack problem, Reliability design problem, Travelling sales person problem.	

	UNIT-IV **Basic Traversal & Search Techniques:** Techniques for Binary Trees and Graphs, Connected Components and Spanning Tress, Bi-Connected Components and DFS. **Sets and Disjoint set Union:** Introduction, Union and Find operations. **UNIT-V** **Back tracking:** General method, N-Queens problem, Sum of subsets, Graph coloring problem. **Branch and bound:** General method, Least cost (LC) search, Control abstractions for LC search, 0/1 Knapsack problem, Travelling salesperson problem. **UNIT-VI** **NP Hard and NP complete problems:** Basic concepts - Nondeterministic algorithms, The classes NP hard and NP complete; NP hard graph problems - Clique decision problem, Node cover decision problem. **PRAM Algorithms:** Introduction, Computational Model.
Text Books and References:	**Text Books:** 1. E.Horowitz, S.Sahni, S.Rajasekaran, "Fundamentals of Computer Algorithms", 2ndEdition, Universities Press, ISBN: 978-8173716126, 2008. **Reference Books:** 1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Cliford Stein, 2. "Introduction to Algorithms", 3rd Edition, Prentice-Hall of India, ISBN: 978-81-203-4007-7, 2010 3. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, India, ISBN - 13: 978-0-19-809369-5, ISBN-10: 0-19-809369-1, 2015
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19SH2202 - ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

Course Category:	Basic Sciences		Credits:	2
Course Type:	Theory		Lecture - Tutorial - Practical:	2-0-0
Prerequisite:	Nil		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- Causes of economic problems. - Behavior of a Consumer while purchasing and consuming various commodities and services - Various production and cost concepts used in managerial decision making process - Formation of different types of business organizations in India. - Application of the basic accounting concepts			

	Upon successful completion of the course, the students will be able to:	
	CO1	Demonstrate an ability to define, analyze and identify the appropriate solution to a business problem using sound economic and accounting principles.
	CO2	Know the role of various cost concepts in managerial decisions and the managerial uses of production function.
Course Outcomes	CO3	Understand to take price and output decisions under various market structures.
	CO4	Know in brief formalities to be fulfilled to start a business organization.
	CO5	Analyse the firm's financial position with the techniques of economic aspects as well as financial analysis.
	CO6	Evaluate and select profitable investment proposals.
Course Content	**UNIT-I** **Introduction to Economics:** Definition of Economics and basic concepts of Micro and Macro-economics. The concept of Demand, Law of demand, Elasticity of Demand: Types and measurement, Demand Forecasting, Methods of Demand Forecasting. **UNIT-II** **Theory of Production and Cost:** Production function, Cobb, Douglas Production Function and its Properties, Law of Variable Proportions, Law of Returns to Scale, Cost Concepts, Cost-Output Relations in Short run Long run, Revenue Curves, Break-Even Analysis. **UNIT-III** **Theory of Pricing:** Classification of Markets, Pricing Under Perfect Competition, Pricing under Monopoly, Price Discrimination, Monopolistic Competition. **UNIT-IV** **Types of Business Organizations:** Sole Proprietorship, Partnership and Joint Stock Company, Shares And Debentures.	

Banking System: Central Bank, Commercial Banks and their Functions, Impact of Technology in Banking Sector.

UNIT-V

Financial Accounting: Concepts and Principles, Journal and Ledger, Trial Balance, Final Accounts: Trading Account, Profit and Loss Account and Balance Sheet (Simple Final Account Problems without Adjustments).

UNIT-VI

Fundamental Concepts of Capital and Capital Budgeting: Factors and Sources of Capital-Meaning, Process and Methods of Capital Budgeting (Payback Period, Npv, Arr & Irr- Simple Problems).

Text Books and References:	**Text Books:** 1. Varshney & Maheswari: Managerial Economics, S. Chand Publishers 2. Business Organisations: C.B.Gupta , S.Chand Publishers 3. Managerial Economics and Financial Accounting: A.R.Arya Sri, Tata Mcgraw Hills publishers. **Reference Books:** 1. Economic Analysis: S.Sankaran, Margham Publications. 2. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas Publishers. 3. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications. 4. M. Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS2203 - FORMAL LANGUAGES AND AUTOMATA THEORY

Course Category:	Program Core		Credits:	4
Course Type:	Theory		**Lecture - Tutorial - Practical:**	3-1-0
Prerequisite:	Knowledge in Discrete Mathematics and logical reasoning		**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives	- Basic mathematical foundations of computation and various other notions. - Understand and conduct mathematical proofs for computation and algorithms. - Familiarity with thinking intuitively for problem solving in related areas of theory in computer science. - Develop a view on the importance of computational theory concepts.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Demonstrate abstract models of computing like DFA and NFA.
	CO2	Learn regular languages and are exposed to an overview of the theoretical foundations of computer science.
	CO3	Design grammars and recognizers for different formal languages and to prove or disprove theorems in automata theory using its properties.
	CO4	Apply Mathematical and formal techniques for solving real time applications using PDA.
	CO5	Perceive the power and limitations of a Turing machine.
	CO6	Determine the decidability and intractability of computational problems.
Course Content	**UNIT-I** **Automata:** Introduction to Finite Automata, Structural Representations, Automata and Complexity, Chomsky hierarchy, The Central concepts of Automata Theory-Alphabets, Strings and Languages, Deterministic Finite Automata, Nondeterministic Finite Automata, Finite Automata with Epsilon-Transitions. **Mealy and Moore Models:** Finite Automata With outputs, Procedure for Transforming a Mealy Machine into Moore Machine and Moore Machine to Corresponding Mealy Machine. **UNIT-II** **Regular Expressions and Languages:** Regular expressions, Finite Automata and Regular Expressions, Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** Proving languages not to be regular, closure properties of regular languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.	

UNIT-III

Context Free Grammars and Languages: Context free grammars, Parse trees, Ambiguity in Grammars and languages, Simplification of Context Free Grammars-Elimination of Useless Symbols, Epsilon-Productions and Unit Productions.

Properties of Context Free Languages: Normal Forms for context free grammars - Chomsky Normal Form and Greibach Normal Form, Pumping lemma for context free languages, Closure properties of context free languages.

UNIT-IV

Push Down Automata: Definition of Push down automaton, The languages of PDA-Acceptance by final state, Acceptance by empty stack, from empty stack to final state, from final state to empty stack, Equivalence of PDA"s and CFG's, Deterministic PDA, Two Stack Pushdown Automata.

UNIT-V

Introduction to Turing Machine: Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing machines.

UNIT-VI

Undecidability: A Language that is not Recursively Enumerable, an Undecidable problem that is RE, Rice"s theorem and Properties of the RE Languages, Post"s Correspondence problem.

Intractable Problems: The classes of P and NP.

Text Books and References:	**Text Books:** 1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008. 2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007. **Reference Books:** 1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015. 2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013. 3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013. 4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS2204 - COMPUTER NETWORKS

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Knowledge in computer fundamentals and basic network essentials.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To learn the essentials of computer network layers and Transmission media. - Explore the general issues regarding MAC, Network and Transport layers. - Study various protocols in TCP/IP suite. - Understand the working principle of DNS and E-mail.		

	Upon successful completion of the course, the students will be able to:		
Course Outcomes	CO1	Understand the basics of computer network layers and overview on transmission.	
	CO2	Get the design issues, and protocols of data link layer.	
	CO3	Study various multiple access protocols, and internetworking devices.	
	CO4	Explore the basic design issues, study various routing, and congestion control algorithms.	
	CO5	Learn the concept of IPv4 issues and overview on transport layer issues.	
	CO6	Understand the basic TCP issues and exposure on DNS & E-Mail.	
Course Content	### UNIT-I **Introduction:** Use of Computer Networks, Network Hardware, Network Software. **Reference Models:** TCP/IP Model, The OSI Model, Comparisons of the OSI and TCP/IP reference model. **Physical Layer:** Guided Transmission Media. ### UNIT-II **Data Link Layer:** Design issues, Error Detection and Correction, Elementary Data Link Layer Protocols, Sliding window protocol, Examples Data link Protocols. ### UNIT-III **Multi Access Protocols:** the Channel allocation Problem. **Multiple Access Protocols:** ALOHA, CSMA, Collision free protocols. **Data link layer switching:** Bridges from 802.x to 802.y, local internetworking, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways. ### UNIT-IV **Network Layer:** Design issues: store and forward packet switching, Services Provided to the Transport Layer, Implementation of connection less and connection oriented.		

Routing algorithms: optimality principle, shortest path, flooding, Distance Vector Routing, the Count-to-Infinity Problem, Link State Routing, Hierarchical Routing, Congestion Control Algorithms.

UNIT-V

Internetworking: Connectionless Internetworking, Tunneling, Internetwork Routing, fragmentation, IPv4, IP addresses.

Transport Layer: The transport Service - Services provided to the upper layers, Transport Service Primitives, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery.

The Internet Transport Protocols UDP: Introduction to UDP, RPC.

UNIT-VI

The Internet Transport Protocols TCP: Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling.

Application Layer: Introduction, DNS, Electronic mail.

Text Books and References:	**Text Books:** 1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education. **Reference Books:** 1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013 2. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Edication. 3. Computer Networks, L. L. Peterson and B. S. Davie, 4th edition, ELSEVIER. 4. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Eduction.
E-Resources	1. https://nptel.ac.in/courses

19MC2202 - TECHNICAL ENGLISH AND SOFT SKILLS

Course Category:	Mandatory course		Credits:	0
Course Type:	Theory		Lecture - Tutorial - Practical:	2-0-2
Prerequisite:	Basic Level of LSRW skills		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To build specific technical vocabulary and describe various technical concepts. - To draft and design effective resumes and job applications. - To improve group discussion skills and summarizing skills. - To attain non-verbal communication skills. - To acquire soft skills including personality development skills. - To obtain soft skills and work efficiently in a realistic professional working environment.			

	Upon successful completion of the course, the students will be able to:
	CO1 Define technical presentations and develop presentation skills by building technical verbal proficiency.
	CO2 Classify the dynamics of group discussion and enhance summarizing skills.
Course Outcomes	CO3 Construct effective resumes and job applications and utilize them in different situations.
	CO4 Analyze different soft skills including non-verbal communication skills and make use of them for career development.
	CO5 Perceive personality development skills and utilize them for all round development.
	CO6 Develop idealistic, practical and ethical values at work place.
Course Content	**UNIT-I** **Technical Presentations:** Writing simple descriptions and explanations on scientific/technical in nature – Definitions – Clarifying the specific meaning, often related to a specific context, or express the essential – Mechanism Descriptions–Process & function descriptions – Technical presentations –Organization – Visuals – Virtual technical presentations like webinars from different virtual platforms – Jargon **UNIT-II** **Group Discussion:** Dynamics of Group Discussion – Types – Relevance – Analyzing personality traits of participants – Discussion of etiquette – Body language – Modulation of voice – Intervention – Fluency and coherence – Positive & Negative roles – Do's and Don'ts of Group Discussion – Summarizing skills **UNIT-III** **Resume and Job Applications:** Writing effective resume' – Resume' styles – Chronological, functional & combinational – Parts of a resume' – Resume' formatting –

Designing resume' for specific situation – Cover letter – Format of cover letter – Opening statement and body paragraph of cover letter

UNIT-IV

Soft Skills & Hard Skills: Soft Skills Vs. Hard Skills and differences – Non-verbal communication – Definition – Types – Importance – Factors influencing body language – Haptics – Proxemics – Kinesics – Chronemics – Oculesics – Vocalics

UNIT-V

Personality Development Skills: Assertiveness – Positive attitude – Self-confidence – Self- motivation – Empathy – Listening skills – Interpersonal skills

UNIT-VI

Soft Skills at Work Place: Corporate etiquette – Dinning etiquette – Goal setting – Career planning –Team work – Strong work ethic –Time management – Adaptability – Problem solving skills – Critical thinking – Leadership skills – Stress management strategies

Text Books and References:	**Reference Books:** 1. A Textbook of English for Engineers and Technologists (combined edition, Vol. 1 &; Orient Black Swan 2010. 2. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw- Hill, 2011 3. Soft Skills, Dr K. Alex, S. Chand Publications, New Delhi 4. English and soft Skills, Dhanavel S.P., Orient Black Swan, 2017 5. Communication Skills and Soft Skills: An Integrated Approach, Suresh Kumar/Sreehari/Savithri, Pearson Education, 2018 6. Personality Development and Soft Skills, Barun K Mitra, OUP, 2nd edition, 2017 7. Technical Communication: Principles and Practice, Meenakshi Raman & Sangeetha Sharma,OUP,2005

19CS22P1 - DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	Lecture - Tutorial - Practical:	0-0-3
Prerequisite:	Knowledge on concept of preparing algorithms for basic problems, elementary data structures and their associated operations.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. • In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naive techniques.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Solve problems using machine learning techniques.
Course Content	1. Implementation of Binary Search technique. 2. Implementing the following sorting techniques. a. Merge sort b. Quick sort 3. Implementation of Optimal solution for a Knap Sack Problem using Greedy Method. 4. Implementation of minimum cost spanning tree using Prim"s Algorithm. 5. Implementation of minimum cost spanning tree using Kruskal"s Algorithm. 6. Implementation of Shortest path problem using Dijkstra's algorithm. 7. Implementation of All pairs shortest path problem. 8. Implementation of BFS technique. 9. Implementation of DFS technique. 10. Implementation of n-queen's problem.	
Text Books and References:	**Text Books:** 1. E.Horowitz, S.Sahni, S.Rajasekaran, "Fundamentals of Computer Algorithms", 2ndEdition, Universities Press, ISBN: 978-8173716126, 2008. **Reference Books:** 1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Cliford Stein, 2. "Introduction to Algorithms", 3rd Edition, Prentice-Hall of India, ISBN: 978-81-203-4007-7, 2010 3. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, India, ISBN - 13: 978-0-19-809369-5, ISBN-10: 0-19-809369-1, 2015	
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm	

19CS22P2 - COMPUTER NETWORKS LABORATORY

Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	Lecture - Tutorial - Practical:	0-0-3
Prerequisite:	Knowledge in computer fundamentals and basic network essentials.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To learn and practice the essentials of computer network layers, protocols and supporting applications.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basics of computer network layers and simulate some of the protocols & application.
Course Content	1. Create sample Wired Network. 2. Create Routing Algorithms. 3. Create TCP connection between two Systems. 4. Create UDP connection between two Systems. 5. Create Webpages. 6. Write a java Program for framing techniques. 7. Write a java Program for error detection mechanism. 8. Write a java Program for error correction mechanism.	
Text Books and References:	**Text Books:** 1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education. **Reference Books:** 1. Introduction to Network Simulator NS2 by Teerawat Issariyakul, Ekram Hossain, 2nd Edition, Springer 2. Java™ : The Complete Reference by Herbert Schildt, Seventh Edition 3. HTML, XHTML and CSS Bible by Steven M. Schafer, 5th Edition, Wiley Publications.	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU
III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION

(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation								Max. Total Marks
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination			
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks		100
1	19CS3101	Compiler Design	3	1	-	4	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60		100
2	19CS3102	Object Oriented Analysis and Design	3	-	-	3	2	40	2	40		3	60		100
3	19CS3103	Cryptography and Network Security	3	-	-	3	2	40	2	40		3	60		100
4	19CS3104	Advanced Database Systems	3	-	-	3	2	40	2	40		3	60		100
5		**Professional Elective - 1**	3	-	-	3	2	40	2	40		3	60		100
	19CS31E1	Software Architecture													
	19CS31E2	Distributed systems													
	19CS31E3	Pattern Recognition													
	19CS31E4	Cloud Computing													
		PRACTICALS													
6	19CS31P1	Object Oriented Analysis and Design Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60		100
7	19CS31P2	Cryptography and Network Security Lab	-	-	3	1.5	-	-	-	40		3	60		100
		TOTAL	15	1	6	19	-	200	-	280		-	420		700

MC: Mandatory Course

19CS3101 - COMPILER DESIGN

Course Category:	Program Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisite:	Basics of Programming Languages and Theory of Computation.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To make the student to understand the process involved in compilation. • Creating awareness among students on various types of bottom up parsers. • Understand the syntax analysis, intermediate code generation, type checking, and the role of symbol table etc.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basics of Compiler Design and the role of Lexical Analyzer
	CO2	Study various Syntax analyzers, grammar rules, SLR parsing techniques
	CO3	Get exposure on syntax translation mechanisms to be motivated to develop interpreters or compiles.
	CO4	Identify various storage allocation strategies, intermediate code generation and their applicability
	CO5	Acquire knowledge on code generation and Run-time storage Management
	CO6	Explore the techniques for code optimization.
Course Content	**UNIT-I** **Introduction to Compiling:** Language Processors, Phases of a compiler, Cousins of the Compiler. Grouping of phases, Compiler construction tools. **Lexical Analysis:** Role of the Lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, The Lexical analyzer Generator Lex. **UNIT-II** **Syntax Analysis:** Role of the parser, Context-free grammars, Writing a grammar, Top-down parsing, Bottom-up parsing. **UNIT-III** **LR Parsers:** Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using ambiguous grammars, Parser generators. **Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes.. **UNIT-IV** **Run-Time Environments:** Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack. Intermediate Code generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking.	

	UNIT-V
	Code Generation: Issues in the Design of a code generator, The target Language, Run-time storage management, Basic blocks and flow graphs, A simple code generator, Register allocation and assignment.
	UNIT-VI
	Code Optimization: The principal source of optimization, Peephole Optimization, Introduction to Data flow Analysis, Loops in flow graphs- Dominators, Depth-First Ordering, Edges in a Depth- First Spanning Tree, Depth of a Flow Graph, Natural Loops.
Text Books & References Books	**TEXT BOOKS** 1. Compilers, Principles Techniques and Tools.Alfred V Aho, Monical S. Lam, Ravi Sethi Jeffery D. Ullman,2nd edition, pearson,2007 **REFERENCE BOOKS** 1. Alfred V.Aho, Jeffrey D.Ullman, Principles of Compiler Design,Publications. 2. Compiler Design K.Muneeswaran, OXFORD 3. Principles of compiler design,2nd edition,Nandhini Prasad,Elsevier 4. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university//iitm

19CS3102 - OBJECT ORIENTED ANALYSIS AND DESIGN

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Require software engineering basics and fundamentals of object oriented features.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	• Specify, analyse and design the use case driven requirements for a particular system. • Model the event driven state of object and transform them into implementation specific layouts. • Identify, analyse the subsystems, various components and collaborate them interchangeably.		

	Upon successful completion of the course, the students will be able to:	
	CO1	Know the importance of modeling and principles, architecture and software development life cycle.
	CO2	Learn about the basics and advanced structural modeling techniques.
Course Outcomes	CO3	Draw the class and object diagrams for various applications.
	CO4	Gain knowledge about the basics of behavioral modeling and its applicability.
	CO5	Learn the state, time and space issues and supporting applicability.
	CO6	Study various component and deployment diagram properties for different applications.
Course Content	**UNIT-I** **Introduction to UML:** The importance of modeling, Principles of modeling, Object oriented modeling, A conceptual model of the UML, Architecture, Software Development Life Cycle. **UNIT-II** **Basic Structural Modeling:** Classes, Relationships, Common Mechanisms and Diagrams. **Advanced Structural Modeling1:** Advanced Classes, Advanced Relationships. **UNIT-III** **Advanced Structural Modeling2:** Interfaces, Types and Roles, Packages. **Class & Object Diagrams:** Terms and Concepts, Common Modeling techniques for Class & Object Diagrams. **UNIT-IV** **Basic Behavioral Modeling:** Interactions, Interaction diagrams, Use cases, Use case diagrams, Activity diagrams. **UNIT-V** **Advanced Behavioral Modeling:** Events and Signals, State machines, Process and Threads, Time and Space, State chart diagrams.	

	UNIT-VI
	Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams.
Text Books and References:	**Text Books:**
	1. Grady Booch, James Rumbaugh, IvarJacobson: The Unified Modeling Language User Guide, Pearson Education.
	Reference Books:
	1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
	2. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
E-Resources	1. https://nptel.ac.in/courses
	2. https://freevideolectures.com/university/iitm

19CS3103 - CRYPTOGRAPHY & NETWORK SECURITY

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Knowledge in Computer security basics and counter attack mechanisms from Internet Threats.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	• Understand OSI security architecture and classical encryption techniques. • Acquire fundamental knowledge on the concepts of finite fields and number theory. • Understand various block cipher and stream cipher models. • Describe the principles of public key cryptosystems, hash functions, digital signature and internet security.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basics of Computer Security and conventional encryption issues.
	CO2	Analyze the models for internet security and learning different types of modern algorithms and its classification.
	CO3	Study different methods of public key cryptosystems and its real-time implementation
	CO4	Learn different message authentication codes and basics of hash functions
	CO5	Study authentication protocols and classification of digital signature standards
	CO6	Deal with Internet related security and system security mechanisms.
Course Content	**UNIT - I** **Introduction**: Overview of Computer Security, Security Attacks, Security Mechanisms and Security Services. Model for Network Security, Network Access Security Model. **Conventional Encryption:** Symmetric Cipher Model**,** Classical Encryption Techniques and Steganography. **UNIT – II** **Modern Techniques:** Block Cipher Principles, S-DES, DES, Strength of DES, AES, Block Cipher Modes of Operation. **Number Theory:** Prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for Primality, Euclidean Algorithm, Chinese Remainder Theorem, and Discrete Logarithms. **UNIT – III** **Public Key Cryptography:** Principles of Pseudorandom Number Generation, Key Distribution & Management, RSA Algorithm, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.	

	UNIT – IV
	Digital Signatures: Digital signature concept & Applications, Digital signature standards.
	User Authentication: Remote User Authentication, Kerberos, X.509 directory service.
	UNIT – V
	Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, Cloud Computing, Cloud Security Risks and Countermeasures, Data Protection in the Cloud, Cloud Security as a Service
	Transport-Level Security: Web Security Considerations, Transport Layer Security, HTTPS, Secure Shell
	UNIT – VI
	Wireless Network Security: Wireless Security, Mobile Device Security,IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.
	IP Security: Overview, Encapsulating Security Payload, Internet Key Exchange
Text Books	1. Cryptography and Network Security: Principles and Practice-William Stallings, Pearson Education. 2. Network Security Essentials (Applications and Standards) by William Stallings, Pearson Education.
References	1. Fundamentals of Network Security, by Eric maiwald 2. Principles of Information Security by Whitman, Thomson. 3. Network Security - The Complete Reference by Robert Bragg.
E-Resources	1. WilliamStallings.com/Crypto/Crypto5e.html 2. www.Tutorialspoint.com

19CS3104 - ADVANCED DATABASE SYSTEMS

Course Category:	Program Core	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Require basics of database management system concepts.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Course Objectives	- To explain and evaluate the fundamental requirements that influences the design of modern database systems. - To assess and apply database functions and packages suitable for enterprise database development. - To evaluate alternative designs and architectures for databases and data warehouses - To discuss various advanced methods of storing, managing and interrogating complex data		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Study various database systems architectures, merits and demerits
	CO2	Analyze parallel Databases to study various operations
	CO3	Understand Distributed databases types, supporting environment and storage
	CO4	Acquire knowledge on Object Based Databases to develop different applications
	CO5	Know the Enhanced E-R features and Advanced Application Developments in Database
	CO6	Specifies the Temporal and spatial Databases, and various transaction processing methods to apply for various domains
Course Content	UNIT – I **Database-System Architectures**: Centralized and Client–Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems and Network Types. UNIT – II **Parallel Databases:** I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism and Query Optimization. UNIT – III **Distributed Databases:** Homogeneous and Heterogeneous Databases, Distributed Data Storages, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Distributed Query Processing, Heterogeneous Distribute Databases. UNIT – IV **Object-Based Databases:** Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.	

	UNIT – V **Database Design and the E-R Model:** Extended E-R Features, Alternative Notations for Modeling Data, Other Aspects of Database Design. **Advanced Application Development:** Performance Tuning, Performance Benchmarks, Other Issues in Application Development Standardization. **UNIT – VI** **Spatial and Temporal Data and Mobility:** Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases. **Advanced Transaction Processing:** Transaction-Processing, Monitors Transactional Workflows, E-Commerce, Main Memory Databases, Real-Time Transaction Systems.
Text Books and References	**Text Book:** 1. Abraham Silberschatz Henry F.Korth S.Sudarshan "Database System Concepts" Sixth Edition, PHI. **Reference Books:** 1. Raghuram Krishnan and Johnnes Gherke "Database Management System" Second Edition. 2. *Peter Rob*, CarlosCoronel, A.*Ananda Rao - "Database* Management Systems".
E-Resources	1. http://www.nptelvideos.in/2012/11/database-management-system.html 2. http://www.cse.iitb.ac.in/infolab/Data/Courses/CS632/

19CS31E1 - SOFTWARE ARCHITECTURE

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Need to know the fundamentals of Software engineering	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	- Understand basic software architecture requirements, views and patterns etc. - Evaluate software architecture and quality attributes - Select and use appropriate architectural styles - Explore appropriate key architectural structures,tactics and methods - Defining guidelines for documenting software Architecture		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basics of software architectural requirements, views, patterns and influences on business and technical issues
	CO2	Analyze the quality attributes and to apply the same to prepare the documentation based on the suitability of attributes
	CO3	Specify the key structures, tactics and patterns to design and specify the architecture.
	CO4	Study different methods of agility and understand the business goals using other methods including various design strategies
	CO5	Prepare a document for a given architecture using views
	CO6	Identify the factors that influence the management and governance
Course Content	UNIT – I **Introduction to Software Architecture:** Definitions**,** Architectural Structures and Views, Patterns, What Makes a "Good" Architecture. **Importance of Software Architecture:** System's Quality Attributes, change and prediction, communication enhancement, Design Decisions, Constraints, Influences, Evolutionary Prototyping, Improving Cost and Schedule Estimates, Transferable, Reusable Model, Independently Developed Components, Vocabulary of Design Alternatives and Training. UNIT – II **Context of Software Architecture:** Technical Context, Project Life-Cycle, Business, Professional**,** Stakeholders and influences. **Quality Attributes:**Understanding quality attributes, Availability, Interoperability, Modifiability, Performance and Security. UNIT – III **Architectural Tactics and Patterns:** Architectural Patterns, Overview, Relationships between Tactics and Patterns. **Quality Attribute Modeling and Analysis:** Modeling Architectures, Attribute Analysis and Checklists, Experiments, Simulations, and Prototypes, Different Stages of the Life.	

UNIT – IV

Architecture in Agile Projects: Overview, Agility and Architecture Methods, examples, Guidelines for the Agile.
Architecture and Requirements: Gathering ASRs from Requirements Documents, Stakeholders, Understanding the Business Goals, Utility Tree and Methods.
Designing an Architecture: Design Strategy, The Attribute-Driven Design Method and supporting steps.

UNIT – V

Documenting Software Architectures: Uses and Audiences for Architecture Documentation, Notations, and Views, Choosing and Combining Views, Building the Documentation Package, Documenting Behavior, Architecture Documentation and Quality Attributes.
Architecture, Implementation, and Testing: Architecture and Implementation, Architecture and Testing.
Architecture Reconstruction and Conformance: Architecture Reconstruction Process, View Extraction, Database Construction, View Fusion, Finding Violations and Guidelines.

UNIT – VI

Architecture Evaluation: Evaluation Factors, Architecture Tradeoff Analysis Method and Evaluation.
Management and Governance: Planning, Organizing, Implementing, Measuring and Governance.
Architecture in the cloud: Basic cloud definitions, Service models and deployment options, Economic justification, Base mechanisms, Sample Technologies, Architecture in a cloud environment.

Text Books and References:	**Text Book:** 1. Len Bass, Paul Clements, Rick Kazman "Software Architecture in Practice", Third Edition, Addison Wesley Publishers, 2013. **Reference Books:** 1. Mary Show, David Garlan**, "S/W Arch. Perspective: on an Emerging Discipline",** 1996, PHI. 2. Jeff Garland, Richard Anthony, "Large**-Scale Software Architecture A Practical Guide using UML**", John Wiley and Sons Ltd, 2003. 3. Oliver Vogel, Ingo Arnold, ArifChughtai, TimoKehrer "**Software Architecture A Comprehensive Framework and Guide for Practitioners**", Springer Publishers, 2009. 4. Ian Gorton, "**Essential Software Architecture**", Second Edition, Springer Publishers, 2011.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/university/iitm**

19CS31E2 - DISTRIBUTED SYSTEMS

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Student needs to have basic knowledge of any operating systems and networking.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Course Objectives	- Understand foundations of Distributed Systems. - Ability to communicate between distributed objects. - Introduce the idea of peer to peer services and various file systems. - Understand the Security techniques used in distributed systems.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Underdstand the basic characterization of distributed systems.
	CO2	Enabling the basics of networking and internetworking with interprocess communication.
	CO3	Understand the Communication between distributed objects.
	CO4	Explore the architecture of distributed file systems.
	CO5	Understand the peer to peer services withtransactions and concurrency control.
	CO6	Exposure to concurrency control in distributed transactions and security.

Course Content	**UNIT-I** **Characterization Of Distributed Systems:** Introduction, Examples of Distributed Systems, Resource Sharing and Web, Challenges, System Models: Introduction, Architectural and Fundamental Models. **UNIT-II** **Networking And Internetworking**: Types of Networks, Network Principles, Internet Protocols, Case Studies: Ethernet, Wifi, Bluetooth and Atm. **Interprocess Communication:** The Api For The Internet Protocols, Client-Server Communication,Group Communication, Case Study: Interprocess Communication In Unix. **UNIT-III** **Distributed Objects and Remote Invocation**: Communication Between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: Java Rmi. **Distributed File Systems:** Introduction, File Service Architecture, Case Study- Sun Network File Systems.

	UNIT-IV **Name Services:** Introduction, Name Services and The Domain Name System, Case Study of The Global Name Service. **Peer to Peer Systems:** Introduction, Napster and Its Legacy, Peer to Peer Middleware, Routing Overlays. **UNIT-V** **Transactions And Concurrency Control:** Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control. **UNIT-VI** **Distributed Transactions:** Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery. **Security:** Introduction, Overview of Security Techniques, Cryptographic Algorithms, Digital Signatures, Case Studies-Kerberos, 802.11 Wifi.
Text Books and References	**Text Books:** 1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education. 2. Distributed Systems, S.Ghosh, Chapman and Hall/CRC, Taylor & Francis Group, 2010. **Reference Books:** 1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press. 2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI. 3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/uiversity/iitm**

19CS31E3 - PATTERN RECOGNITION

Course Category:	Program Core		Credits:	3
Course Type:	Theory		**Lecture – Tutorial – Practical:**	3-0-0
Prerequisite:	Mathematics: basic understanding of differential and integral calculus, linear algebra and probability theory at least at the level of the course description of mathematics		**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives	- Introduce the concepts of feature extraction, Bayesian decision theory, nearest-neighbor rules, clustering, support vector machines, neural networks, classifier combination, and syntactic pattern recognition techniques such as stochastic context-free grammars. - The course is part lecture and part seminar: students will present some course material to the class as well as complete and present a research paper. - In addition, programming assignments will provide students with practical experience in constructing pattern recognition systems such as optical character recognizers (OCR).			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	● Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
	CO2	● Summarize, analyze, and relate research in the pattern recognition area verbally and in writing..
	CO3	● Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
	CO4	● Apply pattern recognition techniques to real-world problems such as document analysis and recognition.
	CO5	● Implement simple pattern classifiers, classifier combinations.
	CO6	●Implement structural pattern recognizers
Course Content	\multicolumn{2}{l}{ **UNIT – I** Introduction, Features, Feature Vectors, Classifiers, Supervised, Unsupervised and Semi-Supervised Learning. **UNIT – II** Introduction, Bayes Decision Theory, Discriminant Functions, Bayes Classification for Normal Distributions, Estimation of Unknown Probability Distributions: ML Parameter Estimation, MAP Estimation, Bayesian Inference, Maximum Entropy Estimation, Mixture Models, Non-Parametric Estimation, the Naïve-Bayes Classifier, the Nearest Neighbor Rule, Bayesian Networks.. **UNIT – III** Introduction, Linear Discriminant Functions and Decisions, Hyper-planes, The Perceptron algorithm, Least Square Methods, Mean Square Estimation Revisited, Logistic Discrimination, Support Vector Machines for Separable Classes, SVM for Non-Separable Classes, SVM for Multiclass Case, ϑ-SVM }	

	UNIT – IV XOR Problem, Two Layer Perceptron, ThreelayerPerceptrons, Algorithms Based On Exact Classification Of Training Set, The Backpropagation Algorithm, Variation Of Bp Theme, Choice Of Cost Function, Choice Of Network Size, Generalized Linear Classifiers **UNIT – V** Probabilistic Neural Networks, SVM-Nonlinear Case, Beyond SVM Paradigm, Decision Trees, Combining Classifiers, Boosting, Class Imbalance Problem **UNIT –VI** Introduction, Proximity Measures, Number of Possible Clusterings, Categories of Clustering Algorithms, Sequential Clustering Algorithms, Agglomerative Algorithms, Divisive Algorithms, Hierarchical Algorithms for Large Datasets.
Text Books and References:	**Text Books:** 1. Pattern Recognition by SergiosTheodoridis and KnostantinosKoutroumbas, Fourth Edition, Elsevier Publications, 2009, **Reference Books:** 1. Pattern Recognition By Narasimhamurthy V Susheeladevi 2. Introduction To Pattern Recognization And Machine Learning By M Narasimhamurthy V Susheeladevi
	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS31E4 - CLOUD COMPUTING

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		**Lecture – Tutorial – Practical:**	3-0-0
Prerequisite:	.Operating Systems, Internet, Network Security, Parallel Processing, Databases and various computing.		**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100
Course Objectives	- To introduce the broad perceptive of cloud architecture and model - To understand the concept of Virtualization and familiar with the lead players in cloud. - To understand the features of cloud simulator and apply different cloud programming model as per need. - To design of cloud Services and explore the trusted cloud Computing system			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Know basic idea about cloud computing vision and its developments.
	CO2	Learn taxonomy of Virtualization techniques in Cloud.
	CO3	Understand categories of cloud and its collaborative services.
	CO4	Study internal components and structure of Cloud models.
	CO5	Acquire knowledge on Aneka Cloud Application Platform.
	CO6	Explore various real time applications & cloud platforms in industry.
Course Content	**UNIT – I** **Introduction to Cloud**: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments. **UNIT – II** **Virtualization**: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. **UNIT – III** **Cloud Computing Architecture** : Introduction, Cloud Reference Model, Architecture ,Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance. **UNIT – IV** **Defining the Clouds for Enterprise**: Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. Scaling a cloud infrastructure - Capacity Planning, Cloud Scale. Disaster **Recovery**: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

	UNIT – V
	ANEKA: Cloud Application Platform Framework Overview, Anatomy Of The Aneka Container, From The Ground Up: Platform Abstraction Layer, Fabric Services, Foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode **UNIT – VI** **Cloud Applications**: Scientific Applications – Health Care, Geoscience And Biology. Business And Consumer Applications- Crm And Erp, Social Networking, Media Applications And Multiplayer Online Gaming**.** **Cloud Platforms in Industry:** Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google App Engine-Architecture and Core Concepts, Microsoft Azure- Azure Core Concepts, SQL Azure.
Text Books and References:	**Text Book:** 1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola,S.Thamarai Selvi from TMH 2013. **Reference Books:** 1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly 2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/university/iitm**

19CS31P1 - OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY

Course Category:	Program Core		Credits:	1.5
Course Type:	Laboratory		Lecture – Tutorial – Practical:	0-0-3
Prerequisite:	Knowledge in any object oriented programming language is required.		Sessional Evaluation:	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Objectives	To draw various UML diagrams and supporting relationships to explore the design and behavior of different applications			

Course Outcomes	Upon the successful completion of the course, the students will be able to:	
	CO1	Develop suitable UML diagrams for various applications or domains as and when required.

Course Content	1. Student Marks Analysis System (Draw the Class diagram). 2. Library Management System (draw the Collaboration diagram). 3. Medical Expert System (Draw the Activity diagram). 4. Course Registration System (Draw the Class and Activity diagram). 5. Order Processing System (Draw the Sequence diagram). 6. Online Railway Ticket Reservation System (Draw the Class and Sequence diagram).
Text Books and References	**TEXT BOOK(S):** 1. Grady Booch, James Rumbaugh, IvarJacobson: The Unified Modeling Language User Guide, Pearson Education. **REFERENCE BOOKS:** **1.** Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education. **2.** AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
E-Resources	1. https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm

19CS31P2 - CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	Lecture - Tutorial - Practical:	0-0-3
Prerequisite:	Knowledge in Computer Fundamentals and Basic Mathematical Fundamentals.	Sessional Evaluation: 40 Univ.Exam Evaluation: 60 Total Marks: 100	
Objectives	• To learn and practice the essentials of Encryption and Decryption Procedureof Cryptography.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basics of Encryption and Decryption Procedure of Cryptography.
Course Content	1. Write a Program for Caesar Cipher in Substitution Techniques. 2. Write a Program for Playfair Cipher in Substitution Techniques. 3. Write a Program for Hill Cipher in Substitution Techniques. 4. Write a Program for One-Time pad in Substitution Techniques. 5. Write a Program for RSA. 6. Write a Program for S-DES Algorithm. 7. Write a Program for Diffie-Hellman Algorithm. 8. Write a Program forElGamal Cryptosystem.	
Text Books and References:	**Text Books:** 1. Cryptography and Network Security: Principles and Practice-William Stallings, 6th Edition, Prentice Hall **Reference Books:** 1. Network Security Essentials (Applications and Standards) by William Stallings, Pearson Education. 2. Fundamentals of Network Security, by Eric maiwald. 3. Principles of Information Security by Whitman, Thomson. 4. Network Security - The Complete Reference by Robert Bragg	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							Max. Total Marks
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks	100
1	19SH3201	Management Science	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	19CS3201	Internet of Things	3	-	-	3	2	40	2	40		3	60	100
3	19CS3202	Artificial Intelligence	3	1	-	4	2	40	2	40		3	60	100
4	19CS3203	Data Warehousing and Mining	3	-	-	3	2	40	2	40		3	60	100
5		**Professional Elective - 2**	3	-	-	3	2	40	2	40		3	60	100
	19CS32E1	Software Project Management												
	19CS32E2	R Programming												
	19CS32E3	High Performance Computing												
	19CS32E4	Wireless Networks												
6	19AC3201	AC: Universal Human Values	2	-	-	-	2	40	2	40		3	60	100
		PRACTICALS												
7.	19CS32P1	Internet of Things Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8.	19CS32P2	Data Warehousing and Mining Lab	-	-	3	1.5	-	-	-	40		3	60	100
9.	19CS32MP	Mini Project	-	-	-	2	-	-	-	40		-	60	100
		TOTAL	17	1	6	21	-	240	-	360		-	540	900

AC: Audit Course

19SH3201 - MANAGEMENT SCIENCE

Course Category:	Basic Science		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Nil		Sessional Evaluation:	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Objectives	Students undergoing this course are expected to • Understand the disciplines of management science and manager's role in business and other decision-making. • Gain an overview of the process of developing and using quantitative techniques in decision making and planning. • Aware of the ethical dilemmas faced by managers and the social responsibilities of business. • Know the significance of strategic management in competitive and dynamic global economy			

	Upon the successful completion of the course, the students will be:	
Course Outcomes	CO1	Able to apply the concepts & principles of management in real life industry.
	CO2	Able to design & develop organization chart & structure for an enterprise.
	CO3	Able to develop marketing strategies based on product, price, place and promotion objectives.
	CO4	Able to manage human resources efficiently and effectively with best HR practices.
	CO5	Able to apply PPC techniques and Work-study principles in real life industry.
	CO6	Able to develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.
Course Content	**UNIT – I** **Introduction to Management**: Concept of Management — Functions of Management, Evolution of Management Thought: Taylor's Scientific Management Theory, Fayal's Principles of Management- Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles. **UNIT – II** **Design of Organization :** principles of Organization –Organisation process- Types of organisation: line ,line and staff organization, function ,committee, matrix, virtual, cellular, team organization. Boundary less organization, inverted pyramid structure, lean and flat organization. Managerial objectives and social responsibilities. **UNIT – III** **Strategic Management**: Corporate planning – Mission, Objectives, programmers, SWOT analysis – Strategy formulation and implementation.	

	Marketing Management: Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.
	UNIT – IV **Human Resources Management**- Manpower planning – Personnel management – Basic functions of personnel management, Job Evaluation and Merit Rating – Incentive plans. **UNIT – V** **Production and Operations management**: Plant Location and Plant Layout concepts-methods of production (Job, Batch & Mass)-Production Planning and control. Work study- Basic procedure involved in Method Study -Work Measurement. **UNIT – VI** **Project Management (PERT/ CPM):** Network Analysis- Programme Evaluation and Review Technique (PERT)- Critical Path Method (CPM)- identifying critical path- probability of completing the project within given time-Project Cost Analysis- Project Crashing (simple problems).
Text Books and References	**TEXT BOOK(S):** 1. Applied management Science and Operations Research Dr. T.P. Singh, Er. Arvind Kumar 2. Management Science A.R.Aryasri 3. Industrial Engineering and Management O.P.Kanna **REFERENCE BOOKS:** 1. Business organizations and management C.B.Gupta 2. Industrial Engineering and Management (Including Production Management) T.R.Banga,S.C.Sharma

19CS3201 - INTERNET OF THINGS

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Require Data communication and networking fundamentals		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To study about the fundamentals of Internet of Things, protocols used, its applications, programming language used and the programming about Raspberry Pi kit. • To study about the latest advancement in the Internet of Things			

		Upon the successful completion of the course, the students will be able to:
Course Outcomes	CO1	Knowing about the definition and characteristics of Internet of Things
	CO2	Distinguish between IoT and M2M and also manages IoT Systems using NETCONG protocol and YANG Data modeling Language
	CO3	Designing an IoT system independent of any specific product / programming language
	CO4	Knowledgeable about IoT Devices and Endpoints like Raspberry Pi, pcDuino, Cubieboard etc. and also makes some case studies on IoT Role in Environment, Agriculture etc.
	CO5	Good at deciding which Framework / Cloud Service to use for a specific IoT Application.
	CO6	Well conversant with a few tools like Chef and Puppet used in IoT
Course Content		## UNIT – I **Introduction and Concepts:** Introduction – Definition and characteristics of IoT, Physical design of IoT – IoT protocols, Logical design of IoT – Functional Communication models, communication API's, IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels & Deployment (6 levels) ## UNIT – II **IoT and M2M:** Introduction- Differences between IoT and M2M, Software Defined Networking and Network Function Virtualization **IoT System Management:** Need for IoT Systems Management, SNMP and its limitations, Network Operator Requirements, NECONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPPER Tools

UNIT – III

Design Methodology of IoT Platforms:

Introduction, Specification of: Purpose and Requirements, the process, Domain and Information Models, Service, IoT Levels, Functional and Operational Views. Device and Component Integration, Application Development. Weather Monitoring IoT System: Case Study, Why Python Language for IoT?

UNIT – IV

IoT Physical Devices and Endpoints:

Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Rapberry Pi Interfaces, Programming Raspberry Pi with Python, other IoT devices – pcDuino, BeagleBone Black, Cubieboard.

Case Studies Illustrating IoT Design: Cities – Smart Parking, Environment – Air Pollution Monitoring, Agriculture – Smart Irrigation

UNIT – V

IoT Physical Servers and Cloud Offerings:

Introduction, WAMP and AutoBahn Framework for IoT, Xively loud for IoT, Django the WebApp Framework, Designing RESTful web API (Extension over Django), Amazon Web Services for IoT – EC2 and AutoScaling, S3, RDS, SQS and EMR, SkyNet IoT Messaging Platform.

UNIT – VI

Tools for IoT:

Python Packages of interest for IoT – JSON, XML, HTTPLib, & URLib, SMTPLib. Tools For IoT: Setting up Chef and Puppet, Multi-tier Application Deployment creation using Chef and Puppet (comprising of HAProxy, Load Balancer, Django App Server and MongoDB Database Server). Steps for IoT Device Management with NETCONF-YANG and Smart Irrigation Management Case Study with the same.

Text Books and References	**TEXT BOOK(S):** 1. Vijay madisetti and ArshdeepBahga,"Internet of Things: Introduction to a New Age of Intelligence", First edition, Apress Publications 2013 **REFERENCE BOOKS:** 1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesnd, Stamatis Kamouskos, Dvaid Boyle, "From Machine-toMachine to the Internet of Things: Introduction to a New Age of Intelligence", First edition, Academic Press, 2014
E-Resources	**1.** https://nptel.ac.in/courses/106105166/ **2.** https://onlinecourses.nptel.ac.in/noc17_cs22/preview

19CS3202 - ARTIFICIAL INTELLIGENCE

Course Category:	Program Core		Credits:	4
Course Type:	Theory		Lecture – Tutorial – Practical:	3-1-0
Prerequisite:	Fundamentals of Networking, Analytical capabilities and logic orientations are required		Sessional Evaluation:	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Objectives	- To apply knowledge of computing and mathematics appropriate to the discipline. - To analyze a problem, and identify and define the computing requirements appropriate to its solution. - To design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.			

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basics of AI and study different types of supporting agent characteristics
	CO2	Know various Problem-solving agents and their behavior in real-world environment
	CO3	Understand and apply the fundamentals of AI search algorithms
	CO4	Know various knowledge representation techniques and its applicability
	CO5	Observe different Learning techniques for future implementation
	CO6	Know the concepts of Knowledge in explanation based learning and utilization
Course Content	\multicolumn{2}{l	}{ ## UNIT – I **Introduction**: Overview on A.I, History , The state of the Art, Intelligent Agents - Agents and Environments, Good behavior, The nature of Environments, the Structure of Agents. ## UNIT – II **Problem Solving**: Problem solving agents, toy problems, Real-world problems, searching for solutions. **Uninformed Search strategies**: BFS, DFS, Depth-limited search. ## UNIT – III **Informed Search strategies**: GBFS, A* search, Local search algorithms: Hill-climbing. **Constraint Satisfaction Problems**: Constraint Satisfaction Problems, Backtracking Search for CSPs, Local search for CSPs. ## UNIT – IV **Adversarial Search**: Games, optimal decision in games, Alpha-Beta pruning, Imperfect, Real-Time Decisions, **Knowledge and reasoning**: Logical Agents: Knowledge -based Agents, The WUMPUS world, Logic, Propositional Logic, Reasoning Patterns in Propositional logic. First-order Logic: Syntax and Semantics of First-Order Logic. }

	UNIT – V **Learning**: Learning from Observations- Forms of Learning, Inductive Learning, Learning Decision Trees, and Ensemble Learning. **UNIT – VI** **Knowledge in Learning**: A Logical formulation of learning, knowledge in learning, Explanation-Based Learning, Learning using Relevance Information.
Text Books and References	**TEXT BOOK(S):** 1. Artificial Intelligence- A Modern Approach, Stuart Russell, Peter Norvig (Person Education), 2nd edition. **REFERENCE BOOKS:** 1. Artificial Intelligence- Rich E & Knight K (TMH), 4th edition. 2. Artificial Intelligence Structures and Strategies complex problem Solving – George F. Lugar Pearson Education. 3. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992... 4. R.J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS3203 - DATA WAREHOUSING AND MINING

Course Category:	Program Core		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Require knowledge on Database Management System concepts.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• Learn the basic concepts of data warehousing and data preprocessing concepts • Explore the data mining and data classification, prediction and clustering techniques for various applications.			

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Know the importance of Data warehousing and Development methodologies
	CO2	Explore on Data warehousing design and modeling concepts for application development
	CO3	Learn the Implementation of ETL Process.
	CO4	Understand data mining and data-preprocessing techniques
	CO5	Identify the importance of Mining Frequent Patterns. to study various regression methods
	CO6	Study the classification and prediction, Cluster analysis and supporting major categories including outer analysis concepts to explore on various applications
Course Content	**UNIT – I** **Introduction to Data Warehousing**: Introduction, Data Warehouse, Data Warehousing, Framework of the Data Warehouse, Data Warehouse Options, Developing Data Warehouses, The Data Warehouse Development Life Cycle, Data Warehouse Development Methodologies. **UNIT – II** **Data Warehouse Design & Modeling**: Defining Dimensional Model, Granularity of Facts, Additivity of Facts, Functional Dependency of the Data, Slowly changing dimensions types, implementing rapidly changing Dimensions, Multi-use Dimensions, Designing: Identifying the source, Data Warehouse Architecture (ETL process). **UNIT – III** **Implementation of ETL Process:** Extract Processing, Interface Processing, Load into Staging, Transform and Prepare for Load, Load Process, Post Load Processing, Generic warehouse Population function. **UNIT – IV** **Introduction to Data Mining**: Data Mining, Architecture of Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Task Primitives, Major issues in Data Mining. **Data Pre-processing**: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.	

	UNIT – V **Attribute-Oriented Induction**: Characterization and Discrimination: Attribute-Oriented Induction for Data Characterization, mining class discriminations, presentation of both characterization and discrimination. **Mining Frequent Patterns, Associations and Correlations**: Basic concepts and a Road Map, the Apriori Algorithm, Generating Association Rules, improving the efficiency of Apriori, Mining Frequent Item sets without Candidate Generation. **UNIT – VI** **Classification and Prediction**: Issues regarding Classification and prediction, Decision Tree induction, Bayes' theorem, Naive Bayesian classification, Regression Methods. **Cluster Analysis**: Types of Data in clustering, Classification of Major Clustering Methods. **Outlier Analysis**: Types of Outliers, Classification of Major Outlier Analysis.
Text Books and References	**TEXT BOOKS:** 1. Data Warehousing Design, Development and Best Practices, Soumendra Mohanty, TMH. 2. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications, 2nd Edition. **REFERENCE BOOKS:** 1. Data Mining Introductory and Advanced Topics, Margaret H Dunhan, Pearson Education. 2. Data Mining, Ian H. Witten Eibe Frank, Morgan Kaufman Publications. **3.** The Data Warehouse Life Cycle Toolkit, Ralph Kimball, WILEY Computer publishing.
E-Resources	1. https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm

19CS32E1 - SOFTWARE PROJECT MANAGEMENT

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Student need to have knowledge in Software engineering	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To study how to plan and manage projects at each stage of the software development life cycle (SDLC) • To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process. • To understand successful software projects that support organization's strategic goals		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basics of software organization as related to project and process management.
	CO2	Recognize the basic capabilities of software project.
	CO3	Procure the basic steps of project planning and project management.
	CO4	Compare and differentiate organization structures and project structures
	CO5	Employ the responsibilities for tracking the software projects.
	CO6	Track the process automation and project control.
Course Content	**UNIT – I** **Conventional Software Management:** The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **UNIT – II** **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process. **UNIT – III** **Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.	

	UNIT – IV **Model based software architectures**: A Management perspective and technical perspective. **Work Flows of the process:** Software process workflows, Iteration workflows. **Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments. **UNIT – V** **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Project Organizations And Responsibilities: Line-Of-Business Organizations, Project Organizations, Evolution Of Organizations. **UNIT –VI** **Process Automation:** Automation Building Blocks, The Project Environment. **Tailoring The Process:** Process Discriminants. **Project Control And Process Instrumentation:** The Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations, Pragmatic Software Metrics, Metrics Automation.
Text Books and References:	**Text Books:** 1. Software Project Management, Walker Royce: Pearson Education, 2005. **Reference Books:** 1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition. 2. Software Project Management, Joel Henry, Pearson Education. 3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/university/iitm**

19CS32E2 - R PROGRAMMING

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Require fundamental knowledge in any programming language, mathematics and statistical techniques		Sessional Evaluation:	40
			Univ. Exam Evaluation:	60
			Total Marks:	100
Course Objectives	• Gain a foundational understanding of R Programming basics • Master the R programming and understand how various constructs are implemented in complex problems and applications			

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the fundamental building blocks of R programming
	CO2	Learn some of the commands and packages to develop simple programs
	CO3	Acquire knowledge of Various storage and retrieval techniques and applicability
	CO4	Study various types of viewing and forms of data objects for application development
	CO5	Adapt different types of testing methodologies and supporting comparative study
	CO6	Get the clear view of how to analyze methods using graphical representations based on statistical data
Course Content	## UNIT – I **Introduction to R programming:** History of R programming, Reserved words of R, Variables and constants of R, Operators of R, precedence and association of R, data types in R. Decision making statements in R programming. Iterative statements ,functions ,strings, arrays, vectors, lists, matrices, factors ,data frames, data reshaping and data interfacing. ## UNIT – II **R-command packages:** Standard Command Packages, Getting Extra Packages of R Commands-Installing Extra Packages for Windows, Running and Manipulating Packages , Loading Packages, Windows-Specific Package Commands. ## UNIT – III **Simple Math:** Use R Like a Calculator, Storing the Results of Calculations. **Reading and Getting Data into R:** Using the combine Command for Making Data, Entering Numerical and Text Items as Data, Scan Command for Making Data. **Reading Bigger Data Files:** read.csv () Command, Other Commands for Reading Data in R, Missing Values in Data Files. ## UNIT – IV **Viewing Named Objects**: Viewing Previously Loaded Named-Objects-Viewing All Objects, Viewing Only Matching Names and Removing Objects from R. **Manipulating Objects:** Manipulating Vectors, Manipulating Matrix and Data Frames, Manipulating Lists.	

	Constructing Data Objects: Making Lists, Making Data Frames, Making Matrix Objects. **Forms of Data Objects:** Testing and Converting , Testing to See What Type of Object You Have , Converting from One Object Form to Another , Convert a Matrix to a Data Frame, Convert a Data Frame into a Matrix, Convert a Data Frame into a List and Convert a Matrix into a list. ## UNIT – V **Simple Hypothesis Testing:** Using the Student's t-test, Two-Sample t-Test with Unequal Variance, Two-Sample t-Test with Equal Variance, One-Sample t-Testing, Using Directional Hypothesis Formula, Syntax and Sub setting Samples in the T-Test. **The Wilcoxon U-Test (Mann-Whitney):** Two-Sample U-Test, One-Sample U-Test, Using Directional Hypotheses, and Formula Syntax and Sub setting Samples in the U-test. **Paired t- and U-Tests :** Correlation and Covariance , Simple Correlation, Covariance, Significance Testing in Correlation Tests and Formula Syntax ## UNIT – VI **Introduction to Graphical Analysis:** **Box-whisker Plots :** Basic Box plots, Customizing Box plots, Horizontal Box plots, **Scatter Plots:** 2 Basic Scatter Plots, Adding Axis Labels, www. Plotting Symbols, Setting Axis Limits, Using Formula Syntax, Adding Lines of Best-Fit to Scatter Plots. **Pairs Plots:** (Multiple Correlation Plots) Line Charts , Line Charts Using Numeric Data , Line Charts Using Categorical Data, Pie Charts , Cleveland Dot Charts . Bar Charts: Single-Category Bar Charts and Multiple Category Bar Charts.
Text Books and References	**TEXT BOOK(S):** 1. Beginning R, the statistical programming language by Dr Mark Gardener. **REFERENCE BOOKS:** 1. "R Programming for Beginners: Fast and Easy Learning" by Steven Keller,**Kindle Edition**. 2. "A Handbook of Statistical Analyses Using R" by Brian Everitt and Torsten Hothorn. 3. "R Graphics Cookbook" by Winston Chang.
E-Resources	1. https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm

19CS32E3 - HIGH PERFORMANCE COMPUTING

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Need to have a basic knowledge in parallel and computing techniques.	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• Understanding basic concepts, architecture and theoretical models of parallel computers. • Importance of compiler transformations, key issues and performance evaluation in parallel operating systems.		

	Upon the successful completion of the course, the students will be able to:		
Course Outcomes	CO1	Explore the need for parallel computers and supporting types of instructions	
	CO2	Create awareness of structure of parallel computers	
	CO3	Study different types of parallel algorithms and their applicability	
	CO4	Acquire knowledge on compiler transformations for parallel computers.	
	CO5	Understand various operating systems for parallel computers	
	CO6	Study the performance evaluation of parallel computers	
Course Content	## UNIT – I **Introduction –** Introduction to Parallel Computers, Utilizing Temporal Parallelism, Utilizing Data Parallelism, Comparison, Data Parallel Processing with Specialized Processors. **Instruction Level Parallel Processing** - Pipelining, Delays, Difficulties, Superscalar Processors, Multithreaded Processors, Future Processor Architecture. ## UNIT – II **Structure of Parallel Computer -** Classifications, Vector Supercomputer, Array Processors, Systolic Array Processors, Shared Memory Parallel Computers, Interconnection Networks, Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers, Cluster of Workstations. ## UNIT – III **Parallel Algorithms-** Models of Computation, Analysis of Parallel Algorithms, Prefix Computation, Sorting, Searching, Matrix Operations, Practical Models of Parallel Computations. ## UNIT – IV **Compiler Transformations for Parallel Computers -** Issues in Compiler Transformations, Target Architecture, Dependence Analysis, Transformations, Transformations for Parallel Computers, Fine Grained Parallelism, Transformation Framework, Parallelizing compilers.		

	UNIT – V	
	Operating Systems for Parallel Computers - Resource Management, Process Management, Process Synchronization, Interprocess Communication, Memory Management, Input / Output Disk Arrays.	
	UNIT – VI	
	Performance Evaluation of Parallel Computers - Basics of Performance Evaluation, Sources of Parallel Overhead, Speedup Performance Laws, Scalability Metric, and Performance Analysis.	

Text Books and References	**TEXT BOOK:**
	  1. Parallel Computers: Architecture and Programming, V.Rajaraman and C.Sivaram Murthy, Prentice-Hall of India private Ltd., 2000.
	REFERENCES:
	  1. The Design and Analysis of Parallel Algorithms, SelimG.Akl, Prentice Hall International Inc, 1989.
	  2. Computer Architecture and Parallel Processing, Hwang K. Briggs F.A.McGraw Hill – 1985.	

E-Resources	**1.** https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm	

19CS32E4 - WIRELESS NETWORKS

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Need to have basics of computer networks	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Course Objectives	• To make the student understand the concepts of Wireless networks • To make the student take up further research as part of his higher studies		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understand the basics of wireless networks
	CO2	Learn various types of wireless networks
	CO3	Study the basics of wireless internet & Ad Hoc wireless networks
	CO4	Expose to the Quality of service standards in wireless network
	CO5	Deal with energy management issues wireless network
	CO6	Have Awareness on Recent Advances In Wireless Networks
Course Content	**UNIT – I** **Introduction:** Fundamentals, Characteristics, Modulation techniques, Multiple access techniques, voice coding, error control, computer networks, Computer network architecture, IEEE 802 standard, wireless network. **UNIT – II** **Wireless Wans And Mans:** Introduction, The Cellular Concept, Cellular Architecture, The First-Generation Cellular Systems, The Second-Generation Cellular Systems, The Third-Generation Cellular Systems, Wireless In Local Loop IEEE 802.16 Standard, Hi per access. **UNIT – III** **Wireless Internet**: Introduction, What Is Wireless Internet, Mobile IP, TCP In Wireless Domain, WAP, Optimizing Web Over Wireless. **Ad Hoc Wireless Networks:** Introduction: Cellular and Ad Hoc Wireless networks, Applications of Ad Hoc Wireless networks, Issues, Ad hoc wireless internet. **UNIT – IV** **Quality Of Service In Ad Hoc Wireless Networks:** Introduction, Issues And Challenges In Providing QOS In Ad Hoc Wireless , Networks, Classifications Of QOS Solutions, MAC layer Solutions, Network Layer Solutions, QOS Frameworks For Ad Hoc Wireless Networks. **UNIT – V** **Energy Management In Ad Hoc Wireless Networks:** Introduction, Need For Energy Management In Ad Hoc Wireless Networks, Classification Of Energy Management Schemes, Battery Management Schemes, Transmission Power Management Schemes,	

	System Power Management Schemes.
	UNIT – VI **Recent Advances In Wireless Networks**: Introduction, Ultra-Wide-Band Radio Communication, Wireless Fidelity Systems, Optical Wireless Networks, The Multimode 802.11, The Meghadoot Architecture.
Text Books and References:	**Text Books:** 1. Ad Hoc Wireless Networks: Architectures and Protocols – C. Siva Ram Murthy and B.S.Manoj, 2004, PHI. **Reference Books:** 1. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – JagannathanSarangapani, CRC Press 2. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19AC3201 - UNIVERSAL HUMAN VALUES

Course Category:	Audit Course		Credits:	0
Course Type:	Theory		Lecture - Tutorial - Practical:	2-0-0
Prerequisite:	SIP-Universal Human Values 1 (desirable)		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• Development of a holistic perspective based on self-exploration about human being, family, society and nature/existence. • Developing clear understanding of the harmony in the human being, family, society and nature/existence. • Strengthening of self-reflection. • Development of commitment and courage to act. • Know about appropriate management patterns with harmony.			

	Upon successful completion of this course students will be able to:	
Course Outcomes	CO1	Understand more about of themselves, and their surroundings (family, society, nature);
	CO2	Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
	CO3	Develop as a socially and ecologically responsible engineers.
	CO4	Justify the need for universal human values and harmonious existence.
	CO5	Relate human values with human relationship and human society.
	CO6	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
Course Content	**UNIT - I** **Introduction to Value Education**: Universal Human Values- I - Self-Exploration - content and process; 'Natural Acceptance' and Experiential Validation - Self-exploration - Continuous Happiness and Prosperity - Basic Human Aspirations - Current scenario - Method to fulfill the above human aspirations- Understanding and living in harmony at various levels. **UNIT - II** **Understanding Harmony in the Human Being - Harmony in Myself:** Human being as a co-existence of the sentient 'I' and the material 'Body' - The needs, happiness and physical facility - The Body as an instrument of 'I' - The characteristics and activities of 'I' and harmony in 'I' - The harmony of I with the Body **UNIT - III** **Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship:** Values in human relationship; meaning of Justice; Trust and Respect; Difference between intention and competence; the other salient values in relationship - the harmony in the society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society-	

Undivided Society, Universal Order- from family to world family.

UNIT - IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: The harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- Recyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence.

UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basic for Humanistic Education - Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: Professional competence – People-friendly and eco-friendly production systems - Appropriate technologies and management patterns for above production systems.

UNIT - VI

Case studies and Strategy: Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order:

  a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

  b) At the level of society: as mutually enriching institutions and organizations.

	Text Books: 1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.
Text Books and References	**Reference Books:** 1. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 2. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999. 3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 4. The Story of Stuff (Book). 5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 6. Small is Beautiful - E. F Schumacher. 7. Slow is Beautiful - Cecile Andrews 8. Economy of Permanence - J C Kumarappa 9. Bharat Mein Angreji Raj - PanditSunderlal 10. Rediscovering India - by Dharampal 11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi 12. India Wins Freedom - Maulana Abdul Kalam Azad 13. Vivekananda - Romain Rolland (English) 14. Gandhi - Romain Rolland (English)

E-Resources	1. https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ
	2. https://aktu.ac.in/hvpe
	3. http://www.storyofstuff.com
	4. https://fdp-si.aicte-india.org/download.php#1

19CS32P1- INTERNET OF THINGS LABORATORY

Course Category:	Program Core	Credits	1.5
Course Type:	Laboratory	Practical:	0-0-3
Prerequisite:	Python Programming and Knowledge about Linux operating system is required	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To design various simple programs using Raspberry Pi kit. • To develop and implement applications using IoT kit		

Course Outcomes	Upon the successful completion of the course, the students will be able to:		
	CO1	Know about the definition and characteristics of Internet of Things, Establishment of communication, connecting various devices and components to support different operating systems for application development
Course Content	1. Study of Raspberry Pi kit and Installation of NOOBS 2. Writing Hello World program 3. Connecting LED and changing its color 4. Connecting a Push Switch and toggling the switch to Raspberry Pi 5. Connecting a buzzer and touch sensor to Raspberry Pi 6. Sending SMS from a Python kit on the Raspberry Pi 7. Measuring the Humidity and Temperature using appropriate sensors (DHT22/AM2302) 8. Send email from a Linux terminal on the Raspberry Pi 9. Setting up a Web Server on Raspberry Pi 10. Setting up Wireless Access Point using Raspberry Pi 11. Controlling Raspberry Pi GPIO Pins using Telegram App	
Components Required	1. Raspberry Pi toolkit 2. Memory card 3. DHT22/AM2302 sensor 4. Bread board 5. Jumper cables 6. Buzzer 7. Multi colored LEDs 8. Any	
References	1. For Telegram GPIO Experiment https://circuitdigest.com/microcontroller-projects/control-raspberry-pi-gpio-with-telegram 2. For Webserver on RaspberryPi https://thepi.io/how-to-set-up-a-web-server-on-the-raspberry-pi/ 3. For configuring a Raspberry as an Access point https://circuitdigest.com/microcontroller-projects/setting-up-wireless-access-point-using-raspberry-pi 4. A link for Good number of IoT Projects https://circuitdigest.com/simple-raspberry-pi-projects-for-beginners	
E-Resources	1. www.w3schools.com 2. http://nptel.ac.in/courses	

19CS32P2 - DATA WAREHOUSING AND MINING LABORATORY

Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	Lecture – Tutorial – Practical:	0-0-3
Prerequisite:	Knowledge in Fundamental concepts of Data Warehouse and Data Mining.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	The course is designed to provide knowledge on Data Warehouse and Data Mining algorithms.		

Course Outcomes	Upon successful completion of the course, the students will be able to acquire knowledge on Data Warehouse and Data Mining algorithms.
Course Content	1. To create data in .csv format 2. To create data in .arff format 3. Preprocessing in Weka 4. Data Reduction Strategy – Dimensionality Reduction or Attribute Removal 5. Data Normalization 6. Classification in Weka Using Decision Trees 7. Decision Tree Induction Using J48 Classifier 8. Classification using Multilayer Perceptron 9. Classification using Naïve Bayes Classifier 10. Evaluating the Performance of IBK Classifier 11. Clustering using k-means algorithm 12. Association Rule Generation using Apriori 13. Data Discretization – To convert numeric data to categorical. 14. Weka Experiment Environment Using Simple Mode .

19CS32MP - MINI PROJECT

Course Category:	Program Core		Credits:	2
Course Type:	Implementation and Documentation		**Lecture - Tutorial - Practical:**	
Prerequisite:	Require the fundamental knowledge in a few core computing areas		**Sessional Evaluation:** 40 **Univ.Exam Evaluation:** 60 **Total Marks:** 100	
Objectives	• To apply the programming knowledge into a real-world situation/simple problem			

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.
Course Guidelines and Evaluation	**GUIDELINE/INSTRUCTION** • The mini project must be done alone. • Submit an early proposal with 1 or 2 page(s) report as per the schedule, description of functionality and how the final product will be. **PROCEDURE** • Formulate a real world problem and gather its requirements, and develop a design solution • Test and validate the conformance of the developed prototype against the original requirements of the problem • Work as a responsible member and possibly a leader of a team in developing software solutions • Participate in and possibly moderate, discussions that lead to making decisions • Express technical ideas, strategies and methodologies in written form to prepare and conduct oral presentations • Self-learning tools, algorithms, and/or techniques that contribute to the software solution of the project must be exposed • Generate alternative solutions, compare them and select the optimum one. **INTERNAL ASSESSMENT (40):** • The internal examination will be conducted by the department and the performance shall be evaluated by the concerned guide and two other senior faculty members act as examiners based on the reviews/reports. **EXTERNAL ASSESSMENT(60):** • The end examination will be conducted jointly by the Guide and another Examiner nominated by Principal/Director as per list given recommended from department **REPORT :** A report must be prepared based on the following contents: • Abstract/Synopsis	

	- Introduction - SRS – An agreement between Developer and Customer or end user (Refer any standard template followed by industry, Organization and any Institute as per current trends) - System Design – Description of modules/functions and basic UML diagrams to support the behaviour of the system - Detailed Design – Supporting UML diagrams to expose different levels of representations including behaviour, Interaction and partial implementation - Implementation details – Coding and Testing - Bibliography – Reference books, web sites and journals (if any)
References:	Refer any standard document/template which may be suitable for current development based on organization/Industry or Institute through various web sites.
E-Resources	Visit any software industry sites or Google for downloading sample formats/templates suitable to your project.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week L	T	D/P	Credits	Evaluation Sessional Test-I Duration In Hours	Sessional Test-I Max. Marks (24+6+10)	Sessional Test-II Duration In Hours	Sessional Test-II Max. Marks (24+6+10)	Total Sessional Marks (Max. 40)	End Semester Examination Duration In Hours	End Semester Examination Max. Marks	Max. Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks	100
1	19CS4101	Machine Learning	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	19CS4102	Data Analytics	3	-	-	3	2	40	2	40		3	60	100
3	19CS4103	Web Technologies	3	-	-	3	2	40	2	40		3	60	100
4		**Professional Elective –3**	3	-	-	3	2	40	2	40		3	60	100
	19CS41E1	Service Oriented Architecture												
	19CS41E2	Embedded Systems												
	19CS41E3	Image Processing and Visualization												
	19CS41E4	Adhoc & Sensor Networks												
5		Open Elective – 1	3	-	-	3	2	40	2	40		3	60	100
		PRACTICALS												
6.	19CS41P1	Machine Learning Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7.	19CS41P2	Data Analytics Lab	-	-	3	1.5	-	-	-	40		3	60	100
		TOTAL	15	-	6	18	-	200	-	280		-	420	700

19CS4101 - MACHINE LEARNING

Course Category	Professional Core	Credits	3
Course Type	Theory	Lecture – Tutorial – Practical	3-0-0
Prerequisite	Basic foundations in data Base and data Mining knowledge.	Sessional Evaluation Univ. Exam Evaluation Total Marks	40 60 100
Objectives	- Define machine learning and problems relevant to machine learning. - Differentiate supervised, unsupervised and reinforcement learning. - Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning. - Perform statistical analysis of machine learning techniques.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Recognize the characteristics of machine learning that make it useful to real-world Problems.
	CO2	Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised.
	CO3	Have heard of a few machine learning toolboxes.
	CO4	Be able to use support vector machines.
	CO5	Be able to use regularized regression algorithms.
	CO6	Understand the concept behind neural networks for learning non-linear functions.
Course Content	**UNIT-I** **Introduction:** Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. **Concept Learning:** Concept learning task, Concept learning as search, Find-S:finding a maximally specific Hypothesis, Version space and Candidate Elimination algorithm, Inductive Bias. **UNIT-II** **Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. **UNIT-III** **Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptrons, Multilayer networks and Back propagation algorithm. **UNIT-IV** **Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Naïve Bayes classifier, Bayesian belief networks, EM algorithm.	

Course Content	**UNIT-V** **Evaluating Hypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theory, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. **Instance Based Learning:** Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, **UNIT-VI**
	.**Reinforcement Learning:** Introduction, Learning Task, Q Learning, Non deterministic rewards and actions, Temporal difference learning, Generalizing from examples, relationship to dynamic programming..
Text Books and References:	**TEXT BOOKS:** 1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education. **REFERENCE BOOKS:** 1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics. 2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS4102 - DATA ANALYTICS

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Basic concepts of Data base Management Systems and Knowledge of Probability and Statistics	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To learn the principles and methods of statistical analysis - Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms. - To understand the techniques of time series and text analysis.		

	Upon the successful completion of the course, the students will be able to:
Course Outcomes	CO1 Understand the importance of learning the basics of Big Data analytics
	CO2 Learn the fundamentals of R and Hadoop to develop simple data analysis applications
	CO3 Learn and understand the various statistical methods
	CO4 Understand the basic concepts of supervised and unsupervised models
	CO5 Study and understand the time series analysis
	CO6 Learn and understand the text analysis and sentiment analysis.
Course Content	**UNIT-I** **Introduction to Big Data Analytics:** Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics. **Data Analytics Life Cycle:** Data Analytics Lifecycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, Case Study: Global Innovation Network and Analysis (GINA). **UNIT-II** **Analytic Methods Using R:** Introduction to R, Exploratory Data Analysis, Statistical Methods for Evaluation. **Advanced Analytics:** Analytics for Unstructured Data- MapReduce and Hadoop, The Hadoop Ecosystem, SQL essentials. **UNIT-III** **Regression:** Categorical Variable, Linear Regression, Logistic Regression, Ordinary Least Squares (OLS), Receiver Operating Characteristic (ROC) Curve, Residuals.

	UNIT-IV **Clustering:** Overview, K-Means, PAM, Density-Based Clustering **Classification:** Decision Tress, Naïve Bayes, Diagnostics of Classifiers **UNIT-V** **Time Series Analysis:** Overview, ARIMA Model, Building and evaluating ARIMA Model, Additional Methods-ARMAX,GARCH **UNIT –VI** **Text Analysis:** Text Analysis Steps, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TDIDF), Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.
Text Books and References	**TEXT BOOKS:** 1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC^2 Education Services, Published by John Wiley & Sons, Inc. **REFERENCE BOOKS:** 1. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition. 2. Student's Handbook for Associate Analytics – II, III. 3. Data Science & Big Data Analytics: ICT ACADEMY by DELL EMC. 4. Mining of Massive Datasets, Jure Leskovec Stanford Univ. AnandRajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.
E-Resources	1. https://nptel.ac.in/courses

19CS4103 - WEB TECHNOLOGIES

Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Need to have the knowledge of any one programming language.		Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Course Objectives	• To introduce PHP language for server-side scripting. • To introduce XML and processing of XML Data with Java. • To introduce Server-side programming with Java Servlets and JSP. • To introduce Client-side scripting with Javascript and AJAX.			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	gain knowledge of client-side scripting, validation of forms with PHP programming
	CO2	Understand server-side scripting with PHP language
	CO3	Understand what XML is and how to parse and use XML Data with Java.
	CO4	gain knowledge of client-side scripting, validation of forms with JS
	CO5	To introduce Server-side programming with Java Servlets.
	CO6	To introduce Server-side programming with JSP.
Course Content	### UNIT-I **Introduction to PHP:** Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, and lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies ### UNIT-II **File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories. ### UNIT-III HTML Common tags: List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java. ### UNIT-IV **Client-side Scripting:** Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation. ### UNIT-V **Introduction to Servlets:** Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.	

	UNIT-VI **Introduction to JSP:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.
Text Books and References:	**TEXT BOOKS:** 1. Web Technologies, Uttam K Roy, Oxford University Press 2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill **REFERENCES:** 1. Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech 2. Java Server Pages —Hans Bergsten, SPD O'Reilly, 3. Java Script, D.Flanagan 4. Beginning Web Programming-Jon Duckett WROX. 5. Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson. 6. Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/university/iitm**

19CS41E1 - SERVICE ORIENTED ARCHITECTURE

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite :	Need to have a basic knowledge in service oriented architecture and its models.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- Enable data to flow between applications in real-time - Move processes online for self-service functionality - Increase overall development efficiency - Multiply the benefits of individual projects - Enables real-time integration, faster integration of new systems and reduces spread of data. - Enables exposure of functionality in portals and distributed development of mobile apps.			

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Exploring the Software oriented Architecture and web services
	CO2	Understanding the details of web services technologies like WSDL, JAX, XML etc.
	CO3	Aware of the Business Process Management.
	CO4	be familiar with the Meta data management in SOA.
	CO5	Knowledge on Web Services Security.
	CO6	have knowledge of Advanced messagesand Transaction processing.
Course Content	**UNIT-I** **Introduction to SOA with Web Services:**The Service-Oriented Enterprise, Service-Oriented Development Service-Oriented Architecture, SOA and Web Services, Rapid Integration, Multi-Channel Access, Extended Web Services Specifications **UNIT-II** **SOA and Web Services for Integration:** Overview of Integration,Integration and Interoperability Using XML and Web Services,Two Approaches for Using XML and Web Services forIntegration and Interoperability,Applying SOA and Web Services for Integration,J2EE Interoperability. **UNIT-III** **SOA and Business Process Management:**Basic Business Process Management Concept,Example Business Process, Combining BPM, SOA, and Web Services, Orchestration and ChoreographySpecifications,Example of Web Services, Composition **UNIT-IV** **Meta data management**: The Simple Approach to Metadata Management Metadata Specifications ,Policy ,WS-MetadataExchange	

	UNIT-V **Web Services Security:**Core Concepts,Challenges, Threats, and Remedies,Securing the Communications Layer,Message-Level, Security,Data-Level Security. **UNIT-VI** **Advanced messaging**:Reliable Messaging,Notification. **Transaction processing**: Paradigm, protocols and coordination, transaction specifications.
Text Books and References	**TEXT BOOK:** 1. Understanding SOA with Web Services by Eric Newcomer, Greg Lomow, and Pearson Education. **REFERENCES:** 2. Web Services Security by Mark O' Neill, et al., Tata McGraw-Hill Edition, 2003. 3. Service –Oriented Architecture for Enterprise Applications by Shankar Kambhampaly, Wiley.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS41E2 - EMBEDDED SYSTEMS

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Require Embedded system basics and fundamentals of embedded system features.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	- To introduce the Building Blocks of Embedded System - To have knowledge about the basic working of a microcontroller system and its programming in assembly language. - To provide experience to integrate hardware and software for microcontroller applications systems.			

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Know the importance of embedded computing, design process.
	CO2	Learn about the basics and architecture of 8051 microcontroller and interrupts and assembly language programming.
	CO3	Study the various logical and arithmetic operations in assembly language.
	CO4	Know the basics of Real time operating system.
	CO5	Learn the design of real time operating system basics.
	CO6	Study various debugging techniques.
Course Content	## UNIT-I **Embedded Computing**: Introduction, Complex Systems and Microprocessor, The Embedded System Design Process, Formalisms for System Design, Design Examples. ## UNIT-II **The 8051 Architecture**: Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Serial data Input/output, Interrupts. **Basic Assembly Language Programming Concepts**: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051. ## UNIT-III Data Transfer and Logical Instructions, Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions. **Applications**: Interfacing with Keyboards, Displays,D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. ## UNIT-IV **Introduction to Real–Time Operating Systems**: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Events, Memory Management, Interrupt Routines in an RTOS Environment.	

	UNIT-V
	Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real -Time Scheduling Considerations, Saving Memory and Power, An example RTOS like µC OS (Open Source).
	UNIT-VI
	Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System.
	Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System
Text Books and References	**TEXT BOOKS:** 1. Computers as Components-principles of embedded computer system design, Wayne Wolf, Elsevier. 2. The 8051 Microcontroller, Third Edition, Kenneth J. Ayala, Thomson. 3. An Embedded Software Primer, David E. Simon, Pearson Education. **REFERENCE BOOKS:** 1. Embedding system building blocks, Labrosse, via CMP publishers. 2. Embedded Systems, Raj Kamal, TMH. 3. Micro Controllers, Ajay V Deshmukhi, TMH. 4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
E-Resources	1. https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm

19CS41E3 - IMAGE PROCESSING AND VISUALIZATION

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Knowledge in Computer Systems, Matrix Algebra, Calculus in Three Dimensions and coordinate transformations.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	• To get familiar with digital image fundamentals • To get exposed with simple image enhancement, compression, segmentation and restoration techniques in spatial and frequency domain		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Learn the fundamental elements of image processing and its applications.
	CO2	Understand the basic image transformations and image enhancement.
	CO3	Demonstrate concepts of various filtering techniques for image representation.
	CO4	Represent various colour models used in wavelet coding techniques.
	CO5	Analyze the concept of mathematical techniques for image compression and segmentation.
	CO6	Describe fundamental mathematical concepts used for representing and visualizing 3D objects.

Course Content	**UNIT - I** **Introduction** – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels. **UNIT - II** **Spatial Domain:** Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. **UNIT - III** **Noise models**– Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering-Minimum Mean Square Error Filtering-Constrained Squares Least Filtering-Geometric Mean Filter. **UNIT –IV** **Color Models:** The RGB Color Model- The CMK and CMYK Color Model. **Wavelets** – SubBand Coding – The Haar Transform- Multiresolution Expansions – Wavelet Transforms in One Dimension.

	UNIT –V **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding–Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards. **Segmentation**: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation; Morphological watersheds. **UNIT - VI** **Boundary Representation –** Chain Code – Polygonal approximation, signature, boundary segments–Boundary Descriptors – Shape number – Fourier Descriptor, moments- Regional Descriptors–Topological feature, Texture – Moments of Two Dimensional Functions-Relational Descriptors.

Text Books and References:	**Text Books:**
	  1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Second Edition, Pearson Education.
	Reference Books:
	  1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
	  2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
	  3. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
	  4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS41E4 - ADHOC & SENSOR NETWORKS

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Wireless Sensor Networks	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100
Course Objectives	- To study the fundamentals of wireless Ad-Hoc Networks. - To study the operation and performance of various Adhoc wireless network protocols. - To study the architecture and protocols of Wireless sensor networks.		

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Understanding the basis of Ad-hoc wireless networks.
	CO2	Learn the design, operation and the performance of MAC layer protocols of Adhoc wireless networks.
	CO3	Expose to the design, operation and the performance of Routing protocols of Adhoc wireless network.
	CO4	Familiar with the Security protocols of Adhoc wireless networks.
	CO5	Distinguish between protocols used in Adhoc wireless network and wireless sensor networks.
	CO6	Describe the routing and power management in hybrid wireless networks.
Course Content	**UNIT-I** **Wireless LANs and PANs:** Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF. **Ad Hoc Wireless Networks:** Introduction, Issues in Ad Hoc Wireless Networks. **UNIT-II** **MAC Protocols:** Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention Based MAC Protocols with Scheduling Mechanisms. **UNIT-III** **Routing Protocols:** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols. **UNIT-IV** **Security Protocols:** Security in Ad Hoc wireless networks, Network security	

requirements, Issues and Challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad Hoc wireless Networks.

UNIT-V

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

UNIT-VI

Hybrid Wireless Networks: Introduction, Next generation hybrid wireless architecture, Routing in Hybrid wireless networks, Pricing In multi-hop wireless networks, power control schemes in hybrid wireless networks, Load balancing in hybrid wireless networks.

Text Books and References:	**Text Books:** 1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008. **Reference Books:** 1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006. 2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication – 2002. 3.Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005 4. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007. 5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS41P1 - MACHINE LEARNING LABORATORY

Course Category	Professional Core	Credits	1.5
Course Type	Practical	**Lecture – Tutorial – Practical**	0-0-3
Prerequisite:	Basic knowledge in DBMS and preliminary fundamentals of data mining algorithms.	**Sessional Evaluation** **Univ. Exam Evaluation** **Total Marks**	40 60 100
Objectives	• To study various machine learning models for building applications.		
Course Outcomes	At the end of this lab session, the students will be able to identify and understand various machine learning algorithms to develop applications using either Python or JAVA.		
Course Content	1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. 3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. 5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set. 7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API. 8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using *k*-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program. 9. Write a program to implement *k*-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. 10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.		
Text Books and References:	1. Tom M. Mitchell, Machine Learning**,** India Edition 2013, McGraw Hill Education. 2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.		

19CS41P2 - DATA ANALYTICS LABORATORY

Course Category:	Professional Core	Credits	1.5
Course Type:	Laboratory	Practical:	0-0-3
Prerequisite:	Require the basics of Database Management Systems and Knowledge of Probability and Statistics	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Course Objectives	- To implement Map Reduce programs for processing big data - To realize storage of big data using H base - To analyze big data using linear models - To analyze big data using machine learning techniques such as Decision tree classification and clustering		

Course Outcomes	Upon the successful completion of the course, the students will be able to:	
	CO1	- Process big data using Hadoop framework - Build and apply linear and logistic regression models - Perform data analysis with machine learning methods - Perform graphical data analysis
Course Content	**Hadoop** 1. Install, configure and run Hadoop and HDFS 2. Implement word count / frequency programs using MapReduce 3. Implement an MR program that processes a weather dataset R **R** 4. Implement Linear and logistic Regression 5. Implement Decision tree classification techniques 6. Implement clustering techniques 7. Visualize data using any plotting framework 8. Implement an application that stores big data in Hbase / R	
Text Books and References	**Text Books**: 1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC2 Education Services, Published by John Wiley & Sons, Inc. 2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reily Media, 2012. **Reference books:** 1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013). 3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press. 4. SeemaAcharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015	
E-Resources	**1.** https://nptel.ac.in/courses **2.** https://freevideolectures.com/university/iitm	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
AFFILIATED TO JNTUA, ANANTAPURAMU
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER
COMPUTER SCIENCE & ENGINEERING
SCHEME OF INSTRUCTION and EVALUATION
(With effect from the batch admitted in the academic year 2019-2020)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							Max. Total Marks
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		
		THEORY	L	T	D/P		Duration In Hours	Max. Marks (24+6+10)	Duration In Hours	Max. Marks (24+6+10)		Duration In Hours	Max. Marks	
1		**Professional Elective - 4**	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
	19CS42E1	Software Testing and Quality Assurance												
	19CS42E2	Intelligent Software Agents												
	19CS42E3	Mobile Application Development												
	19CS42E4	Natural Language Processing												
2		Open Elective –2	3	-	-	3	2	40	2	40		3	60	100
3	19CS42IS	Internship	-	-	-	2	-	-	-	40		3	60	100
4	19CS42MO	Massive Open Online Courses(MOOCs)	-	-	-	3	-	-	-	40		-	60	100
5	19CS42PR	Project	-	-	-	11	-	-	-	80		-	120	200
		TOTAL	6	-	-	22	-	80	-	240		-	360	600

19CS42E1 - SOFTWARE TESTING AND QUALITY ASSURANCE

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Knowledge of Software Engineering basics is required	Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• To understand various types ofsoftware testing techniques • To gain knowledge about manual and automated testing methods. • To study of different Software quality assurance standards and maturity models.		

	Upon the successful completion of the course, the students will be able to:
Course Outcomes	CO1 Understand the Unit and Control flow testing concepts and applicability.
	CO2 Acquire knowledge on Data flow and Domain testing concepts to apply for software project.
	CO3 Apply System integration testing and System test design issues for modules.
	CO4 Get the idea of System test planning, automation and execution.
	CO5 Gain the knowledge in Acceptance testing and software reliability.
	CO6 Apply various Maturity models to improve quality in software development.

UNIT-I

Unit Testing: Concept of Unit testing, Static Unit testing, Defect Prevention, Dynamic Unit testing, Mutation testing, Debugging, Unit testing in eXtreme programming, JUnit:Framework for unit testing, Tools for unit testing.

Control Flow Testing: Outline of control flow testing, Control flow graph, Paths in a control flow graph, Path selection criteria, and Generating test inputs.

UNIT-II

Data Flow Testing: Data flow anomaly, Overview of dynamic dataflow testing, Data flow graph, Data flow terms, Data flow testing criteria, Comparison of data flow test selection criteria, Comparison of testing techniques.

Domain Testing: Domain error, Testing for Domain errors, Sources of domains, Types of domain errors, ON and OFF points, Test selection criterion.

UNIT-III

System Integration Testing: Concept of Integration testing, Different types of Interfaces and interface errors, Granularity of system integration testing, System integration techniques, Software and Hardware integration, Test plan for system integration, Off-the –shelf component integration.

System Test Design: Test design factors, Requirement identification, Characteristics of Testable requirements, Test objective identification, Modeling a test design process, Modeling test results.

UNIT-IV

System Test Planning and Automation: Structure of a system test plan, Assumptions, Test

approach, Test suite structure, Test environment, Test execution strategy, Test effort estimation, Scheduling and Test milestones, System test automation, Evaluation and selection of test automation tools, Test selection guidelines for automation.

System Test Execution: Basic ideas, Modeling defects, Metrics for tracking system test, orthogonal defect classification, defect casual analysis, Beta testing, system test report.

UNIT-V

Acceptance Testing: Types of acceptance testing, Acceptance criteria, Selection of acceptance criteria, Acceptance test plan, Acceptance test execution, Acceptance test report, Acceptance testing in eXtreme programming.

Software Reliability: What is Reliability? Definitions of Software Reliability, Factors influencing software reliability, Applications of software reliability, Reliability models.

UNIT-VI

Software Quality: Five views of software quality, McCall's quality factors and criteria, ISO 9126 Quality characteristics, ISO 9000:2000 Fundamentals, ISO 9000:2000 Requirements.

Maturity Models: Basic idea in software process, CMMI architecture, Five levels of maturity and key process areas, Common features of key practices, Application of CMM, Capability Maturity Model Integration, Test process improvement, Testing Maturity Model.

Text Books and References	**TEXT BOOKS:** 1. Software Testing and Quality Assurance: Theory and Practice by KshirasagarNaik, PriyadarshiTripathy, Wiley Publications. **REFERENCE BOOKS:** 1. Software quality assurance – from theory to implementation by Daniel Galin, Pearson education, 2009. 2. Foundations of software testing by AdityaMathur, Pearson Education, 2008 3. Software testing – principles and practices by SrinivasanDesikan and Gopalaswamy Ramesh, Pearson education, 2006 4. Software testing by Ron Patton, second edition, Pearson education, 2007 5. Software Quality Theory and Management by Alan C Gillies, CengageLearning, Second edition, 2003
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19CS42E2 - INTELLIGENT SOFTWARE AGENTS

Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Need to have knowledge in Artificial Intelligence	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	• To learn the principles, architecture, design and roles of software agents		

	Upon the successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Learn the fundamental concepts of software agents in Information Society.
	CO2	Know when multi-agent system is useful.
	CO3	Understand the security issues in multi-agent systems.
	CO4	Explore development methods and tools in the design of software agents.
	CO5	Design applications of Intelligent Software Agents.
	CO6	Specify how Intelligent Software Agents are useful in real-world.
Course Content	**UNIT-I** **Agents as Tools of the Information Society:** On the Way to the Information Society, Tools of the Information Society, Intelligent Software Agents, Economic Potential. **Fundamental Concepts of Intelligent Software Agents:** Definition of Intelligent Software Agents, Characteristics of Intelligent Software Agents, Classification**.** **UNIT-II** **Base Modules of Agent Systems:** Areas of Influence, Architecture, Communication and Cooperation in Multi-Agent Systems, Learning and Planning in Multi-Agent Systems, Security. **UNIT-III** **Demands Made on The Base Systems**-Introduction, Agent Runtime Environment, Middleware, Computer Operating System And Communications System. **Development Tendencies-** Introduction, Intelligent Agents In Multimedia Environments, Multimedia And Intelligent Agents. **UNIT-IV** **Agent-Oriented Analysis and Design-Object**- Oriented Analysis, Agent-Oriented Methods. **Agent Languages**- Requirements, Java, Telescript, Tcl/ Tk, Safe-Tcl, Agent-Tcl, Component-Based Software Development.	

	UNIT-V
	Application Areas for Intelligent Software Agents: Introduction, Information Retrieval and Filtering: Introduction, Simple Search Engines, Meta Search Engines.
	News Watcher: Introduction, Market Overview, Pointcast Network, Free Loader, Concepts, Architecture.
	Advising And Focusing: Introduction, Market Overview, Ibm Web Browser Intelligence, Letizia.
	UNIT-VI
	Entertainment: Introduction, Market Overview, Life style Finder, Firefly. **Groupware:** Introduction, Market Overview, Lotus Notes Mail, MAXIMS, PLEIADES.
	Electronic Commerce: Introduction, Simple Buying Agents, Complex Buying Agents, Agent-Based Marketplace. Manufacturing.
Text Books and References:	**Text Book:** 1. Intelligent software agents: foundations and applications by Walter Brenner, RüdigerZarnekow, Hartmut Wittig Springer, 1998. **Reference Books:** 1. Intelligent Software Agents, Rich ardMurch, Tony Johnson, Prentice Hall, 2000. 2. Software Agents, Bradshaw, MIT Press, 2000.
E-Resources	1. **https://nptel.ac.in/courses** 2. **https://freevideolectures.com/university/iitm**

19CS42E3 - MOBILE APPLICATION DEVELOPMENT

Course Category:	Professional Elective		Credits:	3
Course Type:	Theory		Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Awareness on programming languages, operating systems and mobile usage.		Sessional Evaluation: Univ. Exam Evaluation: Total Marks:	40 60 100
Objectives	• Implement the design using specific mobile development frameworks • Develop and deploy the mobile applications in marketplace for distribution			

	Upon successful completion of the course, the students will be able to:	
Course Outcomes	CO1	Gain knowledge in the accessibility and usability features for mobile innovation
	CO2	Know the web content accessibility guidelines for mobile.
	CO3	Understand the overview of Mobile applications and Mobile interface.
	CO4	Implement the design and application development using Android SDK.
	CO5	Practice the skills of 2D graphics and UI design as well as multimedia in Android mobile apps.
	CO6	Explore the techniques of mobile cloud computing in mobile applications deployment.
Course Content	### UNIT-I **Accessibility**: The Telephone and Accessible Innovation, Understand Disability, The Business Case for Accessibility, Advocating for Accessibility, The History of Inclusive Thinking: Universal and Inclusive Design ### UNIT-II **Inclusive Thinking:** Persona Spectrum, Digital Inclusion, Users, Empathy. **Web Content Accessibility Guidelines for Mobile:** Perceivable, Understandable, Robust ### UNIT-III **Overview of Mobile App and Mobile Interface:** Mobile System, Mobile Interface and Applications, Big Data Application in Mobile Systems, Data Security and Privacy Protection in Mobile Systems, Concept of Mobile Apps, Brief Introduction of Android and its Framework ### UNIT-IV **Quick Start on Android:** Installing Java, Installing Integrate Development Environment, Installing Android SDK, Creating an Android Application, Android Virtual Device. **Introduction of Key Concepts of Android:** App Components-Activities, Services, Content Providers, Intents. App Resources, App Mainfest. ### UNIT-V **2-D Graphics and Multimedia in Android:** Introduction of 2-D Graphics Techniques- Color, Paint, Path, Canvas, Drawable, Button Selector. Advanced UI Design-Multiple Screens, Action	

	Bar, Custom Views. Overview of Multimedia in Android, Audio Implementations in Android, Executing Video in Android.
	## UNIT-VI
	Data Storage and SQLite Operations: Local Data- Internal and External Storage, Save a File, Delete a File, SQLITE Database-Table Structure, Crud Operations, Usage of SQLITE Techniques
	Mobile Cloud Computing in Mobile Applications Deployment: Concepts and main techniques Of Mobile Cloud Computing, Mobile Cloud Computing Architecture
Text Books and References:	**Text Books:** 1. Rob Whitaker, Developing Inclusive Mobile Apps: Building Accessible Apps for iOS and Android, A Press, 2020. 2. MeikangQiu, Wenyun Dai, and Keke Gai "Mobile Applications Development with Android Technologies and Algorithms", CRC Press, Taylor & Francis Group, 2017. **Reference Books:** 1. Jeff McWherter and ScottGowell, "Professional Mobile Application Development", Wrox, 2012 2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
E-Resources	1. http://developer.android.com/develop/index.html

19CS42E4 - NATURAL LANGUAGE PROCESSING

Course Category:	Program Elective	Credits:	3
Course Type:	Theory	Lecture – Tutorial – Practical:	3-0-0
Prerequisite:	Data structures, finite automata and probability theory Course	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives	Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.		

	Upon the successful completion of the course, the students will be:	
Course Outcomes	CO1	Able to show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
	CO2	Able to understand the mathematical and linguistic concepts of NLP
	CO3	Able to understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
	CO4	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods
	CO5	Able to design, implement, and analyze NLP algorithms
	CO6	Able to design different language modelling Techniques
Course Content	**UNIT-I** **Finding the Structure of Words:** Words and Their Components, Issues and Challenges, Morphological Models. **Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, Performances of the Approaches. **UNIT-II** **Syntax Analysis:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues **UNIT-III** **Semantic Parsing:** Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software, Predicate-Argument Structure, Meaning Representation Systems, Software. **UNIT-IV** **Structure Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling	

	UNIT-V **Recognizing Textual Entailment:** Introduction, The recognizing textual entailment task, The framework for recognizing textual entailment, Case Studies. **UNIT-VI** **Multilingual Sentiment and Subjectivity Analysis:** Introduction, definitions, sentiment and subjectivity analysis on English, Word and Phrase-Level Annotations, Sentence-Level Annotations, Document-Level Annotations.
Text Books and References	**TEXT BOOK(S):** 1.Multilingual Natural Language Processing Applications : From Theory To Practice-Daniel M.Bikel and ImedZitouni , Pearson Publications. **REFERENCE BOOKS:** 1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993. 2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008. 3.Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
E-Resources	1. **https://onlinecourses.nptel.ac.in/noc18_cs13/preview** 2. **https://books.google.co.in/books?isbn=8126510757**

19CS42IS - INTERNSHIP

Course Category:	Internship	Credits:	2
Course Type:	Interaction with Industry.	Lecture - Tutorial - Practical:	
Prerequisite:	Require the fundamental knowledge in a few core computing areas and basics of any programming language.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	• Explore career alternatives prior to integrate theory and practice. • Assess interests and abilities in their field of study. • Identify, write down, and carry out performance objectives (mutually agreed upon by the employer and the student) related to their job assignment.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Gain more experience at identifying the necessary technical and non-technical methods needed to solve an industrial problem.
Course Guidelines and Evaluation	**GUIDELINES:** Every student shall undergo a four-week internship during the B.Tech programme. The internship may be completed in a phased manner with a minimum duration of one week in any phase during inter-semester break / summer vacation. The student shall obtain prior permission from the concerned head of the department regarding the industry / company in which the internship is to be carried out. Every student shall submit a report on the work carried out during the internship in the format specified by the department and shall also submit evidence of on-site internship from the concerned authorities in the industry / company in which the internship is carried out. The report of internship will be evaluated by the examiners for the award of two credits at the end of 42 semester. **INTERNAL ASSESSMENT (40):** The sessional marks will be awarded based on the performance during Internship at the Industry/Company. The distribution of sessional marks shall be 10 for the preparatory work before commencing Internship and 30 for the performance awarded by the supervisor at the Industry. **EXTERNAL ASSESSMENT (60):** The end Examination will be conducted jointly by the Guide and another Examiner nominated by Principal/Director as per list recommended from department.	
References	Go through the course regulations and guide lines given by Internal Review Committee appointed by department.	
E-Resources	Visit the college web site for reference and supporting guidelines.	

19CS42MO - MASSIVE OPEN ONLINE COURSES

Course Category:	MOOCs	Credits:	3
Course Type:	Online Course	Lecture - Tutorial - Practical:	
Prerequisite:	Require the fundamental knowledge in a few core computing areas and basics of programming language.	Sessional Evaluation: Univ.Exam Evaluation: Total Marks:	40 60 100
Objectives	- To captured the interest and attention of academics chosen by student to improve his/her knowledge and learning skills other than curriculum. - Conventional teaching tool are exposed in a well-defined manner rather traditional tools. - Choose the best course which is suitable for current industry expectations. - Open access to any one can participate in an online course for free and courses are designed to support an indefinite number of participants.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Identify and observe various teaching methods, tools and acquire knowledge in any advanced domain as per his/her interest/choice.
Course Evaluation	Massive Open Online Courses (MOOCs) are freely available courses offered online for distance based learners who have access to the internet. It enables the students to access high quality reading resources, take tests and allocate academic grades. Students may register for the course of minimum 40 hours duration offered by authorized Institutions/Agencies through online at any time from the 31semester with the approval of the Head of the Department concerned. This course may be completed by the end of 42 semesters. The certificate issued by the Institutions/Agencies after successful completion of the course will be considered for the award of the grade to that course in 42 semesters. In case a student fails in securing the grade from the Authorized Institutions/Agency, the assessment will be done by the department concerned by conducting a test in the course and credits are awarded on passing the course. **INTERNAL ASSESSMENT (40):** The performance shall be evaluated by the faculty concerned based on the reviews. **EXTERNAL ASSESSMENT (60):** The end Examination will be considered based on getting certificates issued by the Institute/Agencies after successful completion of the course will be for the award of the grade to that course in 4-2 semester.	
References	Visit any IITs or other Institutions offering MOOCs to know the guidelines, Course structure, number of modules and examination pattern to get the certificate based on out of the time boundaries.	
E-Resources	Search the Internet and get the information to download hard copy of resources(Digital videos) as per the concern of Interest.	

19CS42PR - PROJECT

Course Category:	Professional Core	**Credits:**	11
Course Type:	Implementation and Documentation	**Lecture - Tutorial - Practical:**	
Prerequisite:	Require the fundamental knowledge in a few core computing areas and basics of programming language.	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	80 120 200
Objectives	• Acquire practical knowledge within the chosen area of technology for project development. • Develop effective communication skills for presentation of project related activities.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.

Course Content	**GUIDELINE/INSTRUCTION** • The project must be done in a group of 3 to 4 students. • Each group must prepare a title that relates to any engineering discipline and the title must emulate any real-world situation. • Submit an early proposal with 1 or 2 page(s) report as per the schedule, description of functionality and how the final product will be. **ASSESSMENT (Internal - 80 and External - 120)** **Internal - 80** • Project title and problem definition– 15 % • Analysis and Design - 20 % • Implementation – 25 % • Final report(Guide lines are given below) – 10 % • Final Review conducted by INTERNAL REVIEW COMMITTEE with Guide-30 % **External -120** • External evaluation will be conducted by two INTERNAL (from the department) and one EXTERNAL (Outside the college) examiners chosen by Principal/Director from panels recommended by the respective Head of the department. **REPORT : A report must be prepared based on the following contents:** • Abstract/Synopsis. • Introduction and plan of the report. • Literature Survey. • Feasibility Analysis - Feasibility of solution (Economical, Technical etc.). • SRS - An agreement between Developer and Customer or end user (Refer any standard template followed by industry, Organization and any Institute as per

	current trends).
	- System Design - Description of modules/functions and basic UML diagrams to support the behaviour of the system. - Detailed Design - Supporting UML diagrams to expose different levels of representations including behaviour, Interaction and partial implementation. - Implementation details - Coding and Testing. - Future Enhancements. - Bibliography - Reference books, web sites and journals (if any).
References	Refer any standard document/template which may be suitable for current development based on organization/Industry or Institute through various web sites.
E-Resources	Visit any software industry sites or Google for downloading sample formats/templates suitable to your project.