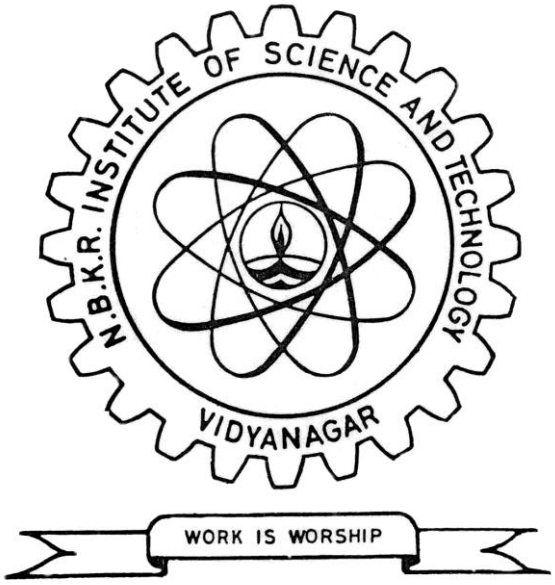
N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

(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.

INFORMATION TECHNOLOGY

(With effect from the batch admitted in the academic year 2020-2021)

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:

Create a technically competent and skilled IT professionals to meet the current challenges and IT industry expectations.

Mission:

M1: To provide technical solutions in the field of Information Technology through advanced quality education.

M2: Study various tools and techniques to become productive, job providers and life-long learners.

M3: Conducting student centric programs to enhance communication, team spirit, leadership qualities and skills upgradation.

M4: To encourage students to participate in co-curricular and extra-curricular activities leading to enhancement of their social and professional responsibilities.

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

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

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

PO4: **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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

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

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

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

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

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

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

SCHEME OF INSTRUCTION

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

INFORMATION TECHNOLOGY – OVERALL SCHEME OF INSTRUCTION (With effect from the academic year 2020-21) R20(a)

S. No	I B.Tech					II B.Tech					III B.Tech					IV B.Tech				
	I Sem	**L**	**T**	**P**	**C**	**I Sem**	**L**	**T**	**P**	**C**	**I Sem**	**L**	**T**	**P**	**C**	**I Sem**	**L**	**T**	**P**	**C**
1	HSMC - Communicative English 20SH1101	3	0	0	3	BSC- Numerical Methods, Probability and Statistics 20SH2103	3	0	0	3	PCC- Data Warehousing and Mining 20CS3101	3	0	0	3	PEC- Professional Elective–III	3	0	0	3
2	BSC – Applied Physics 20SH1102	3	0	0	3	PCC- Discrete Mathematical Structures 20CS2101	3	0	0	3	PCC – Wireless and Ad Hoc Networks 20IT3101	3	0	0	3	PEC- Professional Elective–IV	3	0	0	3
3	BSC – Engineering Mathematics –I 20SH1105	3	0	0	3	PCC-Database Management Systems 20CS2102	3	0	0	3	PCC- Artificial Intelligence 20AD3101	3	0	0	3	PEC- Professional Elective–V	3	0	0	3
4	ESC – Programming for Problem Solving ** 20CS1101	3	0	0	3	PCC- Computer Networks 20CS2103	3	0	0	3	OEC- Open Elective – I	3	0	0	3	JE-Job Oriented Elective - II	3	0	0	3
5	ESC –Basic Electrical Engineering 20EE1102	3	0	0	3	ESC- Digital Logic Design and Computer Organization 20EC2106	3	0	0	3	PEC- Professional Elective–I	3	0	0	3	HSMC -Elective	3	0	0	3
6	BSC –Applied Physics Lab 20SH11P2	0	0	3	1.5	PCC- Database Management Systems Lab 20CS21P1	0	0	3	1.5	PCC - Data Warehousing and Mining Lab 20CS31P1	0	0	3	1.5	MOOCs 20IT41MO	3	0	0	3
7	ESC – Programming for Problem Solving Lab 20CS11P1	0	0	3	1.5	PCC - Computer Networks Lab 20CS21P2	0	0	3	1.5	PCC- Artificial Intelligence Lab 20AD31P1	0	0	3	1.5	SC– Data Representation and Analysis using R Lab 20AD41SC	1	0	2	2
8	ESC - Engineering Workshop 20ME11P2	0	0	3	1.5	ESC – VHDL Programming Lab 20EC21P5	0	0	3	1.5	SC – Communication and Soft Skills 20SH31SC	1	0	2	2	Summer Internship 20IT41IS	0	0	0	3
		-	-	-	-	SC – Application Development using JAVA Lab 20CS21SC	1	0	2	2	MC:: Entrepreneurship 20MC3101	2	0	0	0		-	-	-	-
		-	-	-	-	MC:: Environmental Science 20MC2101	2	0	0	0	Summer Internship 20IT31IS (Community Service Project)	0	0	0	1.5		-	-	-	-
	TOTAL	15	-	9	**19.5**		18	0	11	**21.5**		18	0	8	**21.5**		19	0	2	**23**
	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 – Engineering Mathematics – II 20SH1204	3	0	0	3	PCC- Design and Analysis of Algorithms 20CS2201	3	0	0	3	PCC- Machine Learning Applications 20CS3201	3	0	0	3	Project work with Internship 20IT42PR	0	0	0	12
2.	BSC – Applied Chemistry 20SH1203	3	0	0	3	PCC-Operating Systems 20CS2202	3	0	0	3	PCC- Internet of Things 20IT3201	3	0	0	3					
3.	ESC–Python Programming 20CS1201	3	0	0	3	PCC - Software Engineering 20CS2203	3	0	0	3	PCC- Cryptography and Network Security 20IT3202	3	0	0	3					
4.	ESC–Data Structures 20CS1202	3	0	0	3	PCC- Formal Languages and Automata Theory 20CS2204	3	0	0	3	JE – Job Oriented Elective - I	3	0	0	3					
5.	ESC – Computer Aided Engineering Drawing Lab 20ME12P1	0	0	6	3	HSM- Managerial Economics and Financial Accounting 20SH2201	3	0	0	3	PEC- Professional Elective–II	3	0	0	3					
6.	BSC – English Language Lab 20SH12P1	0	0	3	1.5	PCC - Design and Analysis of Algorithms Lab 20CS22P1	0	0	3	1.5	PCC- Machine Learning Applications Lab 20CS32P1	0	0	3	1.5					
7.	BSC – Applied Chemistry Lab 20SH12P4	0	0	3	1.5	PCC-Operating Systems Lab 20CS22P2	0	0	3	1.5	PCC - Internet of Things Lab 20IT32P1	0	0	3	1.5					
8.	ESC – Data Structures Using Python Lab 20CS12P1	0	0	3	1.5	PCC – Software Engineering Lab 20CS22P3	0	0	3	1.5	PCC- Cryptography and Network Security Lab 20IT32P2	0	0	3	1.5					
9.						SC – Web Development Lab 20CS22SC	1	0	2	2	SC- Mobile App Development Lab 20IT32SC	1	0	2	2					
10.		-	-	-	-	Universal Human Values 20SH2203	3	0	0	**3**	MC:: Advanced Aptitude and Reasoning Skills20MC3202	2	0	0	0					
	TOTAL	12	-	15	19.5	TOTAL	19	0	11	**24.5**	TOTAL	18	0	11	**21.5**	TOTAL	0	0	0	**12**

III - I	III - II	IV - I	IV - I
PROFESSIONAL ELECTIVE – I	***PROFESSIONAL ELECTIVE – II***	***PROFESSIONAL ELECTIVE –III***	***PROFESSIONAL ELECTIVE – IV***
20CS31E1 - Object Oriented Analysis and Design 20CS31E2 - Principles of Programming Languages 20CS31E3 - Computer Graphics 20IT31E1 -Free and Open Source Software	20IT32E1 - Software Project Management 20IT32E2 - Software Architecture 20IT32E3 - Social Information Networks 20AD32E1 - Natural Language Processing	20CS41E1 - Compiler Design 20AD41E1 - Big Data and Applications 20AD41E2 - Data Science 20AD41E3 - Neural Networks and Fuzzy Logic	20CS41E3 - Python Programming – II 20AD41E4 - Deep Learning 20AD41E5 - Nature Inspired Computing for Data Science 20AD41E6 - Virtual Reality
IV - I	**III - II**	**IV - I**	**III-II**
PROFESSIONAL ELECTIVE – V	***JOB ORIENTED ELECTIVE - I***	***JOB ORIENTED ELECTIVE - II***	***OPEN ELECTIVE - II***
20IT41E2 - Block Chain Technologies 20AD41E7 - Game Programming 20AD41E8 - Reinforcement Learning 20AD41E9 - Knowledge Representation and Reasoning	20IT32J1 - Cloud Computing 20IT32J2 - Software Testing Tools	20CS41J1 - Service Oriented Architecture 20CS41J2 - Cyber Security	20IT32O1 – Object Oriented Programming through JAVA

OPEN ELECTIVEs offered by other Departments

ECE	EEE	CE
20EC31O1 - Digital IC Applications 20EC31O2 - Digital Signal Processing 20EC31O3 - Optoelectronics 20EC31O4 - Embedded Systems 20EC32O1 - Electronic Measurement and Techniques 20EC32O2 - Microprocessors and Micro Controllers 20EC32O3 - VLSI Design 20EC32O4 - Cellular Mobile Communication 20EC41O1 - Digital Image Processing 20EC41O2 - DSP Processors & Architecture 20EC41O3 - Neural Networks & Fuzzy Logic 20EC41O4 - Telecommunication & Switching Networks	20EE31O1 - Linear control systems 20EE31O2 - Renewable Energy Sources 20EE31O3 - MATLAB and its Applications in Engineering 20EE32O1 - Energy Conversion Techniques 20EE32O2 - Industrial Electrical Systems 20EE32O3 - Basics of Power Systems 20EE41O1 - Basics of Electrical Vehicle 20EE41O2 - Reliability Engineering	20CEXXO1 - Remote Sensing 20CEXXO2 - Building Technology 20CEXXO3 - Environmental Impact and Management 20CEXXO4 - Disaster Management 20CE31O5 - Basics of Transportation Engineering 20CEXXO6 - Water Resources Management 20CEXXO7 - Cost Effective Housing Techniques 20CEXXO8 - Environmental Pollution and Control

I B.TECH.
I & II Semesters

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

I YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – I SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20SH1101	Communicative English	3	-	-	3	2	40	2	40		3	60	100
2	20SH1102	Applied Physics	3	-	-	3	2	40	2	40		3	60	100
3	20SH1105	Engineering Mathematics - I	3	-	-	3	2	40	2	40		3	60	100
4	20CS1101	Programming for Problem Solving	3	-	-	3	2	40	2	40		3	60	100
5	20EE1102	Basic Electrical Engineering	3	-	-	3	2	40	2	40		3	60	100
		PRACTICALS												
6	20ME11P2	Engineering Workshop	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	20CS11P1	Programming for Problem Solving Lab	-	-	3	1.5	-	-	-	40		3	60	100
8	20SH11P2	Applied Physics Lab	-	-	3	1.5	-	-	-	40		3	60	100
		TOTAL	**15**	**-**	**9**	**19.5**		**200**		**320**			**480**	**800**

20SH1101 - COMMUNICATIVE ENGLISH

(Common to all Branches)

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

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Relate activity-based teaching-learning methods to ensure that learners would be engaged in use of language.
	CO2	Demonstrate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
	CO3	Improve knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.
	CO4	Interpret graphic elements used in academic texts and produce a coherent paragraph interpreting a figure/graph/chart/table.
	CO5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
	CO6	Make use of appropriate reading strategies of comprehension in various academic texts and authentic materials and comprehend, discuss and respond to academic texts orally and in writing.
Course Content	**UNIT-I** **Lesson: On the Conduct of Life: William Hazlitt** **Writing:** Paragraph Writing: Sentence Structures- use of phrases and clauses in sentences- importance of proper punctuation- creating coherence- beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences, **Vocabulary:** Word formation - Suffixes	

	UNIT-II **Lesson: The Brook: Alfred Tennyson** **Writing:** Descriptions: Nature and style of sensible writing - describing - defining - classifying – providing examples and evidence – writing introduction and conclusion **Grammar and Vocabulary:** Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article, prepositions, **Vocabulary:** Word formation- Prefixes **UNIT-III** **Lesson: The Death Trap: Saki** **Writing:** Drafting of Public Speech: Introduction – structure -content - informing facts - conclusion **Grammar:** Pronoun – Agreement, subject-verb agreement **Vocabulary:** Synonyms **UNIT-IV** **Lesson: Innovation: Muhammad Yunus** **Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison **Vocabulary:** Antonyms **UNIT-V** **Lesson: Politics and the English Language: George Orwell** **Writing:** Letter Writing: Official Letters & E-mail letters **Grammar:** Verbs - Tenses; Active voice & Passive Voice, Question Tags, Reported speech **Vocabulary:** One-word substitutes **UNIT-VI** **Reading:** Comprehension: Different Reading Strategies - skimming – scanning - inferring, predicting and responding to content - guessing from context and vocabulary extension. **Writing:** Essay writing: Writing structured essays on specific topics - introducing the issue - analysing and arguing - creating coherence –usage of proper punctuation – importance of conclusion

	Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement) **Vocabulary:** Common Abbreviations
Text Books & References Books	**TEXT BOOKS:** 1. Language and Life: A Skills Approach- I Edition 2018, Orient Black Swan. **REFERENCE BOOKS:** 1. Bailey, Stephen. Academic writing: A hand book 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. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book. 5. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
E-Resources	1. www.englishclub.com 2. www.easyworldofenglish.com 3. www.languageguide.org/english/ 4. www.bbc.co.uk/learningenglish 5. www.eslpod.com/index.html 6. www.myenglishpages.com

20SH1102 - APPLIED PHYSICS

(Common to EEE, CSE, IT and AI&DS)

Course Category:	Basic Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Fundamental concepts of Physics	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To understand various phenomena exhibited by light and describe the characteristics, construction & working of lasers along with applications in Science & Technology. • To acquire knowledge of crystal systems & their analysis using X-rays and concepts of ultrasonics. • Apply principles of quantum mechanics to various atomic phenomena and understand the electrical behaviour of solids. • Explain and provide the knowledge about semiconductors and their use in electronic devices. • Basic properties of dielectric &magnetic materials and their uses in Science & Technology. • Understand the behaviour of superconductors, nano materials, quantum phenomena and the limitations of basic physical laws.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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	Able to 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 concepts of polarization& magnetization and also applications of dielectric& magnetic materials in various disciplines.
	CO6	Basic ideas about superconductors and nano materials with their uses in various fields of Science & Technology.

Course Content

UNIT-I

Wave optics & Lasers

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 (qualitative).

Lasers: Spontaneous & stimulated emission of radiation - Population inversion– Properties of lasers (monochromacity, coherence, directionality, brightness) – Types of lasers: solid state (Nd-YAG), gas (He–Ne) – Applications of lasers in science, engineering & medicine.

UNIT-II

Crystallography, X-ray diffraction &Ultrasonics

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 a crystal: Miller indices – Inter planar spacing in cubic crystals – Bragg's law of diffraction – X-ray diffraction techniques: Laue method – Powder method (Debye – Scherrer method).

Ultrasonics: Introduction - Properties and detection - Production of ultrasonics using Piezo electric method-Applications of ultrasonics.

UNIT-III

Introduction to quantum mechanics &Electron theory

Introduction to quantum mechanics: Wave nature of particles (de-Broglie 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) – Kronig–Penny model (non mathematical treatment) - Origin of energy bands– Classification into conductors, semiconductors & insulators.

UNIT-IV

Semiconductor physics & Semiconductor devices

Semiconductor physics: Intrinsic Semiconductors – Intrinsic conductivity – P&N type semiconductors - Variation of Fermi level with temperature– 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)– Direct & indirect bandgap semiconductors – Light emitting diodes, photo detectors & solar cells (construction, working, materials & applications)

UNIT-V

Dielectric & Magnetic properties

Dielectric properties: Basic definitions – Electronic, ionic and orientation polarizations (qualitative) – Internal field in solid dielectrics – Clausius–Mossotti equation – Ferroelectricity – Applications of dielectrics.

Magnetic properties: Introduction and basic definitions (B, M, H & χ) – 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 and Nanomaterials** **Superconductors:** Introduction – Effect of temperature and magnetic field – Meissner effect – Types of superconductors (type I & II) – BCS theory –DC & AC Josephson effects (qualitative) – 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 P. K. Palanisamy, Scitech Publications (2nd edition). 2. Engineering Physics by S. Maninaidu, Pearson (2009). 3. Applied Physics by K. Thyagarajan, McGraw Hill (2019). **REFERENCE BOOKS:** 1. Solid State Physics, by C. Kittel, Wiley India PVT Limited (2007) 2. Solid State Physics by S.O. Pillai, New Age International Publishers (2018). 3. Engineering Physics by R. K. Gaur and S.L. Gupta, Dhanpatrai Publications (2012)

20SH1105 - ENGINEERING MATHEMATICS – I

(Common to all Branches)

Course Category:	Basic Science	**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:	• The concepts of Newton's law of cooling, Law of natural growth and decay. • Solving higher order differential equations with RHS of different types by using analytical techniques. • 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. • The application of Solutions of Ordinary Differential Equations. • The basic concepts of Matrices. • Taylor's and Maclaurin's series, Maxima and Minima of the functions of two and three variables.		

Course Outcomes	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	Acquire knowledge in solving higher order differential equations by using various types.
	CO3	Acquire basic knowledge in Laplace transforms and their applications.
	CO4	Develop analytical skills in solving the Ordinary Differential Equations by using the Laplace transform technique.
	CO5	Understand effectively the analyzation of the Rank of the matrix, Consistency of system of linear equations, Eigen values and Eigen vectors.
	CO6	Attains skills in analysing 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, 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 transforms, Method of partial fractions, Shifting property, Inverse Laplace transform of a 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, Eigen values and Eigen vectors and their properties. **UNIT-VI** **Differential Calculus:** Taylor's and Maclaurin's series, Maxima and Minima of function of two variables and Lagrangian method of multipliers with three variables only.
Text Books & References Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics - B. S. Grewal, Kanna 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

20CS1101 - 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:	• Learn the procedure how to develop algorithms, representations and programming development steps. • Learn the basic building blocks of C language. • Usage of C constructs (arrays, structures, pointers and file management) to develop various programs. • Create better awareness how effectively utilize the concepts of C for application development		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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.2 Course Content.

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 Mc Graw Hill Education, 2012.

20EE1102 - BASIC ELECTRICAL ENGINEERING

(Common to CSE, IT and AI&DS)

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Fundamental concepts of Electricity and electromagnetic induction.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• The basic concepts of DC circuits and network reduction techniques. • The DC circuit analysis and Network Theorems. • The basic concepts of AC circuits • The construction and working principle of the transformers. • The operation of three phase Induction motor and draw the equivalent circuit. • The operation of PMMC and Moving coil instruments.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Comprehend the fundamental concepts of DC circuits.
	CO2	Perform the DC circuit analysis by Nodal, Mesh analysis and Network theorems.
	CO3	Analyze the single-phase A.C circuits.
	CO4	Acquire the knowledge about the transformers.
	CO5	Know the operation of three phase Induction motor draw the equivalent circuit.
	CO6	Understand the basics of measurements and working of PMMC & Moving Iron instruments.

Course Content

UNIT-I

Fundamentals of electric Circuits: Introduction, Classification of network elements, Voltage-Current relations for passive elements, Kirchhoff's laws, Series-Parallel connection, Source Transformation-Star-Delta transformation, Simple problems.

UNIT-II

D.C. Circuits: Mesh and Nodal Analysis with independent sources – Numerical problems.

Network Theorems: Super-position, Reciprocity and Thevinin's Theorem with independent sources, Simple problems.

UNIT-III

A.C. Circuits: Representation of sinusoidal waveforms, peak, average and RMS values, Real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits consisting of R, RL, RC, RLC combinations (series and parallel), Simple problems.

	UNIT-IV **Transformers:** Construction and Principle of operation, Ideal transformer and practical transformer, Losses, OC & SC tests, Efficiency and Regulation (All the above topics are elementary treatment), simple problems. **UNIT-V** **Three phase Induction motors**: Construction and Principle of operation, slip and rotor frequency, torque equation, determination of equivalent circuit parameters by no-load and blocked rotor tests, simple problems. **UNIT-VI** **Measuring Instruments:** Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) and Moving Iron instruments (Voltmeters and Ammeters).
Text Books & References Books	**TEXT BOOKS:** 1. "Basic Electrical Engineering", by D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill. 2. "Basic Electrical Engineering", by M.S .Naidu and S.Kamakshaiah - TMH. 3. "Circuits & Networks", by A. Sudhakar and Shyam Mohan, 5th edition (2015), TMH. **REFERENCE BOOKS:** 1. "Network Analysis", by M.E Van Valkenburg, Third edition, PHI learning private Limited, 2006. 2. "Fundamentals of Electric circuits", by Charles k Alexander, Mathew N O Sadiku, Tata McGraw Hill Education Private Limited, sixth edition,2017. 3. "Circuits & Systems", by Dr K. M. Soni, S. K. Kataria & sons Publication, Eleventh edition, Reprint 2016.
E-Resources	1. https://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. https://freevideolectures.com/university/iitm

20ME11P2 - ENGINEERING WORKSHOP

(Common to EEE, CSE, IT and AI&DS)

Course Category:	Engineering Science	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	No Prerequisite	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To understand the usage of work shop tools and prepare the models in the trades such as carpentry, fitting, sheet metal & foundry. • To understand the usage of wiring tools and to execute house wiring connections. • To understand and demonstrate the usage of tools of welding, black smithy and machine tools.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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	**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, Saravana Pandian, Vikas publishers, 2007.	

20CS11P1 - 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:	• To learn the C programming constructs and their implementation.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	To solve problems using C programming concepts.
Course Content	**Note: Implement all in Windows & Linux environments.** **LIST OF EXPERIMENTS** 1. To evaluate expressions. 2. To implement if constructs. 3. To implement Switch statement. 4. To demonstrate 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. Demonstrate 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	

20SH11P2 - APPLIED PHYSICS LABORATORY

(Common to EEE, CSE, IT and AI&DS)

Course Category:	Basic Science	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Fundamental concepts of physics.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To provide student 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 exploring 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	**Minimum of 8 experiments to be conducted out of the following** **LIST OF EXPERIMENTS** 1. Determination of rigidity modulus of a 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.	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

I YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – II SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20SH1204	Engineering Mathematics - II	3	-	-	3	2	40	2	40		3	60	100
2	20SH1203	Applied Chemistry	3	-	-	3	2	40	2	40		3	60	100
3	20CS1201	Python Programming	3	-	-	3	2	40	2	40		3	60	100
4	20CS1202	Data Structures	3	-	-	3	2	40	2	40		3	60	100
		PRACTICALS												
5	20ME12P1	Computer Aided Engineering Drawing Lab	-	-	6	3	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
6	20SH12P4	Applied Chemistry Lab	-	-	3	1.5	-	-	-	40		3	60	100
7	20CS12P1	Data Structures Using Python Lab	-	-	3	1.5	-	-	-	40		3	60	100
8	20SH12P1	English Language Lab	-	-	3	1.5	-	-	-	40		3	60	100
		TOTAL	**12**	**-**	**15**	**19.5**		**160**		**320**		**-**	**480**	**900**

20SH1204 - ENGINEERING MATHEMATICS – II

(Common to all Branches)

Course Category:	Basic Science	**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:	• The concepts of Double integrals, Areas and Volumes. • The basic concepts of Triple integrals and its volume, Beta and Gamma functions. • The Gradient, Divergence and Curl operators, Solenoidal and Irrotational vectors. • The basic concepts of Vector Integration. • The determination of Fourier coefficients, Fourier series, Even and Odd Functions and Change of intervals. • The concepts of Fourier Transforms.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Attains skills in analysing the Double integrals also its Areas and Volumes.
	CO2	Understand effectively in analyzing the Triple integrals, Beta and Gamma functions.
	CO3	Acquire knowledge in analyzing the Curl, Divergence and Gradient operators, Solenoidal and Irrotational vectors with their applications.
	CO4	Attains skills in analysing the applications of Green's, Stoke's and Gauss-divergence theorems.
	CO5	Develop analytical skills in solving the problems involving Fourier Series.
	CO6	Understand effectively Fourier Sine and Cosine integral, Fourier Transforms, Fourier Sine and Cosine transforms.

Course Content

UNIT-I

Double integrals: Double integrals - Change of order of integration - Change to polar coordinates - Area and Volumes by double integration.

UNIT-II

Triple 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 Differentiation: Scalar and vector point function, Vector operator Del, Del applied to scalar point function, Gradient, Divergence, Curl, Solenoidal and Irrotational vectors.

	UNIT-IV **Vector Integration:** Line integral-circulation-workdone, Surface integrals – flux, Green's theorem in the plain (Without proof), Stoke's theorem (Without proof), Volume integral, Gauss-divergence theorem (without proof). **UNIT-V** **Fourier Series:** Determination of Fourier coefficients - Fourier series - Even and Odd functions - Change of intervals (0,2l). **UNIT-VI** **Fourier Transforms:** Fourier Integral Theorem (Without proof)-Fourier Sine and Cosine integral - Fourier integral in complex form - 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

20SH1203 - APPLIED CHEMISTRY

(Common to EEE, CSE, IT and AI&DS)

Course Category:	Basic Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Fundamental concepts of Chemistry	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To familiarize engineering chemistry and its applications. • To train the students on the principles and applications of electrochemistry and polymers. • To introduce modern engineering materials, semiconductors and nanomaterials.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Explain the calculation of bond order of O_2 and CO molecules.
	CO2	Illustrate the band theory of solids for conductors, semiconductors and insulators.
	CO3	Apply Nernst equation for calculating electrode and cell potentials.
	CO4	Demonstrate the factors affecting corrosion and corrosion prevention methods.
	CO5	Discuss the different types of polymers and their applications.
	CO6	Understand the types of calorific value.

Course Content

UNIT-I

STRUCTURE AND BONDING MODELS

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N_2, O_2, CO and NO, π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT-II

MODERN ENGINEERING MATERIALS

i. Understanding of materials: Crystal field theory – salient features – splitting in octahedral, tetrahedral and square planar geometry. Properties of coordination compounds- oxidation state, coordination number, magnetic properties and colour.

ii. Semiconductor materials, superconductors- basic concept, band diagrams for conductors, semiconductors and insulators, effect of doping on band structures.

iii. Nano chemistry: Introduction, classification of nano materials, properties and applications of fullerenes, carbon nanotubes and graphene nanoparticles.

UNIT-III

ELECTRO CHEMISTRY AND APPLICATIONS

Introduction to Electro chemistry, Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode), electrochemical cell, cell potential calculations and numerical problems.

Batteries - Primary cells – Zinc-air battery.

Secondary cells – lead acid and lithium ion batteries-working of the batteries including cell reactions.

Fuel cells- hydrogen-oxygen fuel cell– working of the cell.

Potentiometry – potentiometric titration (redox reaction).

Conductometry – concept of conductivity- Specific, equivalent & molar conductance and cell constant, conductivity cell, conductometric titrations (acid-base titrations).

P^H metry-Basic concepts and applications.

UNIT-IV

SCIENCE OF CORROSION

Introduction to corrosion, definition, types of corrosion, Mechanism of corrosion- metal oxide formation by dry corrosion, Pilling Bedworth ratios and uses and electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, Factors affecting the corrosion, prevention methods of corrosion- Cathodic protection (Sacrificial anodic protection and Impressed current cathodic protection) and Metallic coatings - electroplating and electro less plating.

UNIT-V

POLYMER SCIENCE AND TECHNOLOGY

Introduction to polymers, Polymerisation and Types of polymerisation (addition, condensation and co-polymerisation), Poly dispersibity index-Measurement of average molecular weight of polymer.

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

Elastomers – Preparation, properties and applications of Buna S, Buna N and Thiokol.

UNIT-VI

FUEL TECHNOLOGY

Chemical fuels – Introduction, classification, characteristics of a good fuel, calorific value, determination of calorific value (Bomb and Boy's gas calorimeters), numerical problems based on calorific value.

Solid Fuels - Types, ranking of coal and Analysis of coal (Proximate and Ultimate analysis).

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

Gaseous Fuels - L.P.G, Water gas, producer gas and 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 Ed., Chand & Company Ltd., 2000. 4. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.

20CS1202 - DATA STRUCTURES

(Common to CSE, IT and AI&DS)

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in programming languages.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Master the implementation of linked data structures such as linked lists and binary trees. • Familiar with advanced data structures such as balanced search trees and priority queues. • Familiar with several sorting algorithms including quick sort, and merge sort. • Familiar with some graph traversals like DFS, BFS.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand concepts of Data Structures and Learn sorting & searching techniques.
	CO2	Implement stacks and queues using arrays.
	CO3	Gain knowledge in Linked lists and types.
	CO4	Understand the concepts of Binary trees, Binary search trees and Graphs.
	CO5	Explore the basics of balanced search trees - AVL trees, Splay trees.
	CO6	Acquire knowledge in B-Trees and Hash tables.

Course Content

UNIT-I

Introduction to Data Structures: Primitive, non-primitive, Linear, non-linear

Searching: Linear Search and Binary Search.

Sorting Techniques: Bubble Sort, Selection Sort, Quick sort, Merge sort, Insertion Sort, Sorting Efficiency.

UNIT-II

Stacks: Introduction, Stack operations, Implementation of Stacks using Arrays

Applications: Conversion from Infix to Postfix notation, Evaluation of Postfix Expression

Queues: Introduction, operations on Queues, Circular Queues, Priority Queues, Double Ended Queues (deques), Applications of Linear and Priority Queues.

	UNIT-III **Linked Lists:** Introduction, Linked List Operations, Applications. **Types:** Singly, Doubly and Circularly Linked Lists. **Implementation:** Stacks and Queues using Linked Lists. **UNIT-IV** **Tree**: Definition, Representation. **Binary Tree**: Definition and Properties, Representation, Tree traversals. **Binary Search Tree**: Definition and Properties, applications. **Graphs:** Introduction, Basic terminologies, Representation, Graph traversals. **UNIT-V** **Balanced Search Trees:** AVL trees: Definition, operations **Red-Black Trees:** Definition, Representation and operations, **Splay Trees:** Definition, Splay Rotations. **UNIT-VI** **B-Trees**: Indexed Sequential Access Method (ISAM), m-way search trees, B-trees of order m, Height of B-Tree, Insertion and Deletion from B-Tree, Introduction to B+ trees. **Hash Tables**: Dictionaries, Hash Table Structure, Hash Functions. **Collision Resolution:** Linear Probing and Chaining.
Text Books & References Books	**TEXT BOOKS:** 1. Computer Programming and Data Structures by E. Balagurusamy, 4/e, McGraw Hill. 2. Data Structures and Algorithms – concepts, Techniques and Applications by G A V Pai, McGraw Hill. **REFERENCE BOOKS:** 1. C Programming & Data Structures, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning. 2. An Introduction to Data structures with applications: Tremblay J P and Sorenson P G.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS1201 - PYTHON PROGRAMMING

(Common to CSE, IT, AI&DS, EEE, ECE)

Course Category:	Program 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:	• To learn the fundamentals of Python constructs. • To develop various simple programs using Python. • To define Python functions, exceptions and various other features. • To explore features of object-oriented concepts.		

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 functions for application development.
	CO3	Study Strings, Lists and their applications.
	CO4	Acquire knowledge in the concepts of Dictionaries, Tuples, and Sets.
	CO5	Comprehend the rules to construct regular expressions, and apply them to text to search for patterns and make changes.
	CO6	Understand Object-oriented programming paradigm in controlling the access of data and reducing the duplication of code by employing code reusability techniques.

Course Content

UNIT-I

Why Python: Thrust areas of Python, Open Source Software.

Python Basics: Identifiers, Keyword, Statements and Expressions, variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input and Writing Output, Type Conversions, type () function and "is" operator, Dynamic and Strongly Typed Language

UNIT-II

Control Flow Statements: if and nested if, for, while Continue and Break statements, Catching Exceptions.

Functions: Built-in Functions, Commonly Used Modules, Function Definition and Calling the function, The return statement and void function, scope and lifetime of variables, Default Parameters, Keyword Arguments, Variable number of arguments with *args and **kwargs, command line arguments

	UNIT-III **Strings:** Creating and Storing Strings, Basic String Operations, Access characters by Index, Slicing and Joining of Strings, String Methods and Formatting Strings. **Lists:** Creating Lists, List operations, indexing and Slicing, Built-in Functions, List Methods, del() vs pop() **UNIT-IV** **Dictionaries:** Creation, accessing and modifying key-value pairs, built-in functions used on dictionaries, dictionary methods, del statement. **Tuples and Sets**: Creation of Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-in functions, Relationship among Tuples, Lists and Dictionaries, Tuple Methods, aggregation with zip(), Sets, Set Methods and Frozen sets. **UNIT-V** **Files**: Types, Creating, Reading Text data and methods used for it, Manipulating Binary and CSV files, pickling (serialization of objects), os and os.path modules. **Regular Expression Operations**: Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expression and Regular Expression with glob Module. **UNIT-VI** **Object-Oriented Programming:** Classes and Objects and Creating them, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, Polymorphism.
Text Books & References Books	**TEXT BOOKS:** 1. Gowrishankar. S, Veena.A, "Introduction to Python Programming", CRC Press, Taylor and Francis group,2019. **REFERENCE BOOKS:** 1. Brian Heinold, A Practical Introduction to Python Programming. 2. April Speigh, Bite-Size Python: An Introduction to Python Programming. Kenneth A. Lambert, Fundamentals of python - Data structures. 3. Mark Summerfield, Programming in python 3. 4. Yaswanth Kanetkar, Aditya Kanetkar, Let Us Python, BPB Publications, 2020.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm 3. https://wiki.python.org/moin/PythonBooks

20ME12P1 - COMPUTER AIDED ENGINEERING DRAWING LABORATORY

(Common to EEE, CSE, IT and AI&DS)

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

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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:** Solids such as Prisms, Pyramids, Cylinders and Cones resting on their bases on HP. **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.

20SH12P4 - APPLIED CHEMISTRY LABORATORY

(Common to EEE, CSE, IT and AI&DS)

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.		

Course Outcomes	CO1	Determine the cell constant and conductance of solutions.
	CO2	Prepare advanced polymer materials.
Course Content	**Minimum of 8 experiments to be conducted out of the following** **LIST OF EXPERIMENTS** 1. Determination of cell constant and conductance of solutions. 2. Conductometric titration of strong acid Vs strong base. 3. Conductometric titration of weak acid Vs strong base. 4. Determination of pH of unknown solution. 5. Potentiometry - determination of redox potentials and emfs. 6. Determination of Strength of an acid in Pb-Acid battery. 7. Preparation of a polymer-Bakelite. 8. Estimation of ferrous iron by Dichrometry. 9. Estimation of Mangneous by colorimetry. 10. Determination of viscosity of oils with Redwood viscometer 1&2. 11. Determination of Flash and Fire point. 12. Preparation of Nano materials by precipitation method.	
Text Books	**TEXT BOOKS:** 1. Mendham J et al, Vogel's text books of quantitative chemical analysis, 5 Ed., Pearson publications, 2012. 2. KN Jayaveera, Subba reddy & Chandra sekhar, Chemistry lab manual, 1 Ed., SM Enterprises, Hyderabad, 2014 3. Chatwal & Anand, Instrumental methods of chemical analysis, 2 Ed., Himalaya publications, 2006.	

20CS12P1 - DATA STRUCTURES USING PYTHON LABORATORY

(Common to CSE, IT and AI&DS)

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Fundamentals of Computers and basic Mathematics Knowledge in programming languages like C and Python and data structures.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To learn and practice the fundamentals of Python Programming. • Experience the use & functionality of Data structures.		

Course Outcomes	Upon completion of the course, students will be able to gain knowledge on Python programming, and able to solve problems using data structures and feel confident to apply the techniques in real life problems they encounter.
Course Content	1. a) Write a Python program to check whether the given year is leap year or not. b) Develop a Python program to check whether the given number is palindrome. 2. a) Write a Python program to print 'n terms of Fibonacci series using recursion. b) Implement matrix multiplication. 3. a) Using Python, demonstrate use of slicing in string. b) Using Python, demonstrate the use of list & related functions. 4. a) Write a Python program to demonstrate use Dictionary& related functions. b) Write a Python program to demonstrate use tuple, set & related functions. 5. a) Develop a Python program to demonstrate constructors. b) Write a Python program to demonstrate inheritance. 6. Implement the following search methods a. Linear Search b) Binary Search 7. Write a program to implement the sort techniques a. Bubble sort b) Quick sort 8. Write a program that uses functions to perform the following a. Create a singly linked list of integers b. Delete a given integer from the above linked list c. Display the contents of the above list after deletion. 9. Write a program that uses stack operations to convert a given infix expression into its postfix equivalent, implement the stack using an array. 10. Write a program that uses functions to perform the following a. Create a binary search tree (BST) of integers b. Traverse the above BST in Postorder. c. Traverse the above BST in Inorder.

Text Books & References Books	**TEXT BOOKS:** 1. Gowrishankar. S, Veena. A, "Introduction to Python Programming", CRC Press, Taylor and Francis group, 2019. 2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705. 3. Computer Programming and Data Structures by E. Balagurusamy, 4/e, McGraw Hill. 4. Data Structures and Algorithms – concepts, Techniques and Applications by G A V Pai, McGraw Hill. **REFERENCE BOOKS:** 1. Martin C. Brown, "The Complete Reference: Python", McGraw-Hill, 2018. 2. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019Data structures Algorithms and Applications, S. Sahni, University press (India) pvt ltd, 2nd edition, 3. C Programming & Data Structures, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning. 4. An Introduction to Data structures with applications: Tremblay J P and Sorenson P G
E-Resources	1. https://Wiki.python.org/moin/WebProgrammingBooks 2. https://realpython.com/tutorials/web-dev/ 3. https://nptel.ac.in/courses

20SH12P1 - ENGLISH LANGUAGE LABORATORY

(Common to EEE, CSE, IT and AI&DS)

Course Category:	Basic Science	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• The main objective is to prepare the students 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	CO1	These activities practiced in the laboratory are helpful in comprehending the important language aspects which are useful for the real-life situations.
	CO2	These are also helpful in enhancing the language competency and communicative level of students.

Course Content

LIST OF ACTIVITIES

1. **Listening Skills**
   a. Listening for Identifying key terms, understanding concepts
   b. Listening for specific information
   c. Listening for global comprehension and summarizing
   d. 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)
   a. Expressions in various situations
   b. Making requests and seeking permissions
   c. Interrupting and apologizing
   d. Role plays / Situational dialogues

3. **Communication at Work Place:**
   a. Introducing oneself and others
   b. Ice Breaking Activity and JAM Session
   c. Greetings
   d. Taking leave

4. **Debates & Group Discussions**
   a. Discussion in pairs/ small groups on specific topics
   b. Short structured talks
   c. Reporting/ summarizing

5. **Presentations (Oral presentation, PPT & Poster presentation):**
   a. Pre-planning
   b. Non verbal communication
   c. Formal oral presentations on topics from academic contexts
   d. Giving directions

References Books	**REFERENCE BOOKS:** 1. A Manual for English Language Laboratories: Dr. D. Sudha Rani, Pearson Publications.
E-Resources	1. https://www.talkenglish.com/ 2. www.esl-lab.com 3. www.englishmedialab.com 4. www.englishinteractive.net

II B.TECH.
I & II Semesters

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

II YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – I SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20SH2103	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	20CS2101	Discrete Mathematical Structures	3	-	-	3	2	40	2	40		3	60	100
3	20CS2102	Database Management Systems	3	-	-	3	2	40	2	40		3	60	100
4	20CS2103	Computer Networks	3	-	-	3	2	40	2	40		3	60	100
5	20EC2106	Digital Logic Design & Computer Organization	3	-	-	3	2	40	2	40		3	60	100
6	20MC2101	MC :: Environmental Science	2	-	-	-	2	40	2	40		3	60	100
		PRACTICALS												
7	20CS21P1	Database Management Systems Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	20CS21P2	Computer Networks Lab	-	-	3	1.5	-	-	-	40		3	60	100
9	20EC21P5	VHDL Programming Lab	-	-	3	1.5	-	-	-	40		3	60	100
		SKILL ORIENTED COURSE												
10	20CS21SC	Application Development using JAVA Lab	1	-	2	2	-	-	-	40		3	60	100
		TOTAL	**18**	**-**	**11**	**21.5**		**240**		**400**		**-**	**600**	**1000**

MC: Mandatory Course

20SH2103 - NUMERICAL METHODS, PROBABILITY AND STATISTICS

Course Category:	Basic Science	**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 make the student learn about • 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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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 distribution.
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. **UNIT-III**	

	Numerical Solution of Ordinary Differential Equations: Taylor series Method - Euler's Method – Runge-kutta methods (only second and fourth order) – Milne's Predictor-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.
Text Books & References Books	**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

20CS2101 - DISCRETE MATHEMATICAL STRUCTURES

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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	Familiar with the various counting techniques.
	CO4	Identify different recurrence relations and their usage.
	CO5	Provide a generic view on the fundamentals of graphs
	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, Normal forms.

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, 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 colouring. **UNIT-VI** **Algebraic Structures:** Introduction, Structure of algebras, Semi groups, Monoids, Groups, Homomorphisms, Normal sub-groups, Rings.
Text Books & References Books	**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

20CS2102 - DATABASE MANAGEMENT SYSTEMS

Course Category:	Program 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:	• Understand the areas of databases and composition of queries using Structured Query Language and PL/SQL • To study various database design models for building applications • Evaluate a business situation while designing a database system		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Master the basic concepts and explore the applications of database systems.
	CO2	Understand Data Modelling and the Relational model.
	CO3	Learn Relational Algebra operations and basic SQL primitives.
	CO4	Familiar with PL/SQL Query Processing Techniques and Normal forms.
	CO5	Identify the basic issues of transaction processing, concurrency control and methods for recovery.
	CO6	Expose in Advanced Data Models and Security issues.

Course Content

UNIT-I

Introduction to Databases: Characteristics of a Database, Advantages, A brief history of database applications, when not to use DBMS.

Overview of Database languages and architectures: Data models, Schemas and Instances, Three-schema architecture and Data independence, Centralized and Client/Server Architecture for DBMS, Classification of DBMS**.**

UNIT-II

Data Modelling Using (ER) Model: High level conceptual data models, Entity types, Entity sets, Attributes, Keys, Relationship types, Relationship sets, Roles and Structural Constraints, Weak entity types.

Basic Relational Model: Relational model concepts, Constraints and Relational Database Schemas, Update Operations and Dealing with Constraint Violations.

UNIT-III

Formal Relational Languages: Unary relational operations, relational algebra operations, binary relational operations.

Basic SQL: Data definition and types, Specifying constraints, Basic Retrieval Queries, Clauses, Conversion functions and aggregate functions.

	UNIT-IV **PL/SQL:** Introduction to PL/SQL, Variables and Program Data, Conditional and Sequential Control, Loops. **Functional Dependencies and Normalization**: Design Guidelines for Relation Schemas, Functional dependencies, First,2nd and 3rd normal forms, Boyce-Codd normal form, Multivalued dependencies and 4th normal form, Join dependencies and 5th normal form. **UNIT-V** **Introduction to Transaction:** Transaction Processing**,** Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability and Serializability. **Concurrency Control**: Two phase locking techniques, Time stamp ordering, Multi version concurrency control techniques, Validation concurrency control. **UNIT-VI** **Database Recovery Protocols**: Recovery Concepts, Undo/Redo Recovery based on deferred Update, Recovery Techniques based on Immediate Update, Shadow paging. **Database Security:** Security Issues, Discretionary Access Control based on Granting and Revoking Privileges, Mandatory Access Control and Role Based Access Control for Multilevel Security.
Text Books & References Books	**TEXT BOOKS:** 1. RamezElmasri, and Shamkant B Navathe, Database Systems, 6th edition, Pearson Education 2. Steven Feuerstein & Bill Pribyl, Oracle PL/SQL Programming, 2nd Edition **REFERENCE BOOKS:** 1. Silberschatz A, Korth H F, and Sudarshan S, Database System Concepts, 5th edition, McGraw-Hill, 2006. 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

20CS2103 - 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 equip the students with a general overview of the concepts of computer networks. • Familiarize the students with the standard networks layer models. • To establish the communication and their applicability.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basic concepts of computer networks.
	CO2	Acquire the knowledge about various types of application layer protocols.
	CO3	Exposure on transport layer functions.
	CO4	Learn the concept of IPv4 issues and supporting mechanism.
	CO5	Know about working principle of router and routing protocols.
	CO6	Understand the design issues, protocols and their applicability in data link layer.

Course Content

UNIT-I

Computer networks and the Internet: What is the Internet, the Network edge, the Network core, delay, loss, and throughput in Packet-Switched Networks, Protocol Layers and their service models.

UNIT-II

Application Layer: Principles of network applications, the Web and HTTP, Electronic mail in the Internet, DNS—the Internet's directory service.

UNIT-III

Transport Layer: Introduction and Transport-layer Services, Multiplexing and Demultiplexing, Principles of reliable data transfer, Connectionless Transport: UDP, Connection-oriented transport: TCP.

UNIT-IV

Introduction to Network layer: Forwarding and Routing, Network Service Models.

Virtual circuit and Datagram networks: Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks.

The internet protocol: Datagram Format, IPv4 Addressing, ICMP.

UNIT-V

	What's inside a router: Input Processing, Switching, Output Processing, Where does queuing occur, the Routing Control Plane. **Routing algorithms:** The Link-State Routing Algorithm, the Distance-Vector Routing Algorithm, Hierarchical Routing. **Routing in the internet:** RIP, OSPF, BGP. **UNIT-VI** **The link layer:** Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks.
Text Books & References Books	**TEXT BOOKS:** 1. Computer Networking: A Top-Down Approach, James F. Kurose, K. W. Ross, 6th Edition, Pearson Education. **REFERENCE BOOKS:** 1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education. 2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition. 3. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education. 4. Computer Networks, L. L. Peterson and B. S. Davie, 4th edition, ELSEVIER.
E-Resources	1. https://nptel.ac.in/courses

20EC2106 - DIGITAL LOGIC DESIGN & 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		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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 and Binary Numbers:
Digital Systems, Binary Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic Addition and Subtraction, Binary codes: Binary-Coded Decimal Code, Excess-3, Gray Code.

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, Conversion of Canonical POS To Canonical SOP And Vice Versa.

UNIT-II

Gate Level Minimization:
The Map method, Four Variable K-Maps. Products of Sum Simplification, Don't – Care Conditions.

Combinational Logic:
Introduction, Analysis Procedure, Design Procedure, Binary Adder–Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT-III

Synchronous Sequential Logic:
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops

	Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters. **UNIT-IV** **Basic Computer Organization and Design**: Basic Structure of Computers, 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 & References Books	**TEXT BOOKS:** 1. Digital Design –6th Edition, M.Morris Mano, Pearson Education/PHI. 2. 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, 2rd 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

20MC2101 - 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.		

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

Fundamentals of Environmental Science:
Introduction, Definition, Scope and Importance of environmental science - Various components of environment – Atmosphere, lithosphere, hydrosphere and biosphere – Multidisciplinary nature of environmental science-public awareness.

UNIT-II

Natural Resources
Introduction- Classification of Natural resources.
Forest Resources: Importance of Forests, over-exploitation of forest resources-Deforestation-causes, effects and control methods.

Water Resources: Use and over-utilization of surface and ground water – Dams - Benefits and problems-conflicts over water.

Energy Resources: Renewable and non-renewable energy sources. Need to use of alternate energy sources, Impact of energy use on environment.

Land Resources: Importance, Land degradation, Soil erosion and desertification.

	UNIT-III **Ecosystem and Bio-diversity** **Ecosystem:** Definition, types, structure of ecosystem (biotic and abiotic components) and functions of an Ecosystem – Energy flow, Food chains, 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 – conservation of biodiversity (In-situ and Ex-situ conservation). **UNIT-IV** **Environmental Pollution:** Introduction, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and nuclear hazards. **Solid Waste Management:** sources, effects of Municipal solid waste, Industrial solid waste and management of solid waste. **Disaster Management:** Floods, Droughts, earthquakes and cyclones. **UNIT-V** **Social Issues and The Environment:** From unsustainable to sustainable development, urban problems related to energy, water conservation, rainwater harvesting and water shed management. **Climate Change-** Global warming, Acid rain and Ozone layer depletion. **Environmental Acts:** Water (Prevention and control of pollution) Act-Air (Prevention and control of pollution) Act – Wildlife protection Act and Forest conservation Act **UNIT-VI** **Human Population and Environment:** Population growth, variation among nations and population Explosion- Role of information technology in environment and human health. **Case Studies:** Silent valley project, Madhura Oil Refinery and Taj Mahal, Kolleru Lake Aquaculture and Fluorosis in Andhra Pradesh **Field Work:** Visit to a Local Area having river/Forest/grass land/hill/mountain to document environmental assets. Study of common plants, insects and birds.
Text Books & References Books	**TEXT BOOKS:** 1. Environmental Studies by E. Bharucha (2003), University Publishing Company, New Delhi. 2. "Environmental science" by Anubha Kaushik and C.P .Kaushik.(2016), New age International Private Limited. 3. "Environmental science and Engineering" by P.Anandan and R.K. Kumaravelan.(2009), Scitech Publishers. 4. Environmental Studies by K.V.S.G.Murali Krishna(2015), Savera Publishing House

	REFERENCE BOOKS: 1. "Introduction to Environmental science" by Y. Anjaneyulu. 2. "Environmental studies" by Dr.B.S. Chauhan. 3. "Environmental science" by M. Chandrasekhar. 4. Environmental Studies by P.N,Palini swamy, P.Manikandan, A.Geeta and K.Manjula Rani, Pearson Education, Chennai.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS21P1 - DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Basic knowledge in mathematical formulae and preliminary fundamentals of databases.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To study various database design models for building applications.		

Course Outcomes	At the end of this lab session, the students will be able to identify various Database concepts to develop applications using SQL
Course Content	1. Creating and inserting rows into a table. 2. Updating, Deleting and dropping of tables,Queriesusing SELECT command. (use constraints while creating tables) 3. Queries along with sub-Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT Constraints. 4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN) GROUP BY, HAVING,Creation and dropping of Views. 5. 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). 6. Queries using Views, joins on Tables 7. Queries using Access Control based on Granting and Revoking Privileges 8. Creation of simple PL/SQL program which Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block. 9. Develop a program that includes the features NESTED IF, CASE and CASE expression. 10. Develop a program using WHILE LOOP, numeric FOR LOOPS, nested loops using BUILT–IN Exception.
Text Books & References Books	**TEXT BOOKS:** 1. RamezElmasri, and Shamkant B Navathe, Database Systems, 6th edition, Pearson Education **REFERENCE BOOKS:** 1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill. 2. Oracle Database 12C Hands-on SQL and PL/SQL Paperback – Import, 29 Feb 2016 by SatishAsnani. 3. Oracle Pl/SqlProgramming:A Developer's Workbook, Steven Feuerstein , Andrew Odewahn.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS21P2 - 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	At the end of this lab session, the students will be able to understand the basics of computer Network layers and analyse some of the protocols & application.
Course Content	1. Study of different types of Network cables and implement the Cross-Wired Cable and Straight through Cable using Clamping tool. 2. Study Network Devices and its basic network commands in Detail. 3. Study of Network IPV4 addressing and Sub-Netting. 4. Create Web Pages. 5. Analyse Distance Vector Routing. 6. Analyse Link State Vector Routing. 7. Analyse Error Detection Mechanism. 8. Analyse Error Correction Mechanism.
Text Books & References Books	**REFERENCE BOOKS:** 1. Computer Networking: A Top-Down Approach, James F. Kurose, K. W. Ross, 6th Edition, Pearson Education. 2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education 3. HTML, XHTML and CSS Bible by Steven M. Schafer, 5th Edition, Wiley Publications
E-Resources	1. https://www.wireshark.org/ 2. https://bayanbox.ir/view/3697480237749666667/Introduction-to-Network-Simulator-NS2-2012.pdf

20EC21P5 - VHDL PROGRAMMING LABORATORY

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Knowledge on VHDL programming for to design basic logic gates, combinational circuits and flip-flops.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To learn the VHDL programming constructs and its implementation		

Course Outcomes	Upon successful completion of the course, the students will be able to Solve problems using VHDL programming concepts
Course Content	1. To implement AND, OR and NOT logic gates. 2. To implement NAND, NOR, EX-OR AND EX-NOR logic gates 3. To implement half adder and full adder. 4. To implement half subtractor and full subtractor. 5. To implement binary to gray and gray to binary code converters. 6. To implement BCD to 7 segment displayers 7. To implement magnitude comparator. 8. To implement decoder and encoder. 9. To implement multiplexer and demultiplexer. 10. To implement SR flip-flop
Text Books & References Books	**TEXT BOOKS:** 1. Digital Design with an introduction to the Verilog HDL, VHDL and system verilog 6th edition by M.Morris Mano Michael D.Ciletti **REFERENCE BOOKS:** 1. Fundamentals of Digital Circuits fourth edition A.Ananda Kumar, 2. A VHDL Primer 3rd edition by J Bhaskar 3. Very log HDL a guide to Digital Design and Synthesis by Samir Palnitkar
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS21SC - APPLICATION DEVELOPMENT USING JAVA LABORATORY

Course Category:	Program Core	**Credits:**	2
Course Type:	Skill Oriented	**Lecture-Tutorial-Practical:**	1-0-2
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 create the applications in java.		

Course Outcomes	After the completion of this lab, the students will be able to learn and develop various applications using core concepts of Java.
Course Content	**Session-1** • Installation of Java software, study of any Integrated development environment. • Discuss about JAVA BUZZ WORDS, Data Types, Input-Output functions, Types of Variables, Key Words. **Session-2** • Discuss about Control Flow Statements. • Discuss about Access Specifiers, Arrays, Strings. **Session-3** • Discuss about OOPS Concepts. Creation of Classes and Objects. • Discuss About Main Method, Command Line Arguments, this Keyword. **Session-4** • Implementation of Overloading Concept. • Implementation of Inheritance Concept. **Session-5** • Discuss about Super Keyword. • Implementation of Overriding Concept. • Implementation of Abstract Methods & Abstract Classes. **Session-6** • Implementation of Interfaces. • Implementation of Exception Handling. **Session-7** • Implementation of User Defined Packages. • Discuss About Threads and Methods of a Thread class.

	Session-8 • Introduction to Applets and Applet Life Cycle. • Discuss Color and Font Classes. • Implement Graphics Class & Methods. **Session-9** • Implement Event-Handling • Mouse-Events. • Key-Events. **Session-10** • Implementation of AWT Controls • Label, Button • Check Box, Check Box Group • Choice, List **Session-11** • Discuss About Multithreaded Programming. • Discuss About String Handling in Java. **Session-12** • Discuss About Java Database Connectivity. • JDBC Environment Setup, JDBC Database Connections. • Creation of JDBC Application.
Text Books & References Books	**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

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

II YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – II SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20CS2201	Design and Analysis of Algorithms	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	20CS2202	Operating Systems	3	-	-	3	2	40	2	40		3	60	100
3	20CS2203	Software Engineering	3	-	-	3	2	40	2	40		3	60	100
4	20CS2204	Formal Languages and Automata Theory	3	-	-	3	2	40	2	40		3	60	100
5	20SH2201	HSM- Managerial Economics and Financial Accounting	3	-	-	3	2	40	2	40		3	60	100
6	20SH2203	Universal Human Values	3	-	-	3	2	40	2	40		3	60	100
		PRACTICALS												
7	20CS22P1	Design and Analysis of Algorithms Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	20CS22P2	Operating Systems Lab	-	-	3	1.5	-	-	-	40		3	60	100
9	20CS22P3	Software Engineering Lab	-	-	3	1.5	-	-	-	40		3	60	100
		SKILL ORIENTED COURSE												
10	20CS22SC	Web Development Lab	1	-	2	2	-	-	-	40		3	60	100
		TOTAL	**19**	**-**	**11**	**24.5**		**240**		**400**		**-**	**600**	**1000**

20CS2201 - 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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Analyze the time and space complexity of algorithms.
	CO2	Design and analysis of algorithms using greedy strategy.
	CO3	Identify dynamic programming design methodology to solve problems involving principle of optimality.
	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 Definition, Pseudocode Conventions, Space complexity and Time complexity, Asymptotic notations.

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, 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, 0/1 Knapsack problem, Travelling salesperson problem. **UNIT-VI** **NP Hard and NP complete problems:** Nondeterministic algorithms, The classes NP hard and NP complete; NP hard graph problems - Clique decision problem (CDP). **PRAM Algorithms:** Introduction, Computational Model.
Text Books & References Books	**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

20CS2202 - 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:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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, 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, 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.

	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 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. **System Protection and Security:** Goals, Principles and Domain of protection, Security Problem, Program Threats, System and Network Threats.
Text Books & References Books	**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

20CS2203 - 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:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the software Process and various Process Models.
	CO2	Learn the Agile Development and understanding Requirements.
	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 Software Configuration Management and improve software quality assurance.

Course Content

UNIT-I

The Software Process: A generic process model, Process Assessment and Improvement.

Process Models: The Waterfall model, Incremental process models, Evolutionary process models, Concurrent Models, The Unified process, Personal and Team Process models.

UNIT-II

Agile Development: Agility and the cost of change, What is an agile process?, Extreme Programming, Other Agile process models, A tool set for the Agile process.

Understanding Requirements: Requirements engineering, Eliciting requirements, Developing Use cases, Building the Requirements model, Negotiating Requirements, Validating requirements.

UNIT-III

Requirements Modeling: Requirements modeling approaches, Scenario based modeling, Data Modeling Concepts, Class-based modeling, Flow-oriented modeling, Creating a behavioral model.

Design Concepts: The Design process, Design concepts, The Design model.

	UNIT-IV **Architectural Design**: Software architecture, Architectural styles, Architectural design, Assessing Alternative Architectural Designs, Architectural Mapping using Data flow. **Component-level Design**: What is a component?, Designing class-based components, Conducting component-level design, Designing traditional components, Component-Based Development. **UNIT-V** **Software Testing strategies**: A strategic approach to software testing, Test strategies for conventional software, Validation testing, System testing, The Art of debugging. **Product metrics:** A Framework for Product metrics, Metrics for the Requirements Model, Metrics for the Design Model, Metrics for Source code, Metrics for Testing, Metrics for Maintenance. **UNIT-VI** **Software Configuration Management:** Software Configuration Management, The SCM Repository, The SCM Process. **Software Quality Assurance:** Elements of Software quality assurance, SQA Tasks, Goals and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan
Text Books & References Books	**TEXT BOOKS:** 1. Software Engineering - A Practitioner's Approach, Pressman R S, 7th edition, McGraw-Hill. **REFERENCE BOOKS:** 1. Sommerville I, Software Engineering, 9th edition, Pearson Education. 2. Waman S Jawadekar, Software Engineering – Principles and Practice, McGraw-Hill, 2008.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS2204 - FORMAL LANGUAGES AND AUTOMATA THEORY

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Demonstrate abstract models of computing like DFA and NFA.
	CO2	Learn regular languages and are exposed to a 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 & References Books	**TEXT BOOKS:** 1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008. **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 5. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20SH2201 - MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Course Category:	Humanities and Social Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• The concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis. • The nature of markets, methods of Pricing in the different market structures and to know the different forms of Business organization • The preparation of Financial Statements and use of Capital Budgeting techniques to evaluate Capital Budgeting proposals.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Adopt the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.
	CO2	Know the role of various cost concepts in managerial decisions and the managerial uses of production function and to compute breakeven point to illustrate the various uses of breakeven analysis.
	CO3	Understand how to determine price and output decisions under various market structures.
	CO4	Know in brief formalities to be fulfilled to start a business organization.
	CO5	Adopt the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts.
	CO6	Apply capital budgeting techniques in evaluating various long term investment opportunities.
Course Content	**UNIT-I** **Introduction to Managerial Economics and demand Analysis**: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other disciplines. Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule- Demand curve- Law of Demand and its limitations- Elasticity of Demand: Types and Significance **UNIT-II** **Production & Cost Analysis**: Production Function- Isoquants and Isocosts- Cobb-Douglas Production function -Law of variable Proportions- Laws of Returns- Internal and External Economies of Scale. Cost Analysis: Cost concepts-- Break-even Analysis	

	UNIT-III **Theory of Pricing:** Types of competition and Markets- Features of Perfect competition, Monopoly and Monopolistic Competition- Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing- Methods of Pricing. **UNIT-IV** **Types of Business Organizations and Banking System:** 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:** Accounting Principles - Double-Entry system of Accounting- Rules for maintaining Books of Accounts- Journal- Posting to Ledger- Preparation of Trial Balance- Preparation of Final Accounts (with simple adjustments). **UNIT-VI** **Capital and capital budgeting**: Capital and its significance- Types of Capital- Sources of raising capital. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method and Internal Rate of Return (IRR) (simple problems).
Text Books & References Books	**TEXT BOOKS:** 1. Managerial Economics, Varshney&Maheswari 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. Financial Accounting, S.N.Maheswari& S.K. Maheswari Vikas Publishers. 3. Managerial Economics & Financial Analysis, S. A. Siddiqui& A. S. Siddiqui, New age International Space Publications. 4. Managerial Economics and Financial Analysis, M. Sugunatha Reddy, Research India Publication, New Delhi.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20SH2203 - UNIVERSAL HUMAN VALUES

(Common to CSE, IT, and AI&DS)

Course Category:	Human Values	**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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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: **At the level of individual:** as socially and ecologically responsible engineers, technologists and managers **At the level of society:** as mutually enriching institutions and organizations.
Text Books & References Books	**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. **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

20CS22P1 - 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 & References Books	**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	

20CS22P2- 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:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
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. a. FCFS b. SJF c. Priority d. Round Robin. 2. Simulate the following file allocation strategies. a. Sequential b. Indexed c. Linked. 3. Simulate MVT and MFT. 4. Simulate the following File Organization Techniques. a. Single level directory b. Two level 5. Simulate Bankers Algorithm for Dead Lock Avoidance. 6. Simulate the following page replacement algorithms. a. FIFO b. LRU c. Optimal d. LFU 7. Simulate Paging Technique of memory management.
Text Books & References Books	**TEXT BOOKS:** 1. "Operating System Concepts", Abraham Silberchatz, Peter B Galvin, Greg Gagne, 9th Edition, John Wiley & Sons Publication, 2016. **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

20CS22P3 - SOFTWARE ENGINEERING LABORATORY

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	A course on Programming for Problem Solving	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Ability to translate end-user requirements into system and software requirements.
	CO2	Ability to generate a high-level design of the system from the software requirements.
	CO3	Will have experience and /or awareness of testing problems and will be able to develop a simple testing report.

Course Content

List of Experiments:

1. **Develop a project titled Course Management System (CMS)**
   A course management system (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:
   - An area for faculty posting of class materials such as course syllabus and handouts
   - An area for student posting of papers and other assignments
   - A grade book where faculty can record grades and each student can view his or her grades
   - An integrated email tool allowing participants to send announcement email messages to the entire class or to a subset of the entire class
   - A chat tool allowing synchronous communication among class participants
   - A threaded discussion board allowing asynchronous communication among participants.

   Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

2. **Develop a web-based Leave Management Tool - Easy Leave.**
   The Easy Leave is an Intranet based application that can be accessed throughout the Organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications, cancellation of leave, automatic approval of leave, report generators etc in this Tool.

	3. Develop a safe auction management system called E-Bidding. **E-Bidding can be used** • To generate the quick reports • To make accuracy and efficient calculations • To provide proper information briefly • To provide data security • To provide huge maintenance of records Flexibility of transactions can be completed in time **4. Electronic Cash Counter** This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better out look to the user interfaces and to implement all the banking transactions like: • Supply of Account Information • New Account Creations • Deposits • Withdraws • Cheque book issues • Stop payments • Transfer of accounts • Report Generations.
Text Books	1. Software Engineering - A Practitioner's Approach – Roger S. Pressman, 7th edition, McGraw - Hill International Edition. 2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000. 3. Unified modeling language- Grady booch.

20CS22SC - WEB DEVELOPMENT LABORATORY

Course Category:	Program Core	**Credits:**	2
Course Type:	Skill Oriented	**Lecture-Tutorial-Practical:**	1-0-2
Prerequisite:	Basic knowledge of SQL, and JAVA 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 create the web applications.		

Course Outcomes	After the completion of this Course, the students will be able to learn and develop various Web based applications.
Course Content	**Session-I: HTML Basics:** HTML elements, Headings, Paragraphs, Links, Images. **Session-II: HTML Basics:** HTML Table, Lists, Forms, Attributes, Global Attributes, Events. **Session-III: CSS styles:** Syntax, Colors, Borders, Margins, Padding, Text, Fonts, Icons, Links, Lists, Tables, Display, Max-width, Position, Inline-block, Navigator bar, Dropdowns, Image gallery, Forms, Math functions, Rounded corners, Border images, Color keywords, Text effects. **Session-IV: Java Scripts:** Syntax, Variables, Operators, Data types, Functions. **Session-V: Java Scripts:** Objects, Events, Strings, Numbers, Array, HTML DOM. **Session-VI: Java Scripts:** Dates, Math, Switch, Loops, Ajax (JS/JQuery) **Session-VII: JQuery:** Syntax, Selectors, Events, Hide/Show, Fades, Slide animate chaining, Get, Set, Add, Remove, Get/Post. **Session-VIII: Software Installation:** XAMPP software, Integrated Development Environment, Apache on Linux (Installation and Configuration). **PHP Basics:** Discuss about PHP Syntax, Variable, Echo/Print, Data types. **Session-IX: PHP Basics:** Strings, Numbers, Math, Operators, if-else, Switch, Loops, Functions, Arrays, PHP Forms handling, Validation, Form complete, File Open/Read, File Create/Write, File upload. **Session-X: MySQL:** Select, Where, Oderby, Insert into, Update, Delete, Min and Max, Count, Avg, Sum, etc.., Operators.

	MySQL Database: Create db, Drop db, Create table, Drop table, Alter, Constraints, Data types, Functions, Join (Inner, Outer, etc..). **College Website Development: (Session XI, XII, & XIII)** **Session-XI** **Module1:** User Management System (Registration & Login) With admin panel **Module2:** Student Record System **Session-XII** **Module3:** Hostel Management System **Module4:** COVID19 Testing Management System **Session-XIII** **Module5:** Transport Management System **Module6:** Counselling Management System
Text Books & References Books	**REFERENCE BOOKS:** 1. Internet & World Wide Web. How to Program. Fourth Edition, P. J. Deitel, H. M. Deitel. 2. Practical web design: learn the fundamentals of web design with HTML5, CSS3, Bootstrap, jQuery, and Vue.js, Hong, Philippe 3. Learning PHP: A Gentle Introduction to the Web's Most Popular Language, David Sklar
E-Resources	1. https://phpgurukul.com/php-projects-free-downloads/ 2. https://www.php.net/ 3. https://www.w3schools.com/
Required Software	1. Windows Users: XAMPP, Notepad++, and MS Visual Studio Code 2. Linux Users: Apache, MS Visual Studio Code

III B.TECH.
I & II Semesters

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

III YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – I SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20CS3101	Data Warehousing and Mining	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	20IT3101	Wireless and Ad hoc Networks	3	-	-	3	2	40	2	40		3	60	100
3	20AD3101	Artificial Intelligence	3	-	-	3	2	40	2	40		3	60	100
4		**Professional Elective - I**	3	-	-	3	2	40	2	40		3	60	100
	20CS31E1	Object Oriented Analysis and Design												
	20CS31E2	Principles of Programming Languages												
	20CS31E3	Computer Graphics												
	20IT31E1	Free and Open Source Software												
5	20XX31XX	**Open Elective - I**	3	-	-	3	2	40	2	40		3	60	100
6	20MC3101	MC:: Entrepreneurship	2	-	-	-	2	40	2	40		3	60	100
		PRACTICALS												
7	20CS31P1	Data Warehousing and Mining Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	20AD31P1	Artificial Intelligence Lab	-	-	3	1.5	-	-	-	40		3	60	100
		SKILL ORIENTED COURSE												
9	20SH31SC	Communication and Soft Skills	1	-	2	2	-	-	-	40		3	60	100
		INTERNSHIP												
10	20IT31IS	Summer Internship (Community Service Project)	-	-	-	1.5	-	-	-	40		3	60	100
		TOTAL	**18**	**-**	**8**	**21.5**	**-**	**240**	**-**	**400**		**-**	**600**	**1000**

MC: Mandatory Course

20CS3101 - DATA WAREHOUSING AND MINING

Course Category:	Professional 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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basic concepts of data warehouse
	CO2	Understand the basic concepts of ETL Process
	CO3	Apply pre-processing techniques for data cleaning
	CO4	Analyze and evaluate performance of algorithms for Association Rules
	CO5	Analyze Classification and Bayes Theorems
	CO6	Analyze Classification and Clustering algorithms

Course Content

UNIT-I

Introduction to Data Warehousing: Introduction, Data Warehouse, Data Warehousing, Difference between OLAP&OLTP.

Kimball's DW/BI Architecture: Operational Source Systems, Extract, Transformation and Load Systems, Presentation area to support Business intelligence, Business intelligence Applications.

Alternative DW/BI Architectures: Independent Data Mart Architecture.

UNIT-II

Kimball's Dimensional Modelling Techniques Overview: Basic Fact Table Techniques, Basic Dimensional Table Techniques, Dealing with Slowly Changing Dimension Attributes.

UNIT-III

Introduction to Data Mining: Data Mining, Architecture of Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining.

Data Pre-processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-IV

Attribute-Oriented Induction: Attribute-Oriented Induction for Data Characterization.

Mining Class Comparisons: Discriminating between Different Classes.

	Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining. **UNIT-V** **Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision Tree Induction. **Bayesian Classification Methods:** Bayes Theorem, Naive Bayesian Classification, Rule-Based Classification, Support Vector Machines, Lazy Learners. **UNIT-VI** **Cluster Analysis Introduction:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods. **Partitioning Methods:** Classical Partitioning Methods: k-Means and k-Medio's, Hierarchical Methods, Density-Based Methods, Grid-Based Methods.
Text Books & Reference Books	**TEXT BOOKS:** 1. The Data Warehouse Toolkit, Ralph Kimball Margy Ross, Third Edition. 2. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Third Edition, 2012. **REFERENCE BOOKS:** 1. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education. 2. Data Warehousing in the Real World, Sam Aanhory & Dennis Murray Pearson
E-Resources	1. https://aatinegar.com/wp-content/uploads/2016/05/Kimball_The-Data-Warehouse-Toolkit-3rd-Edition.pdf 2. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf 3. https://freevideolectures.com/university/iitm

20IT3101 - WIRELESS AND AD HOC NETWORKS

Course Category:	Professional Core	**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
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		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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: Radio Propagation Mechanisms, Characteristics of the Wireless Channel, Modulation Techniques, Multiple Access Techniques, Voice Coding, Computer Network Architecture, IEEE 802 Networking Standards, Wireless Network.

UNIT-II

Wireless WANS and MANS: 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, HIPERACCESS.

UNIT-III

Wireless Internet: What Is Wireless Internet?, Mobile IP, TCP In Wireless Domain, WAP, Optimizing Web Over Wireless.

Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, 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:** 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**: Ultra-Wide-Band Radio Communication, Wireless Fidelity Systems, Optical Wireless Networks, The Multimode 802.11 – IEEE 802.11a/b/g, The Meghadoot Architecture.
Text Books & Reference Books	**TEXT BOOKS:** 1. Ad Hoc Wireless Networks: Architectures and Protocols – C. Siva Ram Murthy and B.S.Manoj, 2014, Pearson Education, Inc. **REFERENCE BOOKS:** 1. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, 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://www.tutorialspoint.com/Wireless-Networks

20AD3101 - ARTIFICIAL INTELLIGENCE

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

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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	Gain knowledge in Adversarial Search Methods
	CO5	Draw the Inferences based on logical reasoning
	CO6	Apply different Learning techniques for future implementation

Course Content

UNIT-I

Introduction: What is Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents.

UNIT-II

Search: Introduction to Search, 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.

	Problem Solving: Formulating problems, problem types, Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, stochastic search methods. **UNIT-V** **Knowledge and reasoning**: Inference, Propositional Logic, Predicate Logic (first order logic), Logical Reasoning, Forward &Backward Chaining, Resolution. **UNIT-VI** **Learning:** Overview of different forms of learning, decision trees, rule-based learning, neural networks, reinforcement learning. **Game playing:** Perfect decision game, imperfect decision game, evaluation function, minimax, alpha-beta pruning.
Text Books & Reference Books	**TEXT BOOKS:** 1. Artificial Intelligence- A Modern Approach, Stuart Russell, Peter Norvig (Person Education), Third 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. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson. 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

20CS31E1 - OBJECT ORIENTED ANALYSIS AND DESIGN

Course Category:	Professional Elective	**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.		

Course Outcomes	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.
	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 & Reference Books	**TEXT BOOKS:** 1. Grady Booch, James Rumbaugh, Ivar Jacobson: 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

20CS31E2 - PRINCIPLES OF PROGRAMMING LANGUAGES

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in any programming language with Formal Languages and Automata theory basics may be required.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To understand the basics of various programming languages. • To describe a common syntax and semantics among different languages • To explore the basic features of Subprograms, Object Orientation, Exception handling mechanisms and their comparisons. • To get the exposure on functional and imperative programming languages.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Identify the basic language evaluation criteria among multiple Programming languages.
	CO2	Study various building blocks to construct different simple programs.
	CO3	Come across local referencing environments and parameter passing mechanisms for application development.
	CO4	Learn the concept of abstraction and encapsulation properties to explore the advantage of reusability.
	CO5	Acquire the list of essential elements of object oriented programming languages to develop day to day applications.
	CO6	Identify various Exception handling mechanisms and explore Functional programming language features for new domains.

Course Content

UNIT-I

Preliminaries: Necessity of programming languages and Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Tradeoffs, Implementation methods and programming environments.

Describing Syntax and Semantics: Formal methods of describing Syntax, Attribute Grammars and Dynamic Semantics.

UNIT-II

Data Types: Primitive data types, Character string types, User-defined ordinal types, Arrays, Associative arrays, Record and Union types, Pointer and reference types.

Expression statements and Assignment statements: Introduction, Arithmetic expressions, Overloaded operators, Type conversions, Relational and Boolean expressions, Short-Circuit evaluation, Assignment and Mixed mode statements.

UNIT-III

Subprograms: Fundamentals, Design issues, Local referencing environments, Parameter passing methods, Parameters that are subprograms, Overloaded and Generic

	subprograms, Design issues for functions, User-defined Overloaded Operators, Co routines. **Implementing Subprograms:** General semantics of calls and returns, Implementing simple subprograms, Subprogram implementation with stack dynamic local variables. **UNIT-IV** **Abstract Data Types:** Concepts of abstraction, Data Abstraction, Design issues, Language Examples, Parameterized Abstract data types. **Encapsulation Constructs**: Introduction, Encapsulation Constructs, Naming Encapsulations. **UNIT-V** **OOP features**: Introduction, Object oriented programming concepts, Design Issues. **OOP Languages:** Support for OOP in Smalltalk, C++, Java, C#, Ada95, Ruby and Object model of JavaScript, Implementation of Object Oriented constructs. **UNIT-VI** **Exception Handling**: Introduction, Exception handling In Ada, C++ and Java. **Functional Programming Languages**: Overview, Fundamentals of Mathematical functions, introduction to LISP and Scheme, support for functional programming in primarily imperative languages, comparison of functional and imperative languages.
Text Books & Reference Books	**TEXT BOOKS:** 1. Sebesta RW, Concepts of programming languages, 10th edition, Pearson Education 2021 **REFERENCE BOOKS:** 1. Practical Foundations for Programming Languages by Robert Harper, Cambridge University Press, 2nd edition 2016. 2. Kenneth Louden and Kenneth Lambert', Programming Languages: Principles and Practices, 3E, Course Technology publishers. 3. Pratt TW, Zelkowitz MV and Gopal TV, Programming Languages - Design and Implementation, 4th Edition, Pearson Education 2006.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS31E3 - COMPUTER GRAPHICS

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Familiarity with the theory and use of coordinate geometry and basics of linear algebra and Algorithm fundamentals.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the fundamental concepts and theory of computer graphics • Understand modeling, and interactive control of 3D computer graphics applications • The underlying parametric surface concepts be understood • Learn multimedia authoring tools.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
	CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
	CO3	Use of geometric transformations on graphics objects and their application in composite form.
	CO4	Describe the fundamentals of parametric curves and surfaces, and spotlighting.
	CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen
	CO6	Render projected objects to naturalize the scene in 2D view and to learn animated tools

Course Content

UNIT-I

INTRODUCTION: Application areas of computer graphics, Overview of graphic system, Video- display devices, Raster-scan systems, Random scan systems, Graphics monitors and Work stations and Iinput devices.

UNIT-II

OUTPUT PRIMITIVES: Points and lines, Line drawing algorithms, Mid-point circle algorithm, Filled area primitives: Scan-line polygon fill algorithm, Boundary-fill and Flood-fill algorithm.

UNIT-III

2-D GEOMETRICAL TRANSFORMATIONS: Translation, Scaling, Rotation, Reflection and Shear transformation matrix representations and Homogeneous coordinates, Composite transformations, transformations between coordinates.

2-D VIEWING: The viewing pipeline, Window to View-port coordinate transformations, Cohen-Sutherland line clipping.

	UNIT-IV **3-D OBJECT REPRESENTATION:** Spline representation, Hermite curve, Bezier curve and B- spline curve, Polygon surfaces, quadric surfaces, Bezier and B-spline surfaces, Basic illumination models, Polygon rendering methods. **UNIT-V** **3-D GEOMETRIC TRANSFORMATIONS:** Translation, rotation, scaling, reflection and shear transformation and composite transformations. **3-D VIEWING:** Viewing pipeline, viewing coordinates, view volume and general projection transforms. **UNIT-VI** **VISIBLE SURFACE DETECTION METHODS:** Classification, back-face detection, depth-buffer, scan-line, depth sorting. **COMPUTER ANIMATION:** Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specifications.
Text Books & Reference Books	**TEXT BOOKS:** 1. Computer Graphics C version, Second edition by Donald Hearn and M. Pauline Baker, Pearson/PHI, 2002 2. Computer Graphics Principles & Practice, Second edition in C/ Foley, VanDam, Feiner and Hughes/Pearson Education, 2013 **REFERENCE BOOKS:** 1. Computer Graphics Second edition, Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc- Graw hill edition,2002. 2. Procedural elements for Computer Graphics, David F Rogers, Tata McGraw hill, 2nd edition,1988. 3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH, 1979. 4. Computer Graphics, Steven Harrington, TMH, 1987.
E-Resources	1. https://nptel.ac.in/courses

20IT31E1 - FREE AND OPEN SOURCE SOFTWARE

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Operating Systems and Basics of Unix	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• The objectives of this course are to introduce students to open source software. • Students will study common open source software licenses, open source project structure, distributed team software development, and current events in the open source world. • Students will also work on an open source project and will be expected to make a significant contribution.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	demonstrates fundamentals of Open Source.
	CO2	identify basic commands of Linux.
	CO3	express file filter commands and backup commands.
	CO4	recognize python essentials.
	CO5	construct applications with PHP and MYSQL
	CO6	identify real time FOSS applications.

Course Content

UNIT-I

Introduction to Open Sources - Need of Open Source-Advantages of Open Sources-Application of Open Sources-Who create Open Source-Who uses Open Source-Where do I get Open Source Software.

UNIT-II

Introduction to Linux OS: OS basics, Linux GUI: Exploring folders, Installation of binary packages, Built in Package Mangers Introduction to Linux file system, man pages, The first command cat, Command History

Basic Unix Commands: vi editor, Redirection operators, and some Unix commands.

UNIT-III

File Filters: Basic understanding about uniq, grep, cut, paste, join, tr, df, du, who, w, rm, unlink, ulimit, chmod, umask, chown, chgrp, id, diff, sed, cmp, comm, Introduction to pipes

Backup Commands: tar, cpio, zip and unzip commands, mount and umount.

UNIT-IV

Python
Syntax and Style, Python Objects, Number, Sequences, Strings, Lists and Tuples, Dictionaries, Conditional and Loops, Files, Input and Output, Errors and Exceptions

	UNIT-V **Open Source Database** **MySQL:** Introduction-Setting up account- Starting, terminating and writing your own SQL programs. **Open source Programming Languages** **PHP:** Introduction, Variables, Constants, DataTypes, Operators, Statements, PHP and SQL Database, PHP Connectivity-Sending and receiving E-mails. **UNIT-VI** **Real Time FOSS Applications:** Ubuntu Operating System, LAMP, Mozilla Firefox, Virtual Box, Moodle, Wordpress, Android, Libre Office, Maxima, qBittorrent, LaTeX.
Text Books & Reference Books	**TEXT BOOKS:** 1. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional,2004 2. N. B. Venkateshwarlu, "Introduction to Linux: Installation and Programming", BS Publishers, 2008. **REFERENCE BOOKS:** 1. Paul Kavanagh, "Open Source Software: Implementation and Management" Digital Press, 2004
E-Resources	1. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview 2. https://www.digimat.in/nptel/courses/video/106106182/L01.html 3. https://nptel.ac.in/courses/117106113 4. https://www.educba.com/linux-filter-commands/

20MC3101 - ENTREPRENEURSHIP

(Common to EEE, CSE, IT and AI & DS)

Course Category:	Mandatory Course	**Credits:**	0
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Prerequisite:	General Business awareness	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• The students develop and can systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand/ Overview of Entrepreneurship
	CO2	Know the methods of generating ideas
	CO3	Understand the concept of Business planning
	CO4	Understand managing the new venture
	CO5	Know the production and marketing management
	CO6	Know the financial assistance to Enterprise

Course Content

UNIT-I

Introduction to Entrepreneurship: Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur, Opportunities for Entrepreneurs in India and abroad, Woman as Entrepreneur, Role of Entrepreneurship in economic development.

UNIT-II

Creating the Ideas and Starting the Venture: Sources of new Ideas, Methods of generating ideas, creating problem solving. Features and evaluation of joint ventures, acquisitions, merges, franchising, Public issues, rights issues, and bonus issue sand stock splits.

UNIT-III

Business planning process: Meaning of business plan, Business plan process- Writing, evaluation and implementation of business plan, advantages of business planning, Business model canvas

UNIT-IV

Managing the new venture: Sources of capital, venture capital, Record keeping, recruitment, motivating and leading teams,

UNIT-V

Production & Marketing management: Thrust of production management, selection of production techniques, Marketing functions, market segmentation, market research.

	UNIT-VI **Organization Assistance:** Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies (SIDBI, DIC, NSTEDB, APPC etc.), MSME Act Small Scale Industries,
Assignment	**All students (Maximum batch size 5) need to submit a business plan on any entity as per the norms of any financial agency**
Text Books & Reference Books	**TEXT BOOKS:** 1. Entrepreneurship: Robert Hisrich, & Michael Peters, 5th ed., TMH., 1986 2. Entrepreneurship: Dollinger, Pearson, 4th ed., 2004. **REFERENCE BOOKS:** 1. Dynamics of Entrepreneurial Development and Management, Vasant, 2009. 2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999. 3. Entrepreneurial Management, Robert J.Calvin, TMH, 2004. 4. Essential of Entrepreneurship and small business management, Thomas W. Zimmerer & Norman M. Scarborough, 4th ed., PHI, 2005 5. Industrial Relations &Labour Laws, Srivastava, Vikas, 2005.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS31P1 - DATA WAREHOUSING AND MINING LABORATORY

Course Category:	Professional 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:	
	CO1	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	
Text Books & Reference Books	**TEXT BOOKS:** 1. The Data Warehouse Toolkit, Ralph Kimball Margy Ross, Third Edition. 2. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Third Edition, 2012. **REFERENCE BOOKS:** 1. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education. 2. Data Warehousing in the Real World, Sam Aanhory & Dennis Murray Pearson	

E-Resources	1. https://aatinegar.com/wp-content/uploads/2016/05/Kimball_The-Data-Warehouse-Toolkit-3rd-Edition.pdf 2. http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf 3. https://freevideolectures.com/university/iitm

20AD31P1 - ARTIFICIAL INTELLIGENCE LABORATORY

Course Category:	Professional Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Basic Mathematics, Algorithmic Analysis	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To learn how to solve the real world problems.		

Course Outcomes	Upon completion of the course, students will be able to deal with problem solving which needs human intelligence.
Course Content	1. Implement the following operations using Python a. Transpose of a given Matrix. b. Inverse of a given Matrix. c. Student grade assignment based on Marks. 2. Write a program to implement "Guess a Number" Game. 3. Write a program to implement "Towers of Hanoii". 4. Write a program to implement "Tic-Tac-Toe" Game. 5. Write a program to solve "Water Jug Problem". 6. Write a program to solve "Monkey Banana Problem". 7. Write a program to solve "8 Queens Problem". 8. Write a program to solve "Traveling Salesman Problem".
Text Books & Reference Books	**TEXT BOOKS:** 1. E.Horowitz, S.Sahni, S.Rajasekaran, "Fundamentals of Computer Algorithms", 2ndEdition, Universities Press, ISBN: 978-8173716126, 2008. 2. Artificial Intelligence- A Modern Approach, Stuart Russell, Peter Norvig (Person Education), Third Edition. 3. Martin C. Brown, "The Complete Reference: Python", McGraw-Hill, 2018. 2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015. 4. "Introduction to Algorithms", 3rd Edition, Prentice-Hall of India, ISBN: 978-81-203-4007-7, 2010 5. R.J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.
E-Resources	1. https://Wiki.python.org/moin/WebProgrammingBooks 2. https://realpython.com/tutorials/web-dev/ 3. https://www.w3schools.com/

20SH31SC - COMMUNICATION AND SOFT SKILLS

(Common to CSE, IT, AI&DS, & EEE)

Course Category:	Basic Sciences	**Credits:**	2
Course Type:	Skill Oriented	**Lecture-Tutorial-Practical:**	1-0-2
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To acquire soft skills and use them effectively in a realistic professional work places. • To improve analytical abilities to think on a particular given topic • To develop interview skills • To learn writing a standard resume		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Define group discussion skills.
	CO2	Demonstrate effective résumés and job applications.
	CO3	Develop various skills for attending interviews.
	CO4	Classify intrapersonal and interpersonal relationship skills.
	CO5	Interpret personality development skills and put them in practice.
	CO6	Improve personal and professional grooming, business dressing and telephonic skills.

Course Content

1. **Group Discussion:** Dynamics of Group Discussion - Voice Modulation - Fluency and Coherence - Body Language - Summarizing
2. Resume Writing: Structure - Defining the Career Objective - Projecting one's Strengths and Skills - Formats and Styles - Cover Letter
3. Interview Skills: Concept and Process - Pre-Interview Planning - Opening Strategies - Answering Strategies - Interviews through Online Platforms
4. **Intrapersonal & Interpersonal Relationship Skills:** Importance - Intrapersonal Vs. Interpersonal Relationship Skills - Team work at work places
5. **Personality Development Skills** : Assertiveness - Positive Attitude - Self Confidence- Problem Solving Skills - Leadership Skills
6. **Corporate Etiquettes:** Dressing Etiquette- Dining Etiquette – Telephonic Etiquette

Text Books & Reference Books	**REFERENCE BOOKS:** 1. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd. 2. A Course in English communication, Madhavi Apte, Prentice-Hall of India, 2007. 3. Communication Skills, Leena Sen, Prentice-Hall of India, 2005. 4. Academic Writing- A Practical guide for students, Stephen Bailey, Rontledge Falmer, London & New York, 2004. 5. Soft Skills, Dr K. Alex, S. Chand Publications, New Delhi. 6. A Textbook of English for Engineers and Technologists (combined edition, Vol. 1 &; Orient Black Swan 2010.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

III YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – II SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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	20CS3201	Machine learning Applications	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
2	20IT3201	Internet of Things	3	-	-	3	2	40	2	40		3	60	100
3	20IT3202	Cryptography and Network Security	3	-	-	3	2	40	2	40		3	60	100
4		**Job Oriented Elective-I**	3	-	-	3	2	40	2	40		3	60	100
	20IT32J1	Cloud Computing												
	20IT32J2	Software Testing Tools												
5		**Professional Elective–II**	3	-	-	3	2	40	2	40		3	60	100
	20IT32E1	Software Project Management												
	20IT32E2	Software Architecture												
	20IT32E3	Social Information Networks												
	20AD32E1	Natural Language Processing												
6	20MC3202	MC: Advanced Aptitude and Reasoning Skills	2	-	-	-	2	40	2	40		3	60	100
		PRACTICALS												
7	20CS32P1	Machine learning Applications Lab	-	-	3	1.5	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	20IT32P1	Internet of Things Lab	-	-	3	1.5	-	-	-	40		3	60	100
9	20IT32P2	Cryptography and Network Security Lab	-	-	3	1.5	-	-	-	40		3	60	100
		SKILL ORIENTED COURSE												
10	20IT32SC	Mobile App Development Lab	1	-	2	2	-	-	-	40		3	60	100
		TOTAL	**18**	**-**	**11**	**21.5**	**-**	**240**	**-**	**400**		**-**	**600**	**1000**

20CS3201 - MACHINE LEARNING APPLICATIONS

Course Category:	Professional Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Mathematical concepts such as Statistics, Linear Algebra, Calculus, and Probability. Basic programming skills. Knowledge in data mining and warehousing.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To discover patterns in the user data and then make predictions and intricate patterns for answering business questions and solving business problems. • Machine learning in business and other fields is effectively a method of data analysis that works by automating the process of building data models. • Machine learning helps in analysing the data as well as identifying trends. • To be able to formulate machine learning problems corresponding to different applications. • To be able to apply machine learning algorithms to solve problems of moderate complexity		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Learn Basics of Machine Learning and which Real time applications are Using Machine Learning Techniques,
	CO2	Analyze the various Supervised Learning Algorithms- Classification Algorithms, how these algorithms are applied for real time Applications
	CO3	Analyse the various Regress Algorithms- Regression Algorithms, how these algorithms are applied for real time Applications and analyse the various Unsupervised Learning Algorithms, how these algorithms are applied for real time Applications.
	CO4	Analyse Artificial neural network algorithms for Real time applications.
	CO5	Learn the Concept of Reinforcement Learning and working models for applications.
	CO6	Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems
Course Content	**UNIT-I** **Introduction:** What is Machine Learning? Why you use Learning, Life cycle of Machine Learning, Main challenges of Machine Learning, Types of Machine Learning algorithms, Applications of Machine Learning **Python Framewoks:** Numpy, Scipy, Scikit-learn, Theono, Tensorflow, Keras, PyTorch, Pandas, Matplotlib tools to Implement Machine Learning Algorithms. **UNIT-II** **Supervised Learning-I**: Classification Algorithms-Concept Learning, Decision Tree Learning, Naive Bayes Classifier, K-Nearest Neighbour, Real Time Applications of Classification Algorithms, Implementation of Decision Tree and K-Nearest Neighbour using Python Frameworks.	

	Supervised Learning-II: Logistic Regression, Support Vector Machines, Implementation of Logistic Regression, and Support Vector Machines using Python Frameworks. **UNIT-III** **Regression Algorithms**: Linear Regression, Polynomial Regression, Real Time Applications of Regression Algorithms, Implement Linear Regression using Python Frameworks. **Unsupervised Learning:** Clustering Algorithms- K-Means Clustering, Implementation of K-means clustering using Python Frameworks. Dimensionality Reduction- Principal Component Analysis, Implementation of Principle Component Analysis using Python Frameworks, Hidden Markov Model. Real Time Applications of Clustering Algorithms. **UNIT-IV** **Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptron, Multilayer Networks and Back Propagation Algorithm, Implementation of Back Propagation Algorithm using Python Frameworks, Applications of Artificial Neural Networks. **UNIT-V** **Reinforcement Learning:** What is Reinforcement Learning, How Reinforcement Learning works with Example, Characteristics of Reinforcement Learning, Learning Models of Reinforcement Learning-Markov Decision Process, Q-Learning, and Implementation of Q-learning with Python Frameworks, Real Time Applications of Reinforcement Learning. **UNIT-VI** **Genetic Algorithms:** What is Genetic Algorithm, Operators of Genetic Algorithms, How Genetic Algorithm works with illustrative example, Flow Chart for Genetic Programming, Implementation of Genetic Algorithm in Python Frameworks, Real Time Applications of Genetic programming.
Text Books & Reference Books	**TEXT BOOKS:** 1. Tom M. Mitchell, Machine Learning@1997. 2. WEI-MENG LEE, Python Machine Learning, Wiley, 2019 **REFERENCE BOOKS:** 1. O'Reilly, Hands on Machine Learning with Scikit-Learn and Tensor flow@ 2017 2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Third Edition. 3. Rudolph Russell, Machine Learning Step by step guide to implement Machine Learning Algorithms with Python@2018. 4. Shai Shalev Shwartz, Understanding Machine Learning from Theory to Algorithms, Cambridge University Press, 2014
E-Resources	1. https://www.javatpoint.com/artificial-neural-network-genetic-algorithm 2. https://www.geeksforgeeks.org/genetic-algorithms/ 3. https://www.geeksforgeeks.org/ml-logistic-regression-using-python/ 4. https://nptel.ac.in/courses/108104049/

20IT3201 - INTERNET OF THINGS

Course Category:	Professional Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Require Data communication, networking fundamentals and Internet Technologies	**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		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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 & Reference Books	**TEXT BOOKS:** 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

20IT3202 - CRYPTOGRAPHY AND NETWORK SECURITY

Course Category:	Professional 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	Know the different types of Data Encryption models of Symmetric Cipher Techniques and required basic number theory.
	CO3	Gain the knowledge in Data Encryption models of Advanced Symmetric Cipher Techniques.
	CO4	Learn and able to design different types of Data Encryption models of Asymmetric Cipher Techniques and required basic number theory.
	CO5	Study the Data Integrity, authentication protocols and classification of digital signature standards.
	CO6	Acquire the knowledge of the Mutual Trust with Internet related security mechanisms.

Course Content

UNIT-I

Introduction: Overview of Computer Security, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Symmetric Ciphers: Classical Encryption Techniques: Symmetric Cipher Model**,** Substitution Techniques, Steganography.

UNIT-II

Block Ciphers and the Data Encryption Standard: Block Cipher Principles, DES, Strength of DES.

UNIT-III

Advanced Encryption Standard: The Origins AES, AES Structure, AES Round Functions, AES Key Expansion

Block Cipher Operation: Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode.

	UNIT-IV **Number Theory:** Prime and Relatively Prime Numbers,Fermat's and Euler's theorems, Testing for Primality. **Public Key Cryptography:** Principles of Public-key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key exchange. **UNIT-V** **Cryptographic Hash Functions:**Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA) **Message Authentication Codes:** Message Authentication Requirements, Message Authentication functions, Message Authentication Codes. **UNIT-VI** **Key Management and Distribution:** Symmetric key Distribution usingSymmetric Encryption, Symmetric key Distribution using Asymmetric Encryption,Distribution of Public Keys.
Text Books & Reference Books	**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.
E-Resources	1. WilliamStallings.com/Crypto/Crypto5e.html 2. www.Tutorialspoint.com

20IT32J1 - CLOUD COMPUTING

Course Category:	Job Oriented 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
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		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Know basic idea about cloud computing vision and its developments.
	CO2	Classify the Virtualization techniques in Cloud.
	CO3	Compare categories of cloud and summarize their collaborative services.
	CO4	Detail the internal components and structure of Cloud models.
	CO5	Use Aneka Cloud Application Platform in developing cloud applications.
	CO6	Outline the 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.

UNIT-II

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing.

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.

UNIT-IV

Security: data security, network security, host security.

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. **UNIT-VI** **Cloud Applications:** Scientific Applications – Health Care, Geo science, Biology. Business And Consumer Applications - CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.
Text Books & Reference Books	**TEXT BOOKS:** 1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013. 2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly **REFERENCE BOOKS:** 1. 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

20IT32J2 - SOFTWARE TESTING TOOLS

Course Category:	Job Oriented Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in software engineering basics is required.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Learning the fundamentals of testing techniques. • Knowing various testing tools and their applicability. • Comparison of tools to explore the suitability for various domains. • Testing different applications.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Study the basics of testing, test process and supporting features based on its life cycle.
	CO2	Explore the V model for software development and getting awareness on defect management.
	CO3	Learn the basics of testing and study silk test tool and its applicability
	CO4	Apply the WinRunner tool to various test cases.
	CO5	Acquire knowledge on LoadRunner and JMeter tools for virtual users, JDBC and HTTP tests.
	CO6	Gain knowledge on TestDirector and QTP tools and their applicability to database and web applications.

Course Content

UNIT-I

Fundamentals of Software Testing:
Historical prospective, Definitions, Testing during Development Life Cycle, Requirement Traceability Matrix, Workbench, Important features, Misconceptions and principles, Cost aspects.

Software Testing Process:
Psychology, Verification and validation, Testing team and development team, cost of Quality, Characteristics of Test engineers, Levels of testing, Testing approaches, Types of testing, Test plan, Software Reliability, Manual testing and its Limitations/Drawbacks.

UNIT-II

V-Test model:
Introduction, V- model for software, Testing during proposal stage, requirements, planning, design and coding, VV model, Critical roles and responsibilities.

Defect Management:
Introduction and defect classifications, Defect Management Process, Life cycle, Template, root causes, estimation of impact, techniques for finding defect and reporting.

	UNIT-III **Software Testing Tools:** Need and Taxonomy of testing tools, Functional/ Regression testing tools, Performance, Test management, and Source code testing tools, Procedure for selecting testing tool. **Silk Test:** Overview, Architecture, Testing an application, The 4 test scripting language, Checkpoints and Data-driven test cases. **UNIT-IV** **WinRunner**: Overview, Testing an application, Test Script Language, Synchronization of test cases, Data-driven testing, Rapid test Script Wizard and Checking GUI objects. **UNIT-V** **LoadRunner:** Overview, Creating User script using Virtual User Generator, Creating Virtual users using LoadRunner controller. **JMeter:** Overview, JDBC and HTTP tests **UNIT-VI** **TestDirector**: Overview, Test Management Process, Managing the testing process using TestDirector. **QuickTest Professional (QTP)**: Overview, Testing an application, Synchronization, Creating checkpoints, Testing Calculator with parameterization, Testing database and web applications.
Text Books & Reference Books	**TEXT BOOKS:** 1. Software Testing Tools covering with WinRunner, Silk Test, LoadRunner, JMeter, TestDirector and QTP with case studies by Dr.K.V.K.K Prasad, DreamTech Press publishers, 2010. 2. Software Testing Principles, Techniques and Tools by MG Limaye, McGraw Hill Publishers, 2012. **REFERENCE BOOKS:** 1. Software Testing effective methods, Tools and Techniques by Renu Rajani and Pradeep Oak, Tata McGraw Hill Education Private Limited, 2004. 2. Software Testing: A Craftsman's Approach by Paul C.Jorgensen, CRC press, 4th edition. 3. Foundations of Software Testing:ISTQB Certification by Rex Black, Dorothy Graham and Erik P.W.M. Veenendaal, Cenage Learning, 3rd Edition.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20IT32E1 - 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		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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. **Project Control and Process Instrumentation:** The Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations, Pragmatic Software Metrics, Metrics Automation.
Text Books & Reference Books	**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

20IT32E2 - 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 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 Modelling and Analysis: Modelling 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 & Reference Books	**TEXT BOOKS:** 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, 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

20IT32E3 - SOCIAL INFORMATION NETWORKS

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	An understanding of graph theory is desirable	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the components of the social network. • Understand the patterns in complex social network. • Familiarize the graph theory concepts of the social network. • Analyze the statistical models for social network.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the subject related concepts and of contemporary issues
	CO2	Gain knowledge about the importance of graph theory in social networks.
	CO3	Implement the patterns in complex social networks.
	CO4	Identify the relationships among social positions and social roles.
	CO5	Understand the stochastic assumptions about the relational data in a social network.
	CO6	Explore the basics of statistical models for attaining structural hypothesis.

Course Content

UNIT-I

Introduction

Introduction to social network analysis – Fundamental concepts in network analysis – social network data – notations for social network data – Graphs and Matrices.

UNIT-II

Centrality and Prestige

Nondirectional Relations- Degree Centrality, Closeness Centrality, Betweenness Centrality,

Directional Relations- Centrality, Prestige, Comparisons and Extensions

UNIT-III

Structural Equivalence

Background, Definition of Structural Equivalence, Positional Analysis, Measuring Structural Equivalence- Euclidean Distance as a Measure of Structural Equivalence, Correlation as a Measure of Structural Equivalence.

UNIT-IV

Block Models

Definition, Building Blocks- Perfect Fit (Fat Fit), Zero block (Lean Fit) Criterion, One block Criterion, α Density Criterion, Interpretation: Actor Attributes, Describing Individual Positions

	UNIT-V **Dyads** An Overview, Dyads, Simple Distributions: The Uniform Distribution - A Review, Simple Distributions on Digraphs, Statistical Analysis of the Number of Arcs, Statistical Analysis of the Number of Mutuals. **UNIT-VI** **Triads** Random Models and Substantive Hypotheses, Triads, Distribution of a Triad Census: Mean and Variance of a Triad Census, Mean and Variance of Linear Combinations of a Triad Census, Testing Structural Hypotheses: Configurations, From Configurations to Weighting Vectors, From Weighting Vectors to Test Statistics
Text Books & Reference Books	**TEXT BOOKS:** 1. Stanley Wasserman, Katherine Faust, Social network analysis: Methods and applications, Cambridge university press, 2009. **REFERENCE BOOKS:** 1. M.E.J. Newman, Networks: An introduction, Oxford University Press, 2010. 2. Easley and Kleinberg, Networks, Crowds, and Markets: Reasoning about a highly connected world. Cambridge University Press, 2010. 3. Matthew Jackson, Social and Economic Networks. Princeton Univ. Press, 2008. 4. Charu Aggarwal, Social Network data analysis, Springer, 2011. 5. John Scott, Social network analysis, 3rd edition, SAGE, 2013
E-Resources	1. https://nptel.ac.in/courses/106106169

20AD32E1 - NATURAL LANGUAGE PROCESSING

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge of basic Machine learning concepts. Knowledge of mathematical concepts such as Probability, Linear Algebra and Calculus is must.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Learn the concepts of Natural Language processing. • Gain practical understanding of relevant terminology, concepts in Natural Language Processing.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Explain the fundamental models of Natural Language Processing systems
	CO2	Design Finite-State Transducers for English Morphology.
	CO3	Take part in word prediction of Language sentences.
	CO4	Interpret the computational models for assigning POS tagging.
	CO5	Apply basic Top-Down Parser for syntax analysis of Natural Language sentences.
	CO6	Describe probabilistic grammars and parsers for syntax analysis of Natural Language sentences.

Course Content

UNIT-I

Introduction:
Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought and Understanding, The State of the Art, Some Brief History.

UNIT-II

Words and Transducers:
Survey of English Morphology, Finite-State Morphological Parsing, Construction of a finite state lexicon, Finite-State Transducers, FSTs for Morphological Parsing, Transducers and Orthographic rules, The Combination of an FST Lexicon and Rules.

UNIT-III

N-grams:
Word counting in Corpora, Simple (Unsmoothed) N-grams, Training and Test Sets, Evaluating N-GRAMS, Smoothing- Laplace smoothing and Good-Turing Discounting, Interpolation, Back-off.

UNIT-IV

Part-of-Speech Tagging:
English word classes, Tagsets for English, Part-of-speech Tagging, Rule-Based Part-of-Speech Tagging, HMM Part- of-Speech tagging- Computing the most-likely tag sequence, Formalizing Hidden Markov Model taggers, The Viterbi Algorithm for HMM Tagging.

	UNIT-V **Syntactic Parsing:** Parsing as Search- Top Down Parsing, Bottom-Up Parsing, Ambiguity, Search in the face of ambiguity, Dynamic programming parsing methods- CKY parsing, The Earley algorithm, Chart Parsing. **UNIT-VI** **Statistical Parsing:** Probabilistic Context-Free Grammars for Disambiguation, Probabilistic Context-Free Grammars for Language Modeling, Probabilistic CKY Parsing of PCFGs, Learning PCFG Rule Probabilities, Problems with PCFGs, Improving PCFGs by Splitting and Merging Nonterminals.
Text Books & Reference Books	**TEXT BOOKS:** 1. An introduction to natural language processing, computational linguistics, and speech recognition. Daniel Jurafsky & James H. Martin. **REFERENCE BOOKS:** 1. Christopher D. Manning, Hinrich Schutze, Foundations of Statistical Natural Language Processing, (1999), The MIT Press. 2. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval, (2008), Oxford University Press.
E-Resources	1. https://nlp.stanford.edu/fsnlp/

20MC3202 - ADVANCED APTITUDE AND REASONING SKILLS

(Common to EEE, CSE, IT and AI & DS)

Course Category:	Mandatory Course	**Credits:**	0
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Prerequisite:	Basic Mathematical Skills	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Enhancing the problem solving skills. • Solving quantitative aptitude questions effortlessly using advanced strategies. • Advanced strategies of different counting techniques. • Better decision making concepts by proper analysation and representation of data. • Strengthening the basic programming skills for placements. • Enhancing critical thinking and innovative skills.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Become proficient in Solving quantitative aptitude questions effortlessly.
	CO2	Analyse different strategies of solving quantitative ability problems.
	CO3	Demonstrate different counting techniques effectively.
	CO4	Apply better decision making concepts by proper analysation and representation of data.
	CO5	Acquire skills for preparing for interviews, presentations and higher education.
	CO6	Enhance critical thinking and innovative skills.
Course Content	**UNIT-I** **Quantitative Aptitude:** Logarithms, Arithmetic Progressions, Geometric Progressions, Mensuration: Areas & Volumes. **UNIT-II** **Quantitative Ability:** Time and Work, Time Speed and Distance, Percentages, Profit and Loss, Averages and Ages. **UNIT-III** **Permutation and Combination:** Fundamental Counting Principles, Permutations and Combinations, Computation of Linear and Circular Permutations-Advanced problems, Computation of Combination-Advanced problems. **UNIT-IV** **Data Analysis and Interpretation:** Data Sufficiency, Data interpretation: Advanced Interpretation tables, pie charts & bar charts. **UNIT-V** **Logical reasoning:** Logical Connectives, Syllogisms, Binary logic, Venn Diagram, Sequential output tracing, Crypto arithmetic.	

	UNIT-VI **Reasoning Ability:** Coding and Decoding, Input Type Diagrammatic Reasoning, Spatial Reasoning, Clocks and Calendar, Directions.
Text Books & Reference Books	**TEXT BOOKS:** 1. "Quantitative Aptitude for Competitive Examinations", by R S Aggarwal, S. Chand Publishing, Delhi, 3rd Edition, 2017. 2. "Aptipedia Aptitude Encyclopaedia", by FACE, Wiley Publications, Delhi, 1st Edition, 2016. 3. "PlaceMentor", by SMART, Oxford University Press, 1st Edition, 2018. **REFERENCE BOOKS:** 1. "An Introduction to Critical Thinking", by Daniel Flage, Pearson, London, 1st Edition, 2002. 2. "Aptimithra", by ETHNUS, McGraw-Hill Education Pvt. Ltd, 1st Edition, 2013. 3. "A modern approach to non-verbal reasoning", by Dr. Agarwal.R.S, S.Chand &Company Limited 2011 4. "How to Prepare for Quantitative Aptitude for CAT", by Arun Sharma, McGraw Hill Education. 5. "How to Prepare for Logical Reasoning for CAT", by Arun Sharma, McGraw Hill Education.
E-Resources	1. https://www.indiabix.com 2. http://www.m4maths.com 3. http://www.gyanjosh.com 4. http://www.careerbless.com

20CS32P1 - MACHINE LEARNING APPLICATIONS LABORATORY

Course Category:	Professional Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Basic knowledge in fundamentals of data mining algorithms, DBMS, Dataset Formats.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To study various machine learning models for building Real-Time 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 Python.	
	CO1	Understand the basics of Encryption and Decryption Procedure of Cryptography.
Course Content	1. Implementation of Email spam classification using Naïve Bayes Classifier with Python. 2. Implementation of image classification using Support Vector Machines with Python. 3. Predicting the salary of person based on experience using Linear Regression analysis with python. 4. Implementation of Lung Cancer Detection using Machine Learning algorithm with python. 5. Implementation of Language translation using Machine Learning algorithm with python. 6. Implement Chabot using python. 7. Implement Sentiment Analysis using Python. 8. Implement product recommendation system with sales data using python. 9. Implement image recognition system using python. 10. Implementation of Credit card fraud detection in machine learning using python.	
Text Books & Reference Books	1. WEI-MENG LEE, Python Machine Learning, Wiley, 2019 2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education. 3. EthemAlpaydın, Introduction to machine learning, second edition, MIT press. 4. https://www.askpython.com/python/examples/email-spam-classification 5. https://thecleverprogrammer.com/2020/05/17/email-spam-detection-with-machine-learning/ 6. https://medium.com/analytics-vidhya/image-classification-using-machine-learning-support-vector-machine-svm-dc7a0ec92e01 7. https://www.kaggle.com/code/ashutoshvarma/image-classification-using-svm-92-accuracy/notebook 8. https://vitalflux.com/linear-regression-real-life-example/ 9. https://techvidvan.com/tutorials/python-sentiment-analysis/ 10. https://www.analyticsvidhya.com/blog/2022/07/sentiment-analysis-using-python/	

	11. https://towardsdatascience.com/similar-product-recommendations-data-to-deployment-970a085bafce 12. https://data-flair.training/blogs/credit-card-fraud-detection-python-machine-learning/

20IT32P1 - INTERNET OF THINGS LABORATORY

Course Category:	Professional Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-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 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. Create a traffic light signal with three colour lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds 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	

Reference	**REFERENCE BOOKS:** 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

20IT32P2 - CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

Course Category:	Professional Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Knowledge in Computer Fundamentals and Basic Mathematical Fundamentals.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To learn and practice the essentials of Encryption and Decryption Procedure of 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 for El Gamal Cryptosystem.	
Text Books & Reference Books	**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	

20IT32SC - MOBILE APP DEVELOPMENT LABORATORY

Course Category:	Skill Oriented	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	1-0-2
Prerequisite:	Required the basics of Java, XML, SQLite and Android Studio.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Able to Design a Mobile Application. • Develop and deploy the Mobile Applications in marketplace.		

Course Outcomes	Understand the fundamental issues and usage of mobile applications and develop various innovative applications which are useful for society.
Course Content	**Session-I:** Review of Java Concepts, Download and Install Android Studio, Android Setup, Application components, Resources, Activities, Services Develop a Hello World Program **Session-II:** Android User Interfaces: UI Layouts, UI Controls, Styles and Themes. Develop an application that uses GUI components, Font and Colours. **Session-III:** Android Event Handling, Drag and Drop, Notifications. Develop a basic Calculator application that uses Layout Managers and event listeners. **Session-IV:** Alert Dialogues, Clipboard, Animation Develop an application that draws basic graphical primitives on the screen. **Session-V:** Sending SMS, Phone calls Develop an application for SMS, Phone Calls. **Session-VI:** Android Audio Capture, Audio Manager, Audio Complete. Develop a program for Audio Capture. **Session-VII:** SqLite (CRUD). Develop an Android Program to connect Database and Develop Database Operations using SQLite. **Session-VIII:** Text to Speech Develop an Application for Text to Speech. **Session-IX:** Google Maps Develop an application for identify the current location. **Session-X:** Develop an application for College Requirement.

Text Books & Reference Books	**TEXT BOOKS:** 1. Java: The Complete Reference, 10th Edition, Herbert Schildt TMH, Indian Edition. 2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012. **REFERENCE BOOKS:** 1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012. 2. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012. 3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning Ios. 4. Development: Exploring the iOS SDK”, Apress, 2013.
E-Resources	1. http://developer.android.com/ 2. https://www.w3schools.com/ 3. https://www.docs.flutter.dev/ 4. https://www.tutorialspoint.com/android

IV B.TECH.
I & II Semesters

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

IV YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – I SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION (With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		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-III**	3	-	-	3	2	40	2	40	0.8*Best of two + 0.2*least of two	3	60	100
	20CS41E1	Compiler Design												
	20AD41E1	Big Data and Applications												
	20AD41E2	Data Science												
	20AD41E3	Neural Networks and Fuzzy Logic												
2		**Professional Elective-IV**	3	-	-	3	2	40	2	40		3	60	100
	20CS41E3	Python Programming – II												
	20AD41E4	Deep Learning												
	20AD41E5	Nature Inspired Computing for Data Science												
	20AD41E6	Virtual Reality												
3		**Professional Elective-V**	3	-	-	3	2	40	2	40		3	60	100
	20IT41E2	Block Chain Technologies												
	20AD41E7	Game Programming												
	20AD41E8	Reinforcement Learning												
	20AD41E9	Knowledge Representation and Reasoning												
4		**Job Oriented Elective-II**	3	-	-	3	2	40	2	40		3	60	100
	20CS41J1	Service Oriented Architecture												
	20CS41J2	Cyber Security												
5		**HSMC Elective**	3	-	-	3	2	40	2	40		3	60	100
	20SH41E1	Management Science												
	20SH41E2	Customer Relationship Management												
	20SH41E3	Strategic Management												
	20SH41E4	Corporate Governance and Business Ethics												

6	20IT41MO	MOOCs	-	-	-	3	-	-	-	40		-	60	100
		SKILL ORIENTED COURSE												
7	20AD41SC	Data Representation and Analysis using Python Lab	1	-	2	2	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
		INTERNSHIP												
8	20IT41IS	Industry/ Research Internship	-	-	-	3	-	-	-	40		-	60	100
		TOTAL	**16**	**-**	**2**	**23**	**-**	**200**	**-**	**320**		**-**	**480**	**800**

20CS41E1 - COMPILER DESIGN

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	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 develop interpreters or compilers.
	CO4	Identify various storage allocation strategies, intermediate code generation and techniques of accessing non-local data.
	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

Intermediate Code generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking.

Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack.

	UNIT-V **Code Generation:** Issues in the Design of a code generator, The target Language, Addresses in the target code, Basic blocks and flow graphs, A simple code generator, Register allocation and assignment. **UNIT-VI** **Code Optimization:** The principal sources 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 & Reference 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

20AD41E1 - BIG DATA AND APPLICATIONS

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the Big Data Platform and its Use cases • Provide an overview of Apache Hadoop • Provide HDFS Concepts and Interfacing with HDFS • Understand Map Reduce Jobs • Provide hands on Hadoop Eco System • Apply analytics on Structured, Unstructured Data. • Exposure to Data Analytics with R.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Identify Big Data and its Business Implications and List the components of Hadoop and Hadoop Eco-System
	CO2	Access and Process Data on Distributed File System
	CO3	Manage Job Execution in Hadoop Environment
	CO4	Develop Big Data Solutions using Hadoop Eco System
	CO5	Analyse Info sphere Big Insights Big Data Recommendations
	CO6	Apply Machine Learning Techniques using R.

Course Content

UNIT-I

Introduction To Big Data and Hadoop:
Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy,
Introduction to Info sphere Big Insights and Big Sheets.

UNIT-II

HDFS (Hadoop Distributed File System):
The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT-III

Map Reduce:
Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

	UNIT-IV **Hadoop Eco System:** **Pig:** Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. **Hive:** Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. **UNIT-V** **Hbase:** HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. **Big SQL:** Introduction. **UNIT-VI** **Data Analytics with R:** Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Big Data Analytics with BigR.
Text Books & Reference Books	**TEXT BOOKS:** 1. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012. 2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015 **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. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012. 5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012. 6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20AD41E2 - DATA SCIENCE

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Require Transformation Techniques, Linear Algebra and Python Programming.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To impart knowledge on basics of data science, data manipulation and exploratory data analysis concepts that is vital for data science. • To develop skills for applying tools and techniques to analyze, visualize and interpret data.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Demonstrate knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy.
	CO2	Apply Data Preparation and Exploration methods using Pandas to perform data manipulation
	CO3	To determine Data transformation, String manipulation techniques
	CO4	To recognize Combining and merging datasets
	CO5	Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.
	CO6	Construct methods to analyze and interpret time series data to extract meaningful statistics

Course Content

UNIT-I

Introduction to Data Science: Basic terminologies of data science, Types of data, Five steps of data science, Arrays and vectorized computation using NumPy - The NumPy ndarray: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, pseudorandom number generation.

UNIT-II

Data Exploration with Pandas: Process of exploring data, Pandas data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics - Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format, Binary data formats, Interacting with web APIs, Interacting with databases.

UNIT-III

Data Cleaning, Preparation: Handling missing data, Data transformation, String manipulation - String object methods, Regular expressions, Vectorized string functions in Pandas;

UNIT-IV

Data Wrangling: Data wrangling: join, Combine and reshape - Hierarchical indexing, Combining and merging datasets, Reshaping and pivoting.

	UNIT-V **Data Visualization with Matplotlib**: Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools; Data aggregation and Group operations- GroupBy mechanics, Data aggregation, Apply: General split-apply-combine, Pivot tables and Cross-tabulation. **UNIT-VI** **Time Series Analysis**: Date and time data types and tools, Time series basics, Date ranges, Frequencies, and shifting. Time zone handling, Periods and period arithmetic, Resampling and frequency Conversion – Downsampling, upsampling and interpolation, Resampling with periods; Moving window functions.
Text Books & Reference Books	**TEXT BOOKS:** 1. Wes McKinney, Python for Data Analysis, O 'Reilly, 2nd Edition, 2017. **REFERENCE BOOKS:** 1. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018. 2. Rachel Schutt, Cathy O'Neil,Doing Data Science: Straight Talk from the Frontline, O'Reilly, 2014.
E-Resources	1. https://swayam.gov.in/nd1_noc19_cs60/preview 2. https://towardsdatascience.com/ 3. https://www.w3schools.com/datascience/ 4. https://github.com/jakevdp/PythonDataScienceHandbook 5. https://www.kaggle.com

20AD41E3 - NEURAL NETWORKS AND FUZZY LOGIC

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	The Learners need to have the basic knowledge of Statistics, abstract Algebra and concepts of digital logic.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To Facilitate adequate knowledge about supervised and unsupervised neural networks • To Introduce neural network design concepts • To Expose neural networks based methods to solve real world complex problems • To Teach about the concept of fuzziness involved in various systems • To Acquire knowledge of fuzzy logic to design the real world fuzzy systems		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Apply the concepts of feed forward neural networks and their learning techniques.
	CO2	Comprehend the architecture, develop algorithms and apply the concepts of back propagation networks.
	CO3	Understand the techniques of storing association between patterns there by generating the best models
	CO4	Differentiate between the fuzzy and the crisp sets, apply the concepts of fuzziness and the fuzzy set theory.
	CO5	Select the membership functions, write rules and develop the fuzzy controller for Industrial applications.
	CO6	Demonstrate the working of fuzzy neural networks and identify its applications.

Course Content

UNIT-I

Fundamentals of Neural Networks: Basic concepts of Neural networks, Human Brain, Model of an Artificial Neuron, Neural network architectures, Characteristics of Neural Networks, Learning methods, Taxonomy of Neural Network Architectures, Early Neural Network Architectures.

UNIT-II

Back propagation Networks: Architecture of a Back propagation network, the Perceptron Model, The solution, Single layer Artificial Neural Network, Model for Multilayer Perceptron, Back propagation Learning, Illustration, Applications.

UNIT-III

Associative Memory: Auto correlators, Hetero correlators: Kosko's Discrete BAM, Wang et al.'s Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real-coded Pattern Pairs, Applications, Recent Trends.

UNIT-IV

Introduction to Fuzzy logic: Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations,Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

	UNIT-V **Fuzzy Membership and Rules:** Membership functions, Interference in Fuzzy logic, Fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications & Defuzzificataions, Fuzzy Controller, Industrial applications. **UNIT-VI** **Fuzzy Neural Networks:** L-R Type Fuzzy numbers, Fuzzy neutron, Fuzzy back propogation (BP), Architecture, Learning in fuzzy BP, Inference by fuzzy BP, Applications.
Text Books & Reference Books	**TEXT BOOKS:** 1. S. Rajsekaran & G. A. Vijaya lakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications" Prentice Hall of India ,2003. 2. Satish Kumar, "Neural Networks-A class room approach",2nd Edition, Tata McGrawHill,2013. **REFERENCE BOOKS:** 1. Siman Haykin, "Neural Networks and Learning Machines", Third edition, Prentice Hall of India Edition ,2009. 2. Timothy J. Ross, "Fuzzy Sets and Fuzzy Logic with Engineering Applications", Fourth Edition, Wiley India,2021.
E-Resources	1. www.academia.edu 2. www.sciencedirect.com

20CS41E3 - PYTHON PROGRAMMING - II

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Basic mathematical knowledge and basic programming skills.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To learn the fundamentals of NumPy, Pandas, Matplotlib, Scikit-Learn, Scipy • To develop various simple applications using NumPy, Pandas, Matplotlib. • To define Data analysis using python modules. • To explore features of Data Science and Machine Learning Concepts with Python Modules.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the NumPy Arrays with different operations.
	CO2	Acquire the knowledge how to apply Matrices in the data analysis.
	CO3	Understand the importance of Pandas for Data Analysis.
	CO4	Acquire knowledge in the concepts of Data Visualization.
	CO5	Understand and Apply the Machine Learning concepts using Scikit-learn
	CO6	Use Scipy functions in Machine Learning and Data Science

Course Content

UNIT-I

NumPy I: THE ABSOLUTE BASICS FOR BEGINNERS
Installing NumPy, Import NumPy, Difference between Python lists and NumPy Array, what is an Array, How to Create Basic Arrays, Adding Removing and Sorting Elements, How do You Know the Size and Shape of an Array, Can you Reshape An Array, 1D to 2D Arrays (How do you add new Axis to an Array), Indexing and Slicing, How to Create an array with an Existing Data, Basic Array Operations, More Useful Array Operations,

UNIT-II

NumPy II: Creating Matrices, Generating Random Numbers, How to get Unique Items and Counts, Transporting and Reshaping Matrices, Reverse an Array, Reshaping and Flattering Multi-Dimensional Arrays, How to Accessing the Docstring for more information, Working with Mathematical Formulas, How to save and load NumPy Objects.

UNIT-III

Pandas: User Guide: Object Creation, Viewing Data, Selection, Missing Data, Operations, Merge, Grouping, Reshaping, Time Series, Categorical, Getting Data In/ Out

Introduction to Data Structures: Series, Data Frame.

UNIT-IV

Matplotlib: Features of Matplotlib, anatomy and customization of a Matplotlib Plot.

	Plotting and Plot Customization: Creating a plot and figure, Axes, Subplots, Changing Figure sizes. **Customizing Plots:** Plot Titles, Labels and Legends, Text, Ticks, Layouts. Changing Colour of Elements, Visualization Examples. **UNIT-V** **Scikit-Learn:** Introduction to Machine Learning with Scikit-Learn: Machine Learning: The Problem Setting, Loading an Example Datasets, Learning and Predicting, Model Persistence, Conventions. **A Tutorial on Statistical-Learning for Scientific Data Processing:** Statistical Learning, Supervised Learning, Model Selection **UNIT-VI** **Scipy:** Basic Functions, Special Functions, Compressed Sparse Graph Routines, Spatial Data Structures and Algorithms, **Statistics:** Building Specific Distributions.
Text Books & Reference Books	**TEXT BOOKS:** 1. Hands on Data Analysis with NumPy and Python, Curtis Miller. **REFERENCE BOOKS:** 1. Learning the Pandas Library, Matt Harrison. 2. Machine Learning Using Python, Manaranjan Pradhan, U. Dinesh Kumar , Wiley Publications. 3. NumPy User Guide 1.20.0, Written by the NumPy Community 4. Pandas: Powerful Python Data Analysis Tool kit Release 1.3.0, Wes McKinney and the Pandas Development Team. 5. Data Visualization in Python, Daniel Nelson. 6. Scikit-Learn User Guide, Release 0.18.2 , Scikit-Learn Developers. 7. Scipy Reference Guide, Release 0.13.0, Written by the Scipy Community
E-Resources	1. https://www.w3schools.com 2. https://www.geeksforgeeks.org 3. https://numpy.org 4. Learn Pandas Tutorials (kaggle.com) 5. https://matplotlib.org 6. https://kaggle.com/learn/pandas 7. https://scipy-lectures.org 8. https://scikit-learn.org

20AD41E4 - DEEP LEARNING

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in Machine Learning, Artificial Neural Networks. Mathematical concepts such as Statistics, Linear Algebra, Calculus, and Probability.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand complexity of Artificial Neural Networks algorithms and their applications. • Understand the context of neural networks and deep learning • Know how to use a neural network • Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems. • Understand the data needs of deep learning • Have a working knowledge of neural networks and deep learning		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the fundamental concepts of Artificial Neural Networks and improve Deep Learning models
	CO2	Understand Artificial Neural Networks and How it relates to Deep Learning.
	CO3	Understand the basic concepts of Deep Learning and their Applications.
	CO4	Implement deep learning algorithms and solve real-world problems.
	CO5	Apply deep learning algorithms to solve real-time Problems.
	CO6	Build own deep learning project and differentiate between machine learning, deep learning.
Course Content	**UNIT-I** **Artificial Neural Networks:** Introduction, Define Artificial Neural Networks, Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network Terminologies, Learning Rules, Applications of Artificial Neural Networks. **Perceptron Networks:** Single Layer Perceptron, Multi-Layer Perceptron. **UNIT-II** **Feed Forward Networks:** Back Propagation Networks, Radial Basis Function Network, Gradient Descent, Stochastic Gradient Descent. **Self-Organizing Maps:** Self -Organizing Feature Maps, Learning Vector Quantization. **UNIT-III** **Deep Learning:** Defining Deep Learning, Common Architectural Principles of Deep Learning, Basic Building Blocks of Deep Networks, Applications of Deep Learning, Python Frameworks for Deep Learning.	

	Activation Functions: What is Activation Function, Binary Activation Function, Linear Activation Function, Non-Linear Activation Functions-Sigmoid, Tanh (Hyperbolic) ReLU, SoftMax Function. **UNIT-IV** **Deep Learning Architectures-I:** Unsupervised pretrained networks-Deep belief networks, Generative Adversarial Networks, Convolutional Neural Networks, Applications of Convolutional Neural Networks. **UNIT-V** **Deep Learning Architectures-II:** Recurrent Neural Networks, illustrative example, Long Short-Term Memory Networks, Recursive Neural Networks, Applications of Recursive Neural Networks. **UNIT-VI** **Building Deep Networks:** Images and Convolutional Neural Networks, Time series Sequences and Recurrent Neural Networks. **Deep Learning applications:** Image Processing, Natural Language Processing, Speech Recognition, Video Analytics
Text Books & Reference Books	**TEXT BOOKS:** 1. S N Sivanandam, S Sumathi, S N Deepa, Introduction to Neural Networks using Matlab 6.0, McGraw-Hill, 2008. 2. O'REILLY, Deep Learning a Practitioners Approach, Josh Patterson and Adam Gibson, 2017. **REFERENCE BOOKS:** 1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016. 2. Taweh Beysolow II, Introduction to Deep Learning Using R, 2017 3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009. 4. Golub, G., H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013. 5. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
E-Resources	1. www.simplilearn.com/tutorials/deep-learning-tutorial/deep-learning-algorithm 2. www.analyticsvidhya.com/blog/2021/05/introduction-to-supervised-deep-learning-algorithms/ 3. www.v7labs.com/blog/neural-networks-activation-functions

20AD41E5 - NATURE INSPIRED COMPUTING FOR DATA SCIENCE

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Design and analysis of algorithms.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To establish basic knowledge in Nature inspired techniques and understand the need for approximation algorithms. • Design algorithms that utilize the collective intelligence of simple organisms to solve problems.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understanding the basis of natural inspired algorithms.
	CO2	Identify the Nature Inspired Computing Techniques and their classifications.
	CO3	Design and modify different classical Nature Inspired algorithms in terms of Initialization, Processing and Stopping Criteria.
	CO4	Develop basic knowledge of PSO Nature Inspired Computing Technique and their working principle.
	CO5	Understanding basic knowledge of Firefly Nature Inspired Computing Technique and their working principle.
	CO6	Describe the different Hybrid algorithms and their working principle. .

Course Content

UNIT-I

Introduction: What is an Algorithm, Newton's Method, Optimization, Gradient-Based Algorithms, Hill Climbing with Random Restart, Search for Optimality, No-Free-Lunch Theorems, NFL Theorems, Choice of Algorithms, Nature-Inspired Meta heuristics, A Brief History of Meta heuristics

UNIT-II

Analysis of Optimization Algorithms: Algorithm as an Iterative Process, An Ideal Algorithm? A Self-Organization System, Exploration and Exploitation, Evolutionary Operators, Nature-Inspired Algorithms, Simulated Annealing, Genetic Algorithms, Differential Evolution, Ant and Bee Algorithms, Particle Swarm Optimization, The Firefly Algorithm, Cuckoo Search, The Bat Algorithm, Harmony Search, The Flower Algorithm,

UNIT-III

Steel Annealing Algorithm: Annealing and Boltzmann Distribution, Parameters, Unconstrained Optimization, Basic Convergence Properties, SA Behaviour in Practice, Stochastic Tunnelling.

Genetic Algorithms: Introduction, Role of Genetic Operators, Choice of Parameters, GA Variants, Schema Theorem, Convergence Analysis.

	UNIT-IV **PSO Algorithm:** Swarm Intelligence, PSO Algorithm, Accelerated PSO, Implementation, Convergence Analysis, Dynamical System, Markov Chain Approach, Binary PSO. **UNIT-V** **Firefly Algorithm:** Firefly Behaviour, Standard Firefly Algorithm, Variations of Light Intensity and Attractiveness, Controlling Randomization, Algorithm Analysis, Scalings and Limiting Cases, Attraction and Diffusion, Special Cases of FA, Implementation. **UNIT-VI** **Ant Algorithms:** Ant Behaviour, Ant Colony Optimization, Virtual Ant Algorithms. **Bee-Inspired Algorithms:** Honeybee Behaviour, Bee Algorithms, Honeybee Algorithm, Virtual Bee Algorithm, Artificial Bee Colony Optimization. **Harmony Search:** Harmonics and Frequencies, Harmony Search, Hybrid Algorithms, Other Algorithms.
Text Books & Reference Books	**TEXT BOOKS:** 1. Xin-She Yang, "Nature-Inspired optimization algorithms", Elsevier, published in 2014. **REFERENCE BOOKS:** 1. Xin-She Yang, "Nature-Inspired Computation and Swarm Intelligence Algorithms, Theory and Applications", Elsevier, Academic Press, 2020. 2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
E-Resources	1. https://nptel.ac.in/courses 2. https://www.youtube.com/watch?v=I10PcKfLSwI&list=PLVLAu9B7VtkbbkvAV2w8zY9HLOjrgHXyG

20AD41E6 - VIRTUAL REALITY

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Computing basics	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Design a virtual environment and compelling virtual reality experience. • Comprehend and analyze the fundamental issues of virtual reality.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the fundamental issues of virtual reality with example transformations
	CO2	Learn the basic dynamic model of virtual environment to track users.
	CO3	Study and apply the role of visual and acoustic modalities in virtual reality
	CO4	Explore haptic modality and learn the basics of augmented reality
	CO5	Learn the interaction with virtual environment and study multimodal simulations
	CO6	Study various individual applications based on Virtual and Augmented realities

Course Content

UNIT-I

Introduction to Virtual Reality: Definition of Virtual Reality, History of Virtual Reality, Applications of Virtual Reality, Virtual Reality System.

Degrees of Freedom, Pose, Displacement and Perspective: Degree of Freedom, Translational Transformation, Rotational Transformation, Pose and Displacement, Pose of Elements in Mechanical Assembly and Perspective Transformation Matrix.

UNIT-II

Dynamic Model of a Virtual Environment: Equations of Motion, Mass, Center of Mass and Moment of Inertia, Linear and Angular Momentum, Forces and Torques Acting on a Rigid Body, Collision Detection, Computation of Body Motion.

Tracking the User and Environment: Pose Sensor, Measuring Interaction Forces and Torques, Motion Tracking and Physical Input Devices.

UNIT-III

Visual Modality in Virtual Reality: Human Visual Perception, Computer Graphics, Visual Displays

Acoustic Modality in Virtual Reality: Acoustic Modality, Fundamentals of Acoustics, Sound Perception, the Spatial Characteristics of Hearing, Recording Techniques.

	UNIT-IV **Haptic Modality in Virtual Reality:** Human Perceptions and Motor System, Haptic Representation in Virtual Reality, Collision Detection, Haptic Rendering in Virtual Reality, Control of Haptic Interfaces, Haptic Displays. **Augmented Reality:** Definition, Modeling the Real Environment, Displays, User Interfaces and Applications. **UNIT-V** **Interaction with a Virtual Environment:** Manipulation within Virtual Environment, Navigation Within the Virtual Environment, Interaction with Other Users **Design of a Multimodal Virtual Environment:** Interactive Computer Game, Simulated Operation of Complex Systems, Modeling and Simulation of an Avatar, Interactive Configuration of Products **UNIT-VI** **Exploring Virtual Reality Use Cases:** Art, Education, Entertainment and Healthcare **Exploring Augmented Reality Use Cases:** Art, Education, Industry and Commerce, Entertainment and Utilities
Text Books & Reference Books	**TEXT BOOKS:** 1. Virtual Reality Technology and Applications by Matjaz Mihelj, Domen Novak Samo Begus, Springer publishers, New York/ London. 2. Virtual and Augmented Reality for dummies (a wiley brand) by Paul Mealy, John Wiley & Sons publishers **REFERENCE BOOKS:** 1. "Developing Virtual Reality Applications - Foundations of Effective Design" by Alan B. Craig, William R. Sherman, and Jeffrey D. Will, Morgan Kaufmann Publishers 2. Designing Virtual Reality Systems The Structured Approach by Gerard Jounghyun Kim, Springer-Verlag London
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20IT41E2 - BLOCK CHAIN TECHNOLOGIES

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in security mechanisms.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To understand the mechanism of Blockchain and Cryptocurrency. • To understand the functionality of current implementation of blockchain technology. • To understand the required cryptographic background. • To explore the applications of Blockchain to cryptocurrencies and understanding imitations of current Blockchain.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand and apply the fundamentals of Cryptography in Cryptocurrency.
	CO2	Acquire knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency.
	CO3	Deal with the methods for verification and validation of Bitcoin transactions.
	CO4	Demonstrate the Bitcoin mining of several strategies.
	CO5	Understand the methods of Anonymity, Mixing and Decentralized Mixing.
	CO6	Awareness the principles, practices and policies associated Bitcoin business.

Course Content

UNIT-I

Introduction to Cryptography and Cryptocurrencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.

UNIT-II

Blockchain Achieves and Store and Use: Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

UNIT-III

Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements.

UNIT-IV

Bitcoin Mining: The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies.

	UNIT-V **Bitcoin and Anonymity:** Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash. **UNIT-VI** **Community, Politics, and Regulation:** Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who‟s in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York‟s Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds.
Text Books & Reference Books	**TEXT BOOKS:** 1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press 2016. **REFERENCE BOOKS:** 1. Antonopoulos, A. M. Mastering Bitcoin: unlocking digital cryptocurrencies. O‟Reilly Media, Inc. 2014. 2. Franco, P. Understanding Bitcoin: Cryptography, engineering and economics. John 2014.
E-Resources	1. http://nptel.iitm.ac.in

20AD41E7 - GAME PROGRAMMING

Course Category:	Professional Elective	**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:	• To Understand the fundamentals of Game Programming • To Understand the Various Tools used for the Game Programming. • To learn how to apply the Software Engineering Mechanism in the Game Programming. • To Understand the and acquire knowledge of Game Engine Support System and Game Loop and Real Time Simulation.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the Architecture of the Game Engine.
	CO2	Acquire the Knowledge of Version Control for Developing the Game.
	CO3	Acquire the Knowledge of Microsoft Visual Studio for Developing the Game.
	CO4	Analyse the Engine Support System and Management System
	CO5	Apply the Concept of Concept of Containers in the Game Programming.
	CO6	Acquire the Knowledge of Game loops and find the necessity of the Human Interfacing Devices in the Game Designing.

Course Content

UNIT-I

Structure of the Typical Game Team, what is Game, What is a Game Engine, Engine Differences Across Genres, Game Engine Survey, Runtime Engine Architecture, Tools and Asset Pipeline.

UNIT-II

Tools of the Trade: Version Control: Why we use Version Control, Common Version Control System, Overview of Subversion and TortoiseSVN, Setting up Code repository in Google, Installing TortoiseSVN, File version Updating, Committing, Multiple Check Out and Branching and Merging, Deleting Files.

UNIT-III

Tools of the Trade: Version Control: Microsoft Visual Studio: Source files Headers and Translation units, Libraries, Executables and Dynamic Link Libraries, Projects and Solutions, Build Configurations, Project Configuration Tutorials, Debugging your code, Profiling tools, Memory leak and Corruption Detection, Other Tools.

UNIT-IV

Engine Support System: Subsystem Start up and Shut down: C++ Static Initialization Order (or Lack Thereof), Construct on Demand, A simple Approach that Works, Some Examples from Real Engines**,** Naughty Dog's Uncharted Series and The Last of Us.

	Memory Management System: Optimizing Dynamic Memory Allocation, Memory Fragmentation. **UNIT-V** **Engine Support System: Containers:** Container Operations, Iterators, Algorithmic Complexity, Building Container Classes. **Engine Configuration:** Loading and Saving Options, Per User Options, Configuration in some real Engines. **UNIT-VI** **Game Loop and Real Time Simulation:** The Rendering Loop, The Game Loop, Game Loop Architectural Styles, Abstract Time Lines, Measuring and Dealing with Time. **Human Interface Devices**: Types of Human Interface Devices, Interfacing with HID, Types of Inputs, Types of Outputs.
Text Books & Reference Books	**TEXT BOOKS:** 1. Game Engine Architecture, 2nd Edition, Jason Gregory, A K Peters, 2014. **REFERENCE BOOKS:** 1. Best of Game Programming Gems, Mark DeLoura, Course Technology, Cengage Learning, 2014. 2. Rules of Play: Game Design Fundamentals, Katie Salen and Eric Zimmerman, MIT Press, 2003.
E-Resources	1. https://www.futurelearn.com 2. https://www.codingame.com

20AD41E8 - REINFORCEMENT LEARNING

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Basic knowledge in agent and environment interaction Knowledge in programming languages.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Learning basic concepts of Reinforcement Learning. • Understanding basic algorithms of Reinforcement Learning. • Applying Reinforcement Learning with Keras, TensorFlow, and ChainerRL		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Learning basic concepts of Reinforcement Learning
	CO2	Understanding the basic Algorithms and its characteristics
	CO3	Understand and learn about open AI
	CO4	Analysis and applying Python in RL
	CO5	More about Reinforcement Learning with Keras, TensorFlow, and ChainerRL
	CO6	Google's Deep Mind and the Future of Reinforcement Learning

Course Content

UNIT-I

The Reinforcement Learning Problem: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe, History of Reinforcement Learning.

UNIT-II

Multi-arm Bandits: An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation,Tracking a Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search.

UNIT-III

Finite Markov Decision Processes: The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation.

UNIT-IV

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, ValueIteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiencyof Dynamic Programming.

	UNIT-V **Monte Carlo Methods:** Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Off-Policy Monte Carlo Control, Importance Sampling on Truncated Returns. **UNIT-VI** **Temporal-Difference (TD) Learning:** TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning: Off-Policy TD Control, Games, Afterstates, and Other Special Cases.
Text Books & Reference Books	**TEXT BOOKS:** 1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction, 2nd Edition. **REFERENCE BOOKS:** 1. Kyriakos G. Vamvoudakis, Yan Wan, Frank L. Lewis, Derya Cansever," Handbook of Reinforcement Learning and Control (Studies in Systems, Decision and Control, 325)", 1st Edition. 2. Nimish Sanghi,"Deep Reinforcement Learning with Python: With PyTorch, TensorFlow and OpenAI Gym", 1st Edition. 3. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, Jan Peters." Reinforcement Learning Algorithms: Analysis and Applications", 1st Edition.
E-Resources	1. https://nptel.ac.in/courses/106106143 2. https://www.coursera.org/specializations/reinforcement-learning

20AD41E9 - KNOWLEDGE REPRESENTATIONS AND REASONING

Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge of basic computer programming Knowledge of basic mathematical concept. Students must have taken the introductory course in artificial intelligence	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the area of knowledge representations and reasoning in artificial intelligence • To study various Concepts of knowledge representations, processes, contexts and knowledge soup		

Course Outcomes	Upon successful completion of the course, the students will be able:	
	CO1	To identify basic key concepts that explores representing knowledge in logic
	CO2	To recognize the different ontological categories.
	CO3	To apply Knowledge Representation in Engineering
	CO4	To demonstrate what are processes.
	CO5	To identify the syntax and semantics of contexts.
	CO6	To recognize different type of logic and their limitations.

Course Content

UNIT-I

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures**.**

UNIT-II

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

UNIT-III

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics.

UNIT-IV

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change.

UNIT-V

Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

	UNIT-VI **Knowledge Soup:** Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics.
Text Books & Reference Books	**TEXT BOOKS:** 1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning. **REFERENCE BOOKS:** 1. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.
E-Resources	1. https://vdoc.pub/download/knowledge-representation-logical-philosophical-and-computational-foundations-6d93tm4iv4j0 2. https://onlinecourses.nptel.ac.in/noc20_cs30/preview 3. https://freevideolectures.com/university/iitm

20CS41J1 - SERVICE ORIENTED ARCHITECTURE

Course Category:	Job Oriented 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.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Able to understand service oriented architecture concepts.
	CO2	To understand fundamentals of web services and its internal working models.
	CO3	Gives insight overview on web services extensions and manifestation of various web activities.
	CO4	To learn service orientation and its principles associated with SOA.
	CO5	Able to learn several SOA layers with its internal functionality.
	CO6	Briefs SOA delivery strategies and real time case studies.

Course Content

UNIT-I

Introduction to SOA: Fundamental SOA, Characteristics of SOA, Benefits of SOA, pitfalls in SOA, Evolution of SOA

UNIT-II

Web Services Fundamentals: Web service framework, Service roles and models, Service descriptions (WSDL), Messaging with SOAP.

UNIT-III

SOA and WS-* Extensions: What is "WS-*", Message Exchange Patterns, Service activity, Coordination, Atomic transactions, Business activities, Orchestration, Choreography.

UNIT-IV

SOA and Service Orientation: Service orientation and the enterprise, Anatomy of SOA, Principles of service orientation, Service orientation and Object orientation, Naïve web services.

	UNIT-V **Service Layers:** Service Orientation and Contemporary SOA, Service Layer Abstraction, Application, Business and Orchestration Service Layer, Agnostic Services, Configuration Scenarios. **UNIT-VI** **SOA delivery strategies**: lifecycle phases, top down strategy, bottom up strategy, agile strategy. **Case Studies**: Rail Co Ltd, Transit line systems Inc, The OASIS car wash.
Text Books & Reference Books	**TEXT BOOKS:** 1. Service Oriented Architecture Concepts, Technology and Design by Thomas Erl 2006 Pearson Education. **REFERENCE BOOKS:** 1. Understanding SOA with Web Services by Eric newcomer, Greg Lomow, 2007 Pearson Education. 2. Service – Oriented Architecture for Enterprise Applications by Shankar Kambhampaly, Wiley.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

20CS41J2 - CYBER SECURITY

Course Category:	Job Oriented Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge in computer and network fundamentals and basic Security essentials.	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To familiarize various types of cyber-attacks and cyber-crimes. • To give an overview of the cyber laws. • To study the defensive techniques against these attacks.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the basic concepts of Cyber Security.
	CO2	Acquire the knowledge about various types of Cyber Laws.
	CO3	Exposure on cybercrimes in devices.
	CO4	Learn the concept of protection mechanism in social media.
	CO5	Know about policy Management in internet community.
	CO6	Analyze different case studies in Cyber Security,

Course Content

UNIT-I

Introduction to Cybercrime: Definition, Cybercrime and information security, Classification of Cybercrimes, Cybercrime: The legal perspectives, An Indian perspective, Cybercrime and the Indian ITA 2000, A global perspective on Cybercrimes.

UNIT-II

Cyberoffenses: Categories of Cybercrime, how criminals plan the attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets, Attack vector.

UNIT-III

Tools and Methods used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors.

	UNIT-IV **Understanding Computer Forensics:** Historical background of Cyberforensics, Digital Forensics Science, The need for Computer Forensics, Cyberforensics and Digital Evidence, Digital Forensics Life Cycle, Network Forensics. **UNIT-V** **Cybersecurity: Organizational Implications** Introduction, Cost of Cybercrimes and IPR issues, Web Threats for organizations, Social media marketing, Social Computing and the associated challenges for organizations, Protecting People's privacy in the organization, Organizational guidelines for Internet usage, Safe Computing guidelines and Computer usage policy. **UNIT-VI** **Cybercrime and Cyberterrorism:** Introduction, Intellectual property in the Cyberspace, Skills of Hackers and Other Cybercriminals, Sociology of Cybercriminals.
Text Books & Reference Books	**TEXT BOOKS:** 1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley. **REFERENCE BOOKS:** 1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.. 2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group. 3. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRCPress.
E-Resources	1. https://nptel.ac.in/courses

20SH41E1 - MANAGEMENT SCIENCE

Course Category:	HSMC Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the functions of Management and evolution of management thought • Learn the application of the principles in an organization and aware of the social responsibilities of business. • Understand the principles of strategy formulation, implementation and control in organizations and fundamental concepts of marketing. • understand the role of HRM in an organization • understand the concepts of production and operations management of an industrial undertaking • Understand the mechanism of PERT and CPM.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Able to explain the concepts of management.
	CO2	Able to apply the principles of management in designing the organization structure of an enterprise.
	CO3	Able to Identify core concepts of marketing and develop marketing strategies based on product, price, place and promotion objectives
	CO4	Demonstrate the role of HRM in an organization and able to manage human resources efficiently and effectively with best HR practices.
	CO5	Able to select appropriate location for establishing industrial plants and design plant and production layouts
	CO6	Able to determine activities' times and schedule the projects using the CPM and PERT.

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, Staff or functional, line and staff, 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 – Vision, Mission, Goals Objectives, Policies, & programmes -SWOT analysis – Strategy formulation and implementation.

	Marketing Management: Functions of Marketing-Marketing Mix - Marketing Strategies based on Product Life Cycle- Channels of distribution. **UNIT-IV** **Human Resources Management**: Manpower Planning-Recruitment & Selection-Training & Development- Job Evaluation- Performance Appraisal, -Incentives. **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) -Project Cost Analysis- Project Crashing (simple problems).
Text Books & Reference Books	**TEXT BOOKS:** 1. Management Science, A.R.Aryasri, Tata McGraw-Hill Education 2. Industrial Engineering and Management, O. P. Khanna (2004), Dhanpat Rai, New Delhi. **REFERENCE BOOKS:** 1. Business organizations and management, C.B.Gupta, Sultan Chand and Sons. 2. Industrial Engineering and Management (Including Production Management) T.R.Banga, S.C.Sharma, Khanna Publishers. 3. Production and Operations Management, Panner Selvam (2004), Prentice Hall of India, New Delhi

20SH41E2 - CUSTOMER RELATIONSHIP MANAGEMENT

Course Category:	HSMC Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the importance of CRM in the real business. • Know how do organizations implement CRM such that it benefits their business needs? • Understand how CRM helped define best practices and customer management methodology		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Aware of the basics of customer relationship management
	CO2	Analyze the CRM link with the other aspects of marketing
	CO3	Know the CRM planning process.
	CO4	understand the Role of CRM in increasing the sales of the company
	CO5	Aware of the CRM practices in various markets and sectors
	CO6	Aware and analyze the different issues in CRM

Course Content

UNIT-I

CRM Basics: Meaning & Definition - Dimensions of CRM - Nature of CRM - Goals of CRM - Advantages of CRM

UNIT-II

CRM Concepts: Customer Value, Customer Expectation, Customer Satisfaction, Customer Centricity, Customer Acquisition, Customer Retention, Customer Loyalty, Customer Lifetime Value. Customer Experience Management, Customer Profitability, Enterprise Marketing Management, Customer Satisfaction Measurements, Web based Customer Support.

UNIT-III

Planning for CRM: Steps in Planning-Building Customer Centricity, Setting CRM Objectives, Defining Data Requirements, Planning Desired Outputs, Relevant issues while planning the Outputs, Elements of CRM plan. CRM Strategy: The Strategy Development Process, Customer Strategy Grid.

UNIT-IV

CRM and Marketing Strategy: CRM Marketing Initiatives, Sales Force Automation, Campaign Management, Call Centres.

UNIT-V

Practice of CRM: CRM in Consumer Markets, CRM in Services Sector, CRM in Mass Markets, CRM in Manufacturing Sector.

	UNIT-VI **CRM Planning and Implementation:** Issues and Problems in implementing CRM, Information Technology tools in CRM, Challenges of CRM Implementation. CRM Implementation Roadmap, Road Map (RM) Performance: Measuring CRM performance, CRM Metrics.
Text Books & Reference Books	**TEXT BOOKS:** 1. Francis Buttle, Stan Maklan, Customer Relationship Management: Concepts and Technologies, 3rd edition, Routledge Publishers, 2015 2. Kumar, V., Reinartz, Werner Customer Relationship Management Concept, Strategy and Tools, 1st edition, Springer Texts, 2014 **REFERENCE BOOKS:** 1. Jagdish N.Sheth, Atul Parvatiyar & G.Shainesh, "Customer Relationship Management", Emerging Concepts, Tools and Application", 2010, TMH. 2. Dilip Soman & Sara N-Marandi," Managing Customer Value" 1st edition, 2014, Cambridge. 3. Alok Kumar Rai, "Customer Relationship Management: Concepts and Cases", 2008, PHI. 4. Ken Burnett, the Handbook of Key "Customer Relationship Management", 2010, PearsonEducation. 5. Mukesh Chaturvedi, Abinav Chaturvedi, "Customer Relationship Management-An Indian Perspective", 2010 Excel Books, 2nd edition

20SH41E3 - STRATEGIC MANAGEMENT

Course Category:	HSMC Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To expose students to various perspectives and concepts in the field of Strategic Management • The course would enable the students to understand the principles of strategy formulation, implementation and control in organizations. • To help students develop skills for applying these concepts to the solution of business problems • To help students master the analytical tools of strategic management		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Students will be able to describe major theories, background work, concepts and research output in the field of strategic management.
	CO2	Students will able to prepare the mission statement for the operational efficiency
	CO3	Students will be able to analyse the environment through SWOT Analysis
	CO4	Able to understand organizational change
	CO5	Students will be able to demonstrate capability of making their own decisions in dynamic business landscape.
	CO6	Students will be able to develop their capacity to think and execute strategically.

Course Content

UNIT-I

Strategic Management: An Introduction Strategic Thinking Vs Strategic Management Vs Strategic planning, meaning of strategic management, concept of strategy, policy and strategy, strategy and tactic, Strategy and strategic plan, Nature of strategic plan, nature of strategic decisions, approaches to strategic decision making, levels of strategies, The strategic management process, strategic management: merits and demerits

UNIT-II

Mission, Objectives, Goals and Ethics What is mission, concept of goals, Integration of individual and organisation goals: A Challenge, How Objectives are pursued, how are mission and objectives are formulated, why do mission and objective change, vision mission, objectives, goals and Strategy: Mutual relationships, core of strategic management: vision A-must, ethics and strategy

UNIT-III

External environment: Analysis and appraisal Concept of environment, environmental analysis and appraisal, why environmental scanning and analysis, component of environment, SWOT: A tool of environment analysis, techniques of environmental search and analysis, ETOP: A technique of diagnosis, decision making on environmental information.

	UNIT-IV **Organisational change and innovation:** Planned and unplanned change, causes or forces of organisational change, managing planned change, choosing a change strategy, creativity and innovation in organisations, organizational creativity and innovation process, learning organisation **UNIT-V** **Generic competitive strategy:** Generic vs. competitive strategy, the five generic competitive strategy, competitive marketing strategy option, offensive vs. defensive strategy, **Corporate strategy:** Concept of corporate strategy, offensive strategy, defensive strategy, scope and significance of corporate strategy **UNIT-VI** **Strategic evaluation and control:** Evaluation of strategy and strategic control, why strategy evaluating, criteria for evaluation and the evaluation process, strategic control process, types of external controls.
Text Books & Reference Books	**TEXT BOOKS:** 1. Strategic management: the Indian context 5th edition, kindle edition R srinivasan 2. Strategic management: Indian and Global Context supriya singh **REFERENCE BOOKS:** 1. Dess, G. G., Lumpkin, G. T., Eisner, A. B., McNamara, G. 2013. Strategic Management: Creating Competitive Advantages, 7th Edition, McGraw-Hill International Edition, McGraw-Hill/Irwin.

20SH41E4 - CORPORATE GOVERNANCE AND BUSINESS ETHICS

Course Category:	HSMC Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• Understand the Corporate Governance and regulatory mechanism in emerging economies. • Understand various corporate governance philosophies to explain how they contribute to world society. • Understand the corporate governance in Indian perspective • Understand the Corporate Governance in banking sector and in emerging economies. • Understand the importance of Business Ethics in day-to-day working environment. • Explore the implications of business ethics at international level.		

Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Comprehend Corporate Governance and regulatory mechanism in emerging economies.
	CO2	Compare various corporate governance philosophies to explain how they contribute to world society.
	CO3	Analyze the corporate governance in Indian perspective
	CO4	Contrast the Corporate Governance in banking sector with emerging economies.
	CO5	Understand the importance of Business Ethics in day-to-day working environment.
	CO6	Explore the implications of business ethics at international level.
Course Content	**UNIT-I** Corporate Governance – Concept of Corporate Governance (CG) – Aims and Objectives – Good Corporate Governance importance of CG — parties to CG – Issues in CG in Emerging Economies – corporate governance regulatory mechanisms in India. **UNIT-II** Corporate Governance in Global – Developments CG in USA and UK – The Cadbury Committee, the Green bury Committee, Global convergence in CG- the OECD principals- Sarbanes-Oxley act 2002 **UNIT-III** CG in India – Need and Importance CG – History of CG – The CII Initiatives – Naresh Chandra Committee – Kumaramangalam Birala Committee – Narayana Murthy Committee – Clause 49 of Listing agreement.	

	UNIT-IV Corporate Governance in Banks - Why Corporate Governance in Banks – CG and the World Bank – Basel Committee on Corporate Governance – Ganguly Committee Recommendations - RBI Initiatives **UNIT-V** An overview of Business Ethics- Definition and nature of Business Ethics- Types of business ethic issues -Need and benefit of Business Ethics- - History of the development of Business ethics- Arguments for and against Business Ethics- competitive Issues Legal and Regulatory Philanthropic Issues. **UNIT-VI** Business Ethics in a Global Economy- Ethical perceptions and International Business- Global Values- Various Ethical Issues around the Globe- Cross cultural Issues.
Text Books & Reference Books	**REFERENCE BOOKS:** 1. Fernando A.C – Corporate Governance- Principles, Policies and Practices – Pearson Education- New Delhi-2006. 2. Subhash Chandra Das – Corporate Governance –Codes, Systems, Standards and Practices – PHI Learning-New Delhi -2009. 3. C.S.V. Murthy - Business Ethics and Corporate Governance- Himalaya Publishing House- Mumbai- 2009 4. Kesho Prasad - Corporate Governance - PHI Learning-New Delhi -2009 5. Singh S - Corporate Governance- Global Concepts and Practices – Excel Books – New Delhi -2005. 6. Donald H. Chew Jr. and Staurt L. Gillan - Corporate Governance at Crossroads – Tata Mc Graw-Hill Co.Ltd., New Delhi- 2006.
E-Resources	1. www.oecd.org 2. www.ecgi.org 3. www.cacg.org

20AD41SC - DATA REPRESENTATION AND ANALYSIS USING PYTHON LABORATORY

(Common to CSE, IT, AI&DS, ECE, and EEE)

Course Category:	Skill Oriented	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	1-0-2
Prerequisite:	Basic Knowledge of Data Analysis and R Programming Fundamentals	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100
Objectives:	• To strengthen the ability to identify and apply the suitable R functions for the given Datasets. • To develop skills to Analyse and Visualize the Data.		

Course Outcomes	After the completion of this Course, the students will be able to Analyze and Visualize the Data.
Course Content	**Session-I:** Download and install any Python-Programming Environment and install basic packages (numpy, pandas, matplotlib, scikitlearn, etc). **Session-II:** Develop python programs using numpy module. **Session-III:** Develop python matrix programs using numpy module. **Session-IV:** Develop a python program for reshaping of numpy arrays. **Session-V:** Develop dataframe objects. **Session-VI:** Develop programs for JSON to Python dataframes and Python dataframes to JSON. **Session-VII:** Develop a program read the data from any file and apply different types of operations using pandas. **Session-VIII:** Develop a program for dashboard. **Session-IX:** Develop programs for data visualization using matplotlib. **Session-X:** Develop a program for Linear Regression model. **Session-XI:** Develop a program for Decision Tree Regression model. **Session-XII:** Develop a program for Random Forest Regression model. **Session-XIII:** Develop a model predict the weather forecasting by the customer requirement.

Text Books & Reference Books	**TEXT BOOKS:** 1. Hands on Data Analysis with NumPy and Python, Curtis Miller. **REFERENCE BOOKS:** 1. Learning the Pandas Library, Matt Harrison. 2. Machine Learning Using Python, Manaranjan Pradhan, U. Dinesh 3. Kumar , Wiley Publications. 4. NumPy User Guide 1.20.0, Written by the NumPy Community 5. Pandas: Powerful Python Data Analysis Tool kit Release 1.3.0, Wes 6. McKinney and the Pandas Development Team. 7. Data Visualization in Python, Daniel Nelson. 8. Scikit-Learn User Guide, Release 0.18.2 , Scikit-Learn Developers. 9. Scipy Reference Guide, Release 0.13.0, Written by the Scipy Community 10. Python for Data Science by Prof. Raghunadhan Rangaswamy.
E-Resources	1. https://www.w3schools.com/ 2. https://numpy.org 3. https://pandas.pydata.org 4. https://matplotlib.org 5. https://scikit-learn.org 6. https://scipy.org

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)

AFFILIATED TO JNTUA, ANANTAPURAMU

IV YEAR OF FOUR-YEAR B. TECH DEGREE COURSE – II SEMESTER

INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2020-2021)

S. No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Max. Total Marks (100)
		MAJOR PROJECT	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	20IT42PR	Project work with Internship	-	-	-	12	-	-	-	80		-	120	200
		TOTAL	**-**	**-**	**-**	**12**	**-**	**-**	**-**	**80**		**-**	**120**	**200**