JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous):: ANANTHAPURAMU
DEPARTMENT COMPUTER SCIENCE AND ENGINEERING
B.Tech. Course Structure (R20)

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Induction Program – 3 weeks

S.No	Course No	Course Name	Category	L-T-P	Credits
		Semester-I(Theory-5,Lab -4)			
1.	20A15101	Linear Algebra and Calculus Common to All branches of Engineering	BS	3-0-0	3
2.	20A15201	AppliedPhysics Common to EEE, ECE, CSE	BS	3-0-0	3
3.	20A15501	CommunicativeEnglish Common to EEE, ECE, CSE, CHEM	HS	3-0-0	3
4.	20A10501	Problem Solving and C Programming	ES	3-0-0	3
5.	20A10301	Engineering Drawing Common to EEE, ECE, CSE	LC	1-0-2	2
6.	20A10302	Engineering Graphics Lab Common to EEE, ECE, CSE	LC	0-0-2	1
7.	20A15202	Applied Physics Lab Common to EEE, ECE, CSE	BS	0-0-3	1.5
8.	20A15502	Communicative English Lab Common to EEE, ECE, CSE, CHEM	HS	0-0-3	1.5
9.	20A10502	Problem Solving and C Programming Lab	ES	0-0-3	1.5
				Total	**19.5**

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S.No	Course No	Course Name	Category	L-T-P	Credits
		Semester-II(Theory-5,Lab -5)			
1.	20A15102	Differential Equations & Transformations	BS	3-0-0	3
2.	20A15303	Chemistry Common to EEE, ECE, CSE	BS	3-0-0	3
3.	20A10503	Python Programming	ES	3-0-0	3
4.	20A12401	Basic Electrical and Electronics Engineering Common to MECH, CSE, CHEM	ES	3-0-0	3
5.	20A10303	Engineering Workshop Common to EEE, ECE, CSE	LC	0-0-2	1
6.	20A10505	CSE Workshop Common to EEE, ECE, CSE	LC	0-0-4	2
7.	20A10504	Python Programming Lab	ES	0-0-3	1.5
8.	20A15304	Chemistry Lab Common to EEE, ECE, CSE	BS	0-0-3	1.5
9.	20A12402	BasicElectricalandElectronicsEngineeringLab Common to MECH, CSE, CHEM	ES	0-0-3	1.5
10.	20A10803	Environmental Science Common to EEE, ECE, CSE	MC	3-0-0	0.0
				Total	**19.5**

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S.No	Course No	Course Name	Category	L-T-P	Credits
Semester- III (Theory-5 ,Lab3)					
1.	20A35103	Discrete Mathematics & Graph Theory	BS	3-0-0	3
2.	20A30501	Digital Systems	PC/ES	3-0-0	3
3.	20A30502	Data Structures	PC/ES	3-0-0	3
4.	20A30503	OOPS through Java	PC/ES	3-0-0	3
5	20A39101A 20A39101B 20A39101C	Humanities Elective Common to EEE, ECE, CSE Managerial Economics And Financial Analysis Entrepreneurship & Incubation Business Ethics And Corporate Governance	HS	3-0-0	3
6	20A30504	Digital Systems Lab	PC/ES	0-0-3	1.5
7.	20A30505	Data Structures Lab	PC/ES	0-0-3	1.5
8.	20A30506	OOPS through Java Lab	PC/ES	0-0-3	1.5
9.	20A30507	Skill oriented Course – I IoT Using Python	SC	1-0-2	2
10	20A19101	Mandatory Course-II (Universal Human Values) Common to EEE, ECE, CSE	MC	3-0-0	0
11	20A39901	NSS/NCC/NSO Activities	-	0-0-2	0
				Total	**21.5**

S.No	Course No	Course Name	Category	L-T-P	Credits
Semester-IV (Theory- ,Lab)					
1.	20A45103	Probability and Statistical Methods	BS	3-0-0	3
2.	20A40501	Computer Organization	PC/ES	3-0-0	3
3.	20A40502	Database Management Systems	PC/ES	3-0-0	3
4.	20A40503	Operating Systems	PC/ES	3-0-0	3
5.	20A40504	Software Engineering	PC/ES	3-0-0	3
6.	20A40505	Database Management Systems Lab	PC/ES	0-0-3	1.5
7.	20A40506	Operating Systems Lab	PC/ES	0-0-3	1.5
8.	20A40507	Software Engineering Lab	PC/ES	0-0-3	1.5
9.	20A40508	Skill oriented Course – II Exploratory Data Analytics with R	SC	1-0-2	2
10	20A49102	Mandatory non-credit Course-III (Design Thinking for Innovation) Common to All Branches	MC	2-1-0	0
				Total	**21.5**
Community Service Internship/Project (Mandatory) for 6 weeks duration during Summer vacation					

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DEPARTMENT COMPUTER SCIENCE AND ENGINEERING
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S.No	Code	Course Name	Category	L-T-P	Credits
1.	20A50501	Formal Languages and Automata Theory	PC	3-0-0	3
2.	20A50502	Computer Networks	PC	3-0-0	3
3.	20A50503	Design and Analysis of Algorithms	PC	3-0-0	3
4.	20A50504a 20A50504b 20A50504c	ProfessionalElective-I 1. Introduction toAI 2. Object Oriented AnalysisDesign 3. OptimizationTechniques	PE	3-0-0	3
5.	20A50505	Open Elective - I (Each department offer one course including Mathematics, Physics, Chemistry and HSS) (Common to All Branches) 1. Introduction to Java Programming	OE	3-0-0	3
6.	20A50506	Computer Networks Lab	PC	0-0-3	1.5
7.	20A50507	Design and Analysis of Algorithms Lab	PC	0-0-3	1.5
8.		Skill Advanced Course-I Soft Skills	SC	1-0-2	2
9.	20A50508	Evaluation of Community Service Project			1.5
10.	20A59901	Mandatory non-credit Course - IV Intellectual property Rights Common to EEE, ECE, CSE	MC	2-0-0	0
				Total	21.5

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DEPARTMENT COMPUTER SCIENCE AND ENGINEERING
B.Tech. Course Structure (R20)

S.No	Code	Course Name	Category	L-T-P	Credits
— Semester-VI					
1.	20A60501	Compiler Design	PC	3-0-0	3
2.	20A60502	Machine Learning	PC	3-0-0	3
3.	20A60503	Cryptography & Network Security	PC	3-0-0	3
4.	20A60504a 20A60504b 20A60504c	Professional Elective-II 1. Softwaretesting 2. Fundamentals of AR/VR 3. Image and VideoProcessing	PE	3-0-0	3
5.	20A60505	Open Elective - II (Each department offer one course including Mathematics, Physics, Chemistry and HSS) (Common to All Branches) 1. Introduction to Linux Programming	OE	3-0-0	3
6.	20A60506	Cryptography & Network Security Lab	PC	0-0-3	1.5
7.	20A60507	Professional Elective-II Lab	PC	0-0-3	1.5
8.	20A60508	Machine Learning Lab	PC	0-0-3	1.5
9.	20A60509	Skill Oriented Course-IV Full stack Development	SC	1-0-2	2
10.	20A65901	Mandatory non-credit Course - V Indian Constitution	MC	2-0-0	0
				Total	21.5
— Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation					

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B.Tech. Course Structure (R20)

S.No	Code	Course Name	Category	L-T-P	Credits
		Semester-VII			
1.	20A70501a 20A70501b 20A70501c	Professional Elective-III 1. AgileMethodologies 2. CloudComputing 3. PatternRecognition	PE	3-0-0	3
2.	20A70502a 20A70502b 20A70502c	Professional Elective-IV 1. DevOps 2. Advance NetworkTechnologies 3. DesignPatterns	PE	3-0-0	3
3.	20A70503a 20A70503b 20A70503c	Professional Elective-V(MOOC) 1. DeepLearning 2. Block Chain Technology andApplications 3. Natural Language Processing	PE	3-0-0	3
4.	20A70504	Open Elective - III (Each department offer one course including Mathematics, Physics, Chemistry and HSS) 1. CyberSecurity (Common to All Branches)	OE	3-0-0	3
5.	20A70505	Open Elective - IV (Each department offer one course including Mathematics, Physics, Chemistry and HSS) (Common to All Branches) 1. Introduction to DBMS	OE	3-0-0	3
6.	20A75401a 20A75401b 20A75401c	Humanities Elective((Common to All Branches) 1. Managementscience 2. Businessenvironment 3. Organizationalbehaviour	HS	3-0-0	3
7.	20A70506	Skill Oriented Course-V Mobile Application Development	SC	1-0-2	2
	20A70507	Summer Internship Evaluation		-	3
				Total	**23**

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Semester-VIII					
S.No	Code	Course Name	Category	L-T-P	Credits
1.	20A80501	Full Internship & Project work	PR	-	12
				Total	12

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HONOUR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

S.No.	Course Code	Course Name	Contact Hours per week		Credits
			L	**T**	
1	20A05H11	Edge and Fog Computing	3	1	4
2	20A05H12	Quantum Computing	3	1	4
3	20A05H13	Introduction to Autonomous Navigation Systems	3	1	4
4	20A05H14	Reinforcement Learning	3	1	4
SUGGESTED MOOCs					
5	20A05H15a	MOOC I*	--	--	2
6	20A05H16a	MOOC II*	--	--	2

** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.

Minor Degree In COMPUTER SCIENCE AND ENGINEERING

S.No.	Course Code	Course Title	Contact Hours per week			Credits
			L	**T**	**P**	
1.	20A05M11	Introduction to Data Science	3	1	0	4
2.	20A05M12	Introduction to AI & ML	3	1	0	4
3.	20A05M13	Data Analytics using Python	3	1	0	4
4.	20A05M14	Software Project Management	3	1	0	4
5.	20A05M15a	MOOC I* DAA				2
6.	20A05M16a	MOOC II* Deep Learning				2

** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTAPUR

COMPUTER SCIENCE AND ENGINEERING

S.No.	Course Code	Open Elective Course – I* Course Name	L	T	P	Credits
1.	20A50105	Experimental Stress Analysis	3	0	0	3
2.	20A50205	Electric Vehicle Engineering	3	0	0	3
3.	20A50305	Optimization Techniques	3	0	0	3
4.	20A50405	Basics of Electronics and Communication	3	0	0	3
5.	20A50505	Introduction to Java Programming	3	0	0	3
6.	20A50805	Energy Conversion and Storage Devices	3	0	0	3
7.	20A55101	Optimization Methods (Mathematics)	3	0	0	3
8.	20A55201	Material Characterization Techniques(Physics)	3	0	0	3
9.	20A55401	E-Business (H & SS)	3	0	0	3
10.	20A55301	Chemistry Of Energy Materials (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

S.No.	Course Code	Open Elective Course – II Course Name	L	T	P	Credits
1.	20A60105	Disaster Management(CIVIL)	3	0	0	3
2.	20A60205	Renewable Energy Systems(EEE)	3	0	0	3
3.	20A60305	Solar Energy Systems(MECH)	3	0	0	3
4.	20A60405	Basics of Integrated Circuits Applications(ECE)	3	0	0	3
5.	20A60505	Introduction to Linux Programming (CSE) (CSE)	3	0	0	3
6.	20A60805	Green Technology(CHEM)	3	0	0	3
7.	20A65101	Mathematical Modelling & Simulation (Common for CIVIL,MECH &CHEM)(Mathemtics)	3	0	0	3
8.	20A65102	Wavelet transforms and its Applications (Common for EEE&ECE) (Mathemtics)	3	0	0	3
9.	20A65103	Statistical Methods for Data Science CSE (Data Science) (Mathemtics)	3	0	0	3
10.	20A65201	Physics Of Electronic Materials And Devices (Physics)	3	0	0	3
11.	20A65501	Academic Writing and Public Speaking(H & SS)	3	0	0	3
12.	20A65301	Chemistry Of Polymers And Its Applications (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

COMPUTER SCIENCE AND ENGINEERING

		Open Elective Course – III*				
S.No.	Course Code	Course Name	L	T	P	Credits
1.	20A70103	Building Technology for Engineers (CIVIL)	3	0	0	3
2.	20A70204	Battery Management Systems (EEE)	3	0	0	3
3.	20A70304	Modern Manufacturing Methods (MECH)	3	0	0	3
4.	20A70404	Digital Electronics (ECE)	3	0	0	3
5.	20A70504	CyberSecurity (CSE)	3	0	0	3
6.	20A70804	Industrial Pollution Control Engineering (CHEM)	3	0	0	3
7.	20A75101	Numerical Methods for Engineers	3	0	0	3
8.	20A75201	SMART MATERIALS AND DEVICES (Physics)	3	0	0	3
9.	20A75501	Employability Skills (H&SS)	3	0	0	3
10.	20A75301	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

		Open Elective Course – IV*				
S.No.	Course Code	Course Name	L	T	P	Credits
1.	20A70104	Environmental Impact and Assessment (CIVIL)	3	0	0	3
2.	20A70205	IOT Applications in Electrical Engineering (EEE)	3	0	0	3
3.	20A70305	Material Handling Equipment (MECH)	3	0	0	3
4.	20A70405	Principles of Digital Signal Processing (ECE)	3	0	0	3
5.	20A70505	Introduction to DBMS (CSE)	3	0	0	3
6.	20A70805	Solid Waste management (CHEM)	3	0	0	3
7.	20A75102	Number theory and its Applications (Mathemtics)	3	0	0	3
8.	20A75202	Sensors and Actuators For Engineering Applications (Physics)	3	0	0	3
9.	20A79102	English Literary Spectrum (H & Ss)	3	0	0	3
10.	20A75302	Chemistry Of Nanomaterials And Applications (Chemistry)	3	0	0	3

*It is mandatory that the candidate should select any subject other than parent branch subject.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
LINEAR ALGEBRA AND CALCULUS
Common to All Branches of Engineering

Course Code: 20A15101   **Semester I(R20)**   **L T P C: 3 0 0 3**

Course Objectives:
- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:
CO1: develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO2: Utilize mean value theorems to real life problems.
CO3: familiarize with functions of several variables which is useful in optimization.
CO4: Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
CO5: Students will become familiar with 3- dimensional coordinate systems and also learn the Utilization of special functions.

UNIT- I: Matrices
Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous equations linear equations. Eigenvalues and Eigenvectors and their properties, Properties of Eigen values and Eigen vectors on special matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix.

UNIT – II: Mean Value Theorems
Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), related problems.

UNIT – III: Multivariable calculus
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – IV: Multiple Integrals
Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.

UNIT – V: Beta and Gamma functions
Beta and Gamma functions and their properties, relation between beta and gamma functions,

evaluation of definite integrals using beta and gamma functions.

Textbooks:
1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference Books:
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
6. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education
9. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
APPLIED PHYSICS
Common to EEE, ECE& CSE
Course Code: 20A15201   Semester – I(R20)   L T P C: 3 0 0 3
Course Objectives:
- To make a bridge between the physics in school and engineering courses.
- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
- To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory of solids.
- Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:
CO1: Study the different realms of physics and their applications in both scientific technological
        Systems through physical optics.
   CO2: Identify the wave properties of light and the interaction of energy with the matter.
   CO3: Asses the electromagnetic wave propagation and its power in different media.
   CO4: Understands the response of dielectric and magnetic materials to the applied electric and
        Magnetic fields.
   CO5: Study the quantum mechanical picture of subatomic world along with the discrepancies
between the classical estimates and laboratory observations of electron transportation
phenomena by free electron theory and band theory.
   CO6: Elaborate the physical properties exhibited by materials through the understanding of
        Properties of semiconductors and superconductors.

UNIT – I: Wave Optics

Interference-Principle of superposition –Interference of light – Conditions for sustained interference- Interference in thin films (Reflection Geometry)– Colors in thin films –Newton's Rings–Determination of wavelength and refractive index.

Diffraction-Introduction–Fresnel and Fraunhofer diffraction–Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

Polarization-Introduction–Types of polarization–Polarization by reflection, refraction and double refraction - Nicol's Prism -Half wave and Quarter wave plateswith applications.

UNIT – II: Lasers and Fiber Optics
Lasers-Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action–Pumping mechanisms – Nd-YAG laser – He-Ne laser – Applications of lasers.

Fiber optics-Introduction –Principle of optical fiber–Acceptance Angle–Numerical Aperture–Classification of optical fibers based on refractive index profile and modes –Propagation of electromagnetic wave through optical fibers – Fiber optic communication system – Losses in optical fibers –Applications.

UNIT – III: Dielectric and Magnetic Materials
Dielectric Materials-Introduction –Dielectric polarization– Dielectric polarizability, Susceptibility and Dielectric constant –Types of polarizations: Orientation polarization (Qualitative), Electronic and Ionic polarization – Lorentz internal field –Clausius-Mossotti equation– Dielectric breakdown - Dielectric Loss – Piezoelectricity and Ferro electricity.

Magnetic Materials-Introduction – Magnetic dipole moment – Magnetization –Magnetic susceptibility and Permeability–Origin of permanent magnetic moment –Classification of magnetic materials: Dia, Para, Ferro, Ferri&Antiferro–Domain concept of Ferromagnetism (Qualitative) – Hysteresis –Soft and Hard magnetic materials.

UNIT – IV: Quantum Mechanics, Free Electron Theory andBand theory of Solids
Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory-Classical free electron theory– Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory – Origin of resistance –Fermi-Dirac distribution–Density of states–Fermi energy.

Band theory of Solids- Bloch's Theorem (Qualitative)–Kronig-Penney model (Qualitative) –E vs K diagram – Classification of crystalline solids –Effective mass of electron –m^* vs K diagram – Concept of hole.

UNIT – V: Semiconductors and Super Conductors

Semiconductors- Introduction–Intrinsic semiconductors –Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors – Density of charge carriers – Dependence of Fermi energy on carrier concentration and temperature–Drift and diffusion currents – Einstein's equation–Direct and indirect band gap semiconductors–Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect– Type I and Type II superconductors – BCS theory –Josephson effects (AC and DC)– High T_c superconductors – Applications of superconductors.

Text books:
1. Engineering Physics by M.N.Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2018).
3. Applied Physics by P.K. Palanisamy ,SciTech publications (2018)

Reference Books:
1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition (2018)
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2014).
3. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers (2018).
4. Engineering Physics by Shatendra Sharma, Jyotsna Sharma, Pearson Education (2018)
5. Engineering Physics by Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press (2016)
6. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill (2014)
7. Engineering Physics by B.K. Pandey and S. Chaturvedi, Cengage Learning (2018)
8. University Physics by H.D. Young and R.A. Freedman, Pearson (2017)

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
COMMUNICATIVE ENGLISH
Common to EEE, ECE& CSE & CHEM

Course Code: 20A15501 **Semester – I(R20)** **L T P C: 3 0 0 3**

Course Objectives:
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

Course Outcomes:

CO1: Retrieve the knowledge of basic grammatical concepts.

CO2: Understand the context, topic, and pieces of specific information from social or transactional

   dialogues spoken by native speakers of English

CO3: Apply grammatical structures to formulate sentences and correct word forms

CO4: Analyze discourse markers to speak clearly on a specific topic in informal discussions

CO5: Evaluate reading/listening texts and to write summaries based on global comprehension of

   these texts.

CO6: Create a coherent paragraph interpreting a figure/graph/chart/table

UNIT – I: On the conduct of life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT – 2: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

UNIT – 3: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing, Paragraph Writing **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

UNIT – 4: Innovation: Muhammad Yunus
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice

UNIT – 5: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and**

Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Text books:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:
- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
- Raymond Murphy's *English Grammar in Use* Fourth Edition (2012) E-book
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- Oxford Learners Dictionary, 12th Edition, 2011

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
PROBLEM SOLVING AND C PROGRAMMING

Course Code: 20A10501   **Semester – I (R20)**   **L T P C: 3 0 0 3**

Course Objectives:
- Introduce the internal parts of a computer, and peripherals.
- Introduce the Concept of Algorithm and use it to solve computational problems
- Identify the computational and non-computational problems
- Teach the syntax and semantics of a C Programming language
- Demonstrate the use of Control structures of C Programming language
- Illustrate the methodology for solving Computational problems

Course Outcomes:
CO1: Assemble a computer using parts
CO2: Recognize the importance of programming language independent constructs
CO3: Solve computational problems
CO4: Select the features of C language appropriate for solving a problem
CO5: Design computer programs for real world problems
CO6: Organize the data which is more appropriated for solving a problem

UNIT – I:
Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited Operational overview of a CPU.
Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth

generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts.

UNIT – II:
Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design.
Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

UNIT – III:
Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do-while, break and continue, Goto and labels.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables. Scope rules, Header files, Static Variables.

UNIT – IV:
Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the kth smallest element**.**

UNIT – V:
Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, typedef, unions, bit-fields.

File in C: Introduction, Using Files in C, Working with Text Files, Working with Binary Files, Direct File Input and Output, Files of records.

Text books:

1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

Reference books:

- P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
- RS Bichkar" Programming with C", 2012, Universities Press.
- Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
ENGINEERING DRAWING
Common to EEE, ECE& CSE

Course Code: 20A10301   **Semester – I(R20)**   **L T P C: 1 0 2 2**

Course Objectives:
- Bring awareness that Engineering Drawing is the Language ofEngineers
- Familiarize how industry communicates technicalinformation
- Teach the practices for accuracy and clarity in presenting the technical information
- Develop the engineering imagination essential for successfuldesign

Course Outcomes:
- Draw various curves applied in engineering
- Plot the projection of points, Lines and planes
- Draw the projections of solids inclined to one or both planes
- Draw the sectional view and true shape of the regular solids
- Draw the development of surfaces of solids

UNIT – I:
Introduction to Engineering Drawing: Principles of Engineering Drawing andits significance-Conventions in drawing-lettering - BIS conventions.

a)Conic sections including the rectangular hyperbola- general methodonly,
b) Cycloid, epicycloids andhypocycloid
c) Involutes

UNIT – II:
Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

UNIT – III:
Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliaryviewsmethod.

UNIT – IV:
Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

UNIT – V:
Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts

Text books:
1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016

Reference Books:
- Dr K.Prahlada Rao, Dr. S. Krishnaiah, Prof.A.V.S. Prasad, Engineering Graphics, Amaravati publications.
- Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right,2009
- Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers,2000
- Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
- K.C.John, Engineering Graphics, 2/e, PHI,2013
- Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
ENGINEERING GRAPHICS LAB
Common to EEE, ECE& CSE

Course Code: 20A10302   Semester – (R20)   L T P C: 0 0 2 1
Course Objectives:
- Instruct the utility of drafting & modelling packages in orthographic and isometric drawings
- Instruct graphical representation of machinecomponents

UNIT: Computer Aided Drafting
Introduction to Geometric Modeling: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets,arrays,dimensions.
Dimensioning principles and conventional representations**.**

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Text books:

1. K. Venugopal, V.Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.

Reference Books:

- T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
- K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
- Linkan Sagar, BPB Publications, Auto Cad 2018 Training Guide.
- K.C.John, Engineering Graphics, 2/e, PHI,2013
- Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
APPLIED PHYSICS LAB
Common to EEE, ECE& CSE

Course Code: 20A15202   **Semester – I(R20)**   **L T P C: 0 0 3 1.5**

Course Objectives:
- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effectin a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Course Outcomes:

- Operate optical instruments like microscope and spectrometer
- Determine thickness of a hair/paper with the concept of interference
- Estimate the wavelength of different colors using diffraction grating and resolving power
- Plot the intensity of the magnetic field of circular coil carrying current with distance
- Evaluate the acceptance angle of an optical fiber and numerical aperture
- Determine the resistivity of the given semiconductor using four probe method
- Identify the type of semiconductor i.e., n-type or p-type using hall effect
- Calculate the band gap of a given semiconductor

List of experiments:

1. Determination of the thickness of the wire using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Determination of dispersive power of prism
5. Determination of wavelength of LASER source using diffraction grating
6. Determination of particle size using LASER
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Determination of dielectric constant by charging and discharging method
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method
10. Measurement of magnetic susceptibility by Gouy's method
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
12. To determine the resistivity of semiconductor by Four probe method
13. To determine the energy gap of a semiconductor
14. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
15. Measurement of temperature coefficient of resistance using thermostat

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- SChand Publishers, 2017
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
COMMUNICATIVE ENGLISH LAB
Common to EEE, ECE& CSE& CHEM

Course Code: 20A15502   **Semester – I(R20)**   **L T P C: 0 0 3 1.5**

Course Objectives:

- students will be exposed to a variety of self instructional, learner friendly modes of language learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions, public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- Listening and repeating the sounds of English Language
- Understand the different aspects of the English language
- proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities ☐Analyze the English speech sounds, stress, rhythm, intonation and syllable ☐Division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings ☐Create awareness on mother tongue influence and neutralize it in order to ☐Improve fluency in spoken English.

List of Topics

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons
4. Role Play or Conversational Practice
5. JAM
6. Etiquettes of Telephonic Communication
7. Information Transfer
8. Note Making and Note Taking **9.**E-mail Writing
10. Group Discussions-1
11. Resume Writing
12. Debates
13. Oral Presentations
14. Poster Presentation
15. Interview Skills-1

Suggested Software

Orel, Walden Infotech, Young India Films

Reference Books
1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links:

www.esl-lab.comwww.englishmedialab.com
www.englishinteractive.net

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
PROBLEM SOLVING AND C PROGRAMMING LAB
Course Code: 20A10502   Semester – I(R20)   L T P C: 0 0 3 1.5
Course Objectives:

Course Outcomes:

1. Construct a computer given its parts (L6)

2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

List of experiments:
1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges
   a ← b ← c ← d
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series
   Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series
   $$1 - x^2/2! + x^4/4! - x^6/6! + ...$$
10 Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1 to 100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d.. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.
21. File operations
22. Indexing of a file

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
DIFFERENTIAL EQUATIONS AND TRANSFORMATIONS
Course Code: 20A15102   Semester – II(R20)   L T P C: 3 0 0
3
Course Objectives:

1) To enlighten the learners in the concept of differential equations and multivariable calculus.
2) To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes:
UNIT – I: Linear differential equations of higher order (Constant Coefficients)
Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.

UNIT – II: Partial Differential Equations
Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's methodand non-linear PDEs (Standard Forms)

UNIT – III: Applications of Partial Differential Equations
Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation.

UNIT – IV: Laplace Transforms
Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Fourier Series: Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions-typical wave forms - Parseval's formula- Complex form of Fourier series.

UNIT – V: Fourier transforms & Z Transforms
Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem.

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
CHEMISTRY

Course Code: 20A15303   **Semester – II(R20)**   **L T P C: 3 0 0 3**

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches

Course Outcomes:
- Apply Schrodinger wave equation to hydrogen atom, Illustrate the molecular orbital energy level diagram of different molecular species, Explain the band theory of solids for conductors, semiconductors and insulators Discuss the magnetic behavior and colour of complexes.
- Explain splitting in octahedral and tetrahedral geometry of complexes Discuss the magnetic behaviour and colour of coordination compounds Explain the band theory of solids for conductors, semiconductors and insulators. Demonstrate the application of Fullerenes, carbon nano tubes and Graphines nanoparticles
- Apply Nernst equation for calculating electrode and cell potentials, Differentiate between pH metry, potentiometric and conductometric titrations, Explain the theory of construction of battery and fuel cells, Solve problems based on cell potential.
- Explain the different types of polymers and their applications, Explain the preparation, properties and applications of PVC, Bakelite   Describe the mechanism of conduction in conducting polymers, Discuss Buna-S and Buna-N elastomers and their applications.
- Explain the different types of spectral series in electromagnetic spectrum, Understand the principles of different analytical instruments, Explain the different applications of analytical instruments.

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 O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT – II: Modern Engineering Materials
i). Coordination compounds: Crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. Properties of coordination compounds-Oxidation state, coordination, magnetic and colour.
ii). Semiconductor materials, super conductors- basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.
iii). Nanochemistry: Introduction, classification of nanometerials, properties and applications of Fullerenes, carbonnanotubes and Graphenes nanoparticles
iv).Super capacitors: Introduction, Basic concept-Classification – Applications.

UNIT – III: Electrochemistry and Applications

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (Ni-Cad),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

UNIT – IV: Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastic and Thermosetting plastic, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

UNIT – V: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law, Principle and applications of UV-Visibleand IR Spectroscopies. Solid-Liquid Chromatography–TLC, retention time and pH metry

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

JNTUA College of Engineering (Autonomous), Ananthapuramu

Department of Computer Science & Engineering
PYTHON PROGRAMMING

Course Code:20A10503   Semester – II (R20)   L T P C: 3 0 0 3

Course Objectives:

- To teach the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To train in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes:

1. Explain the features of Python language
2. Select appropriate data structure for solving a problem
3. Design object-oriented programs for solving real-world problems

UNIT – I:
Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.
Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

UNIT – II:
Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.
Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

UNIT – III:
Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.
Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.
Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

UNIT – IV:

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions:

UNIT – V:

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

Text book:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
Part – A: Basic Electrical Engineering
Common to MECH, CSE, CHEM

I B.Tech – II Sem   L T P   3 0 03

Course Objectives:
1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on Power system generation, transmission and distribution

Unit 1 DC & AC Circuits:
Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, Resonance.
Learning Outcomes: Students should be able to
● recall Kirchoff laws
● analyze simple electric circuits with DC excitation
● apply network theorems to simple circuits
● analyze single phase AC circuits consisting of series RL - RC - RLC combinations

Unit 2 DC & AC Machines:
Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Torque equation – Analyze Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC tests on transformer - Principle and operation of 3-phase AC machines [Elementary treatment only]
Learning Outcomes: Students should be able to
● explain principle and operation of DC Generator & Motor.
● perform speed control of DC Motor
● explain operation of transformer and induction motor.
● explain construction & working of induction motor - DC motor
Unit 3 Basics of Power Systems:

JNTUACEA EEE R20 w.e.f. 2020 Batch
1. 2. 3. 4.
Layout & operation of Hydro, Thermal, Nuclear Stations –Principle of operation of solar PV cell, characteristics of PV cell – Basic concept of wind power generation- Typical AC power supply scheme – Definition of short, medium and long transmission lines – Concepts of distribution system.

Learning Outcomes: Students should be able to
● understand working operation of various generating stations
● analyze the I-V characteristics solar PV cell

Text Books:
1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:
1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.
Course Outcomes: The students should be able to
● apply concepts of KVL/KCL in solving DC circuits
● understand and choose correct rating of a transformer for a specific application
● illustrate working principles of DC Motor
● identify type of electrical machine based on their operation
● understand the basics of power generation, transmission **and distribution**

**JNTUA COLLEGE OF ENGINEERING (Autonomous):: ANANTHAPURAMU
DEPARTMENT OF MECHANICAL ENGINEERING**

I –Year B.Tech.II -Semester   **L   T   P   C**
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20A12401

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

**ELECTRONICS ENGINEERING
PART- B**

COURSE OBJECTIVES
The students will be able to
Understand principle and terminology of electronics.
Analyse the characteristics of electronic devices and understand the working of basic circuits such as rectifiers, amplifiers, filters, oscillators.
Understand the concept of Digital Logic
Understand the Concept & Principles of Digital Logic

COURSE OUTCOMES	
At the end of this course the student will be able to	
CO1	Able to apply the knowledge of diodes, Zener diodes, BJT"s and FET"s for applications of different circuits.
CO2	Analyse the applications of operational amplifiers.
CO3	Solve problems of various digital logic gates and circuits.
CO4	Correlate the fundamental concepts to various Real life applications of today.

UNIT I
Diodes and Transistors: Semiconductor Diode, Zener Diode, Rectifier Circuits, Wave Shaping Circuits,Bipolar Junction Transistors(operating modes modes,Configurations and Charecteristics), Introduction to Transistor Biasing and Transistor as an amplifier, Introduction to Field-Effect Transistors (Configurations and characteristics).

UNIT II
Operational Amplifiers: Op-amp Equivalent Circuit, Ideal and practical Op-amp characteristics, Op-Amp Applications (Inverting amplifier, Non -inverting amplifier, Summing, scaling & averaging amplifiers, integrator, differentiator, Active filters, oscillators and comparators).

UNIT III

Digital Electronics: Number Systems and Codes, Logic Gates, Boolean Theorems, DeMogan''s Theorems, Algebraic Simplification, Karnaugh Map Method. Binary Addition, 2''s Complement System, Full Adder, BCD Adder. NAND and NOR gate Latches, S-R Flip-Flop, JK Flip-Flop, D Flip-Flop, Introduction to Shift registers and Counters

Text Books:

Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education

Ramakant A.Gayakwad, Op-Amps and Linear Integrated Circuits, Eastern Economy Edition

3.M.Morris Mano and Michael D.Ciletti, Digital Design, Pearson Education,4th Edition

References:

R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education.

Bell, D. A., Electronic Devices and Circuits, Oxford University Press

3.R.J. Tocci: Digital Systems; PHI, 6e, 2001.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
ENGINEERING WORKSHOP
Common to EEE, ECE, CSE

Course Code: 20A10303   Semester – II(R20)   L T P C: 0 0 2 1

Course Objectives:
- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:
- Apply wood working skills in real world applications.
- Build different objects with metal sheets in real world applications.
- Apply fitting operations in various applications.
- Apply different types of basic electric circuit connections.
- Use soldering and brazing techniques.

List of Topics

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints
    a)Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
    a) Tapered tray b) Conical funnel c) Elbow pipe   d) Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises
  a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheelertyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections
    a)   Parallel and series b) Two way switch c) Godown lighting
d) Tube light   e) Three phase motor f) Soldering of wires

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
CSE WORKSHOP
Common to EEE, ECE, CSE

Course Code: 20A10505   **Semester – II (R20)**   **L T P C:0 0 4 2**

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX
- To learn about Networking of computers and use Internet facility for Browsing and Searching
- To learn about Google Forms and Google Sites

Course Outcomes:
- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors and Prepare spread sheets forcalculations using excel and also the documents using LAteX.
- Prepare Slide presentations using the presentation tool.
- Interconnect two or more computers for information sharing.
- Access the Internet and Browse it to obtain the required information.

List of experiments:

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet

Task 11: LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

Task 12: Google Forms and Google Sites: Create a Google Form, Add Questions, Edit Questions, Preview and Send Form, Analyze Form Responses. Create a Website using Google Sites. Update, Share and Publish a website.
Sample Programs: Create a Feedback Survey form and download the Responses, Create Online Quiz and Analyze Responses, Create and Publish "Student Profile Website".

Task 13: Fundamentals of web programming: HTML, DHTML, and JAVA Script.

References:
1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.
7. https://support.google.com/a/users/answer/9991170
8. https://support.google.com/a/users/answer/9282722

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
PYTHON PROGRAMMING LAB
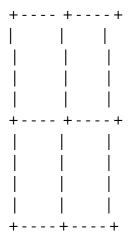Course Code: 20A10504   Semester – II(R20)   L T P C: 0 0 3 1.5
Course Objectives:

1. To train solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To illustrate the features of Python language

Course Outcomes:

1. Design solutions to mathematical problems
2. Organize the data for solving the problem
3. Develop Python programs for numerical and text based problems
4. Select appropriate programming construct for solving the problems
5. Illustrate object-oriented concepts

Laboratory Experiments:
1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
|         |         |
|         |         |
|         |         |
|         |         |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
        #
      # # #
    # # # # #
  # # # # # # #
```

.

.

.

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice

5. Write a program that draws Archimedean Spiral

6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.

7. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

   >>> import time

   >>>time.time()

   1437746094.5735958

   Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

8. Given n+r+1 <= 2^r . n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.

9. Write a program that evaluates Ackermann function

10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:

11. Write a function called estimate_pi that uses this formula to compute and return an estimate of π.

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.

12. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.

13. Given a text of characters. Write a program which counts number of vowels, consonants and special characters.

14. Given a word which is a string of characters. Given an integer say 'n'. Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.

15. Given rows of text, write it in the form of columns.

16. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same

17. Write program which performs the following operations on list's. Don't use built-in functions

      a) Updating elements of a list

      b) Concatenation of list's

      c) Check for member in the list

      d) Insert into the list

      e) Sum the elements of the list

      f) Push and pop element of list

      g) Sorting of list

      h) Finding biggest and smallest elements in the list

      i) Finding common elements in the list

18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.

19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.

20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.

21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.

22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.

23. Write a program illustrating the object oriented features supported by Python.

24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.

25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

2. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016

3. DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
CHEMISTRY LAB
Common to EEE, ECE, CSE

Course Code: 20A15304   Semester – II (R20)   L T P C: 0 0 3 1.5

Course Objectives:

- Verify fundamentals concepts with experiments

Course Outcomes:
- determine the cell constant and conductance of solutions
- prepare advanced polymer materials
- determine the physical properties like surface tension, adsorption and viscosity
- estimate the Iron and Calcium in cement
- calculate the hardness of water

List of Experiments:
1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Estimation of Ferrous Iron by Dichrometry.
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite and measurement of its mechanical properties (strength.).
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterial's by precipitation
12. Measurement of 10Dq by spectrophotometric method

Text books:
1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB
Part – A: Electrical Engineering Lab
Common to Mech, CSE & Chem

Course Code:20A12402   **Semester – II(R20)**   **L T P C: 0 0 3 1.5**

Course Objectives:

- To Verify Kirchoff's laws and Superposition theorem ☐To learn performance characteristics of DC Machines. ☐To perform various tests on 1- Phase Transformer.
- To Study the I – V Characteristics of Solar PV Cell

Course Outcomes:

- Understand Kirchoff's Laws & Superposition theorem.
- Analyze the various characteristics on DC Machines by conducting various tests.
- Analyze I – V Characteristics of PV Cell
- Apply the knowledge to perform various tests on 1-phase transformer

List of experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Load test on 1-Phase Transformer.
7. I – V Characteristics of Solar PV cell
   8. Brake test on DC Shunt Motor

Part – B: Electronics Engineering Lab

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.
- To analyze the characteristics of Diodes, BJT, MOSFET, UJT.
- To design the amplifier circuits from the given specifications.
  • Exposed to linear and digital integrated circuits.

Course Outcomes:

- Learn the characteristics of basic electronic devices like PN junction diode, Zener diode & BJT.
- Construct the given circuit in the lab
- Analyze the application of diode as rectifiers, clippers and clampers and other circuits. ☐Design simple electronic circuits and verify its functioning.

List Of Experiments:

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Full Wave Rectifier with & without filter.
4. Wave Shaping Circuits. (Clippers & Clampers)
5. Input & Output characteristics of Transistor in CB / CE configuration.
6. Frequency response of CE amplifier.
7. Inverting and Non-inverting amplifiers using Op-AMPs.
8. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required:

DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
ENVIRONMENTAL SCIENCE
Common to EEE, ECE, CSE
Course Code: 20A10803   **Semester – II(R20)**   **L T P C: 3 0 0 0**

Course Objectives:
- To make the students to get awareness on environment, to understand the importance of protecting natural resources , ecosystems for future generations and pollution causes due to day activities of human life to save earth from the inventions by the engineers.

Course Outcomes:

UNIT – I:
MULTIDISCIPLINARY NATURE OF ENVIRONMAENTAL STUDIES: - Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestration, case studies. Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture. Fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources.

UNIT – II:
ECOSYSTEMS: Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
   a. Forest ecosystem
   b. Grassland ecosystem
   c. Desert ecosystem
   d. Aquatic ecosystems(ponds, streams, lakes, rivers, oceans, estuaries)
BIODIVERSITY AND ITS CONSERVATION: Introduction () Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of

biodiversity.

UNIT – III:
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measure of:

a) Air Pollution
b) Water Pollution
c) Soil Pollution
d) Marine Pollution
e) Noise Pollution
f) Thermal Pollution
g) Nuclear hazards

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:
SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents holocaust. Case Studies – Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of pollution) Act – Wildlife Protection Act – Forest Conservation Act –Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:
HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations, Population explosion – Family Welfare Programmed – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.
FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects and birds – river, hill slopes, e.t.c

Text books:
1. Text book of Environmental Studies for Undergraduate courses by ErachBarucha for University Grants Commission, Universities Press.
2. Environmental Studies by PalaniSwami – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Discrete Mathematics & Graph Theory
Course Code: 20A35103   Semester III(R20)   L T P C : 3 0 0 3
Course Objectives:

Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatory and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems.

Course Outcomes:

CO1:   Apply mathematical logic to solve problems.
CO2:   Understand the concepts and perform the operations related to sets, relations and functions.
CO3:   Gain the conceptual background needed and identify structures of algebraic nature.
CO4:   Apply basic counting techniques to solve combinatorial problems.
CO5:   Formulate problems and solve recurrence relations.
CO6:   Apply Graph Theory in solving computer science problems

UNIT – I: Mathematical Logic

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT – II: Set theory

Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application,Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT – III: Elementary Combinatorics

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT – IV: Recurrence Relations

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT – V: Graphs

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

Textbooks:
1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002

Reference Books:
1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Graph Theory with Applications to Engineering and Computer ScienceByNarsinghDeo.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
DIGITAL SYSTEMS

Course Code: 20A30501 **Semester III(R20)** **L T P C: 3 0 0 3**

Course Objectives:
- Students would have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- On completion of this course students will have the skills and confidence to conceive and implement a complex digital system.
- Draw a circuit diagram for a sequential logic circuit and analyze its timing properties (input setup and hold times, minimum clock period, output propagation delays).
- Make the students to apply IoT data for business solution in various domains in secured manner.

Course Outcomes:
CO1: Realize different number systems and number base conversions and Boolean functions using universal gates.
CO2: Utilize the postulates of the Boolean Algebra to minimize the Combinational circuits.
CO3: Design and Analyze Sequential circuits and Finite State Machines.
CO4: Understand the definition and significance of the Internet of Things
CO5: Analyze the characteristics and concepts of embedded computing devices.

UNIT – I: DIGITAL FUNDAMENTALS
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

UNIT – II: COMBINATIONAL CIRCUIT DESIGN
Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder,BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT – III: SYNCHRONOUS SEQUENTIAL CIRCUITS
Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF,Analysisanddesign of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT - IV: INTRODUCTION TO IoT
The Internet of Things, The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?

UNIT – V: Prototyping Embedded Devices
Prototyping Embedded Devices- Electronics, Embedded Computing Basics, Arduino, Raspberry Pi.
Making Connections- Creating Series and Parallel Circuits, Switching Electric Current On and Off, Creating a Combination Circuit.

Textbooks:
1. M. Morris Mano, M.D. Ciletti, "Digital Design", 5th edition, Pearson, 2018
2. Cathleen Shamieh, Electronics for dummies, A Wiley Brand, 3rd Edition, 2015.
3. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, 2014

Reference Books:
1. Donald P Leach, Albert Paul Malvino, GoutamSaha, "Digital Principles and applications", McGrawHill , 8th Edition,2015.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press, 3rd Reprinted Indian Edition, 2012
3. R.D. Sudhakar Samuel, "Digital Logic Design", Elsevier Publishers.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
DATA STRUCTURES

Course Code:20A30502   **Semester III(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To impart the basic concepts of data structures and algorithms
- To understand the concepts about searching and sorting techniques
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
- To Understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcomes:
CO1: Ability to analyze the efficiency of program based on time complexity.
CO2: Implement Abstract data types using arrays and linked list.
CO3: Apply the different linear data structures like stack and queue to various computing problems.
CO4: Describe the hash function and concepts of collision and its resolution methods.
CO5: Able to apply principles and concepts of graph theory in practical situations.

UNIT – I: Introduction
Introduction and Overview: Definitions, Algorithms, Algorithm efficiency: Linear loops, logarithmic loops, Nested loops, Big-O notation, Standard measures of Efficiency, Big-O Analysis Examples, Abstract Data Types – Advantages of ADT, Concept of Data Structure, Over view of Data Structures, Implementation of Data Structures.
Sequential Storage Representation: Arrays, operations on Arrays – insertion, deletion, Traversing, Applications of Arrays - Linear Search, Binary Search, Insertion Sort, Merging of Arrays

UNIT – II: Linked Lists
Linked Lists: Definition, Single lined list: Representation of list in memory, Operations of single linked list, Circular linked list; Double Linked List: Operations of Double linked list; Applications of linked list: Sparse Matrix Manipulations, Polynomial representation.

UNIT – III: Stacks & Queues
Stacks: Introduction, Definition, Representation of stack: Array representation, Linked representation, Operations of stack, Applications of Stack: Evaluations of Arithmetic Expressions, Expression Conversion, Towers of Hanoi Problem.
Queues: Introduction, Definition, Representation of Queues: Array representation, Linked representation, Operations of Queues.

UNIT – IV: Queues & Hash Tables
Various Queue Structures: Circular Queue, Dequeue, Priority Queue, Applications of Queues.
Hash Tables: Hashing Techniques, Collision Resolution Techniques, Closed Hashing, Open Hashing, Comparison of Collision Resolution Techniques.

UNIT – V: Trees
Trees: Basic Terminologies, Definition and Concepts, Binary Tree, Properties of Binary Tree, Representation of Binary Tree, Binary Tree Traversals. Binary Search Tree: Binary Search Tree Properties, Binary Search Trees Operations, AVL Search Trees.

Textbooks:
1. D. Samantha, "Classic Data Structures" 2nd Edition, PHI Publication.
2. Richard F. Gilberg&Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C" 2nd Edition, Cengage Learning.

Reference Books:
1. Jean Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", Second Edition, Tata McGraw Hill
2. Rajesh K. Shukla, " Data Structures using C & C++", Wiley.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
OOPS THROUGH JAVA

Course Code:20A30503   **Semester III(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To understand object-oriented concepts and problem-solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes:

CO1: Solve real-world problems using OOP techniques.

CO2: Apply code reusability through inheritance, packages and interfaces

CO3: Solve problems using java collection framework and I/O classes.

CO4: Develop applications by using parallel streams for better performance and develop applets for web applications.

CO5: Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT – I: **Introduction**
Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT – II: **Inheritance, Packages, Interfaces**
Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT – III: **Exception handling, Stream based I/O**
Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT – IV: **Multithreading, The Collections Framework**
Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.
The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque.

Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT – V: **Applet, GUI Programming with Swings, Accessing Databases with JDBC**
Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets
GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog.
Accessing Databases with JDBC:
Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:
1.   Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2.   Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:
 1. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
 2. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
 3. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press
 4. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
 5. Object Oriented Programming through Java, P. Radha Krishna, University Press.
 6. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.
 7. Java Programming and Object-oriented Application Development, R.A. Johnson,
 8. Cengage Learning.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Humanities Elective-I)
Common to All Branches

Course Code:20A39101a   Semester III(R20)   L T P C : 3 0 0 3

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To know the various types of Market Structures & pricing methods and its strategies
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

Course Outcomes:

CO1: Define the concepts related to Managerial Economics, financial accounting and management.

CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets

CO3: Apply the concepts of production, cost and revenues for effective business decisions

CO4: Analyze how to invest their capital and maximize returns

CO5: Evaluate the capital budgeting techniques

CO6: Develop theaccounting statements and evaluate the financial performance of business entity.

UNIT-I: Managerial Economics
Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand –DemandElasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT-II: Production and Cost Analysis
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost&Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) -Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT-III: Business Organizations and Markets
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT- IV: Capital Budgeting
Introduction – Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method,

Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT-V: Financial Accounting and Analysis

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Text Books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

References:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
ENTREPRENEURSHIP& INCUBATION
(Humanities Elective-I)
Common to All Branches

Course Code:20A39101b   Semester III(R20)   L T P C : 3 0 0 3

Course Objectives:
- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of new enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:
CO1: Define the Concepts related to the Entrepreneurship and Incubators
CO2: Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3: Apply the Knowledge in generating ideas for New Ventures.
CO4: Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5: Evaluate the role of central government and state government in promoting Entrepreneurship.
CO6: Create and design   business plan structure through incubations.

UNIT-I: Entrepreneurship
Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Intrapreneur - entrepreneurial mindset and personality - Recent trends.

UNIT-II: Women Entrepreneurship
Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations. Entrepreneurship Development and Government.Role, of Central and State Government - incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions.

UNIT-III: Product Development
Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods – Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

UNIT-IV: Startups
Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-

Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition.

UNIT-V: Finance

Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey-Institutions supporting entrepreneurship development.

TEXT BOOKS

1. D F Kuratko and T V Rao, Entrepreneurship - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

REFERENCES

1. VasantDesai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwan‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.
4. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

Department of Computer Science & Engineering
BUSINESS ETHICS AND CORPORATE GOVERNANCE

(Humanities Elective-I)
Common to All Branches

Course Code:20A39101c   **Semester III**   **L T P C : 3 0 0 3**

Course Objectives:
- To make the student understand the principles of business ethics
- To enable them in knowing the ethics in management
- To facilitate the student's role in corporate culture
- To impart knowledge about the fair-trade practices
- To encourage the student in creating knowing about the corporate governance

Course Outcomes:
CO1: Define the Ethics and Types of Ethics.
CO2: Understand business ethics and ethical practices in management
CO3: Understand the role of ethics in management
CO4: Apply the knowledge in cross cultural ethics
CO5: Analyze law and ethics
CO6: Evaluate corporate governance

UNIT-I: ETHICS
Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics, Types, Characteristics, Factors, Contradictions and Ethical Practices in Management- Corporate Social Responsibility – Issues of Management – Crisis Management.

UNIT-II: ETHICS IN MANAGEMENT
Introduction Ethics in production, finance, Human Resource Management and, Marketing Management - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

UNIT-III: CORPORATE CULTURE
Introduction, Meaning, definition, Nature, Scope, Functions, and significance – Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

UNIT- IV: LEGAL FRAME WORK
Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers.

UNIT -V: CORPORATE GOVERNANCE
Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and

regulatory

Frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BoDs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.

Text books.
1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. BholananthDutta, S.K. Podder – Corporation Governance, VBH.

Reference books
1. Dr. K. Nirmala, Karunakara Reddy: Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal : Indian Ethos and Values for Managers

JNTUA College of Engineering(Autonomous),Ananthapuramu
Department of Computer Science & Engineering
DIGITAL SYSTEMS LAB
Course Code:20A30504   **Semester III(R20)**   **L T P C : 0 0 3 1.5**
Course Objectives:
- To present a problem oriented introductory knowledge of Digital circuits and its applications.
- Explain the elements of digital system abstractions such as digital representations of information, digital logic, Boolean algebra, state elements and finite state machine (FSMs).
- Design simple digital systems based on these digital abstractions, using the "digital paradigm" including discrete sampled information.
- Work in a design team that can propose, design, successfully implement and report on a digital systems project.
- Train the students to build IoT systems using sensors, single board computers and open source IoT platforms.

Course Outcomes:
CO1: Design, Test and evaluate various combinational circuits such as adders, subtractors, multipliers, comparators, parity generators, multiplexers and de-Multiplexers.
CO2: Construct flips-flops, counters and shift registers and verify its functionality
CO3: Realize and implementation of Asynchronous and Synchronous counters using Flip-Flop IC's .
CO4: Implementation of different combinational logic circuits using IC's.
CO5: Design and develop IoT based sensor systems.

List of Experiments:
1. To verify (a) Demorgan's Theorem for 2 variables
2. The sum-of product and product-of-sum expressions using universal gates.
3. To design and implement 4-bit Parallel Adder/ subtractor using IC 7483.
4. To realize (a) 4:1 Multiplexer using gates
5. 3-variable function using IC 74151(8:1 MUX)
6. 8 Demux and 3:8 Decoder using IC74138.
7. To realise the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop.
8. To realize the following shift registers using IC7474 (a) SISO (b) SIPO (c)PISO (d) PIPO.
9. To realize the Ring Counter and Johnson Counter using IC7476.
10. To realize the Mod-N Counter using IC7490.
11. Build Indoor Air Quality Monitoring System using IoT Platform
    a. Monitored Parameters: Temperature, Humidity, CO2, VOC
    b. Function1: Generate notifications and alerts in case of parameters beyond limits
12. Function2: Mix fresh air in case of CO2 level crossing threshold level of 1000ppm Build Smart Farming application using IoT Platform
    a. Monitored Parameters: Soil Moisture, Rainfall, Weather Forecast
    b. Function1: Switch ON irrigation pump intelligently based on monitoring parameters
13. Build Smart Parking application using IoT Platform

a.Monitored Parameters: Vehicle detection

b. Function1: Provide information to user about free space in parking slots

14. Build Smart Home system using IoT Platform

a. Monitored Parameters: People presence, Outside ambient conditions, IAQ parameters

b. Function1: Control Home appliances through manual application control

c. Function2: Intelligently control appliances based on monitoring parameters

References:
1. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424

2. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
DATA STRUCTURES LAB

Course Code:20A30505   **Semester III(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- The course is designed to develop skills to design and analyze simple linear and non linear data structures.
- It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:
CO1: Able to design and analyze the time and space efficiency of the data structure.
CO2: Be capable to identity the appropriate data structure for given problem.
CO3: Have practical knowledge on the applications of data structures.

List of Experiments:
1. Implement Linear and Binary search techniques with recursive and non-recursive functions.
2. Implement Insertion and Merge sort techniques.
3. Implement Complex numbers addition and multiplication using structures.
4. Implement single linked list operations (Insert front, Insert rear, Delete front, Delete rear, and Traversal0.
5. Implement Sorted linked list and Delete a node by search.
6. Implement Double linked list operations (Insert front, Insert rear, Delete front, Delete rear, and Traversal).
7. Implement Stack operations using arrays and linked list.
8. Implement convert an infix expression into post fix expression
9. Implement evaluation of post fix expression.
10. Implement Queue operations using arrays and linked list
11. Implement Circular and DeQueue using arrays
12. Implement Priority Queue using arrays
13. Implement Binary Search Tree Operations (Insertion, Deletion, Traversal)
14. Implement AVL Tree Operations.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
OOPS Through JAVA LAB

Course Code:20A30506   **Semester III(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes:
CO1: Recognize the Java programming environment.
CO2: Select appropriate programming constructs to solve a problem.
CO3: Develop efficient programs using multithreading.
CO4: Design reliable programs using Java exception handling features.
CO5: Extend the programming functionality supported by Java.

Week-1
a. Installation of Java software, study of any Integrated development environment, Use Eclipse orNetbeans platform and acquaint with the various menus. Create a test project, add a test class and run it.
   See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with java program to find prime numbers between 1 to n.
b. Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.
c. Develop a Java application to generate Electricity bills. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Commute the bill amount using the following tariff.
 If the type of the EB connection is domestic, calculate the amount to be paid as follows:
- First 100 units - Rs. 1 per unit
- 101-200 units - Rs. 2.50 per unit
- 201 -500 units - Rs. 4 per unit
- > 501 units   - Rs. 6 per unit
 If the type of the EB connection is commercial, calculate the amount to be paid as follows:
- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- > 501 units   - Rs. 7 per unit
d. Write a Java program to multiply two given matrices.

Week-2
a. Write Java program on use of inheritance, preventing inheritance using final, abstract classes.
b. Write Java program on dynamic binding, differentiating method overloading and overriding.

c. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen) using
Interfaces.

Week-3
a. Write Java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read, display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.
b. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
c. Write a Java program to read the time intervals (HH:MM) and to compare system time if the system Time between your time intervals print correct time and exit else try again to repute the same thing. By using StringToknizer class.

Week-4
a. Write a Java program to implement user defined exception handling.
b. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

Week-5
a. Write a Java program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
b. Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds.

Week-6
a. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part where n is the sequence number of the part file.
b. Write a Java program that reads a file name from the user, displays information about whetherthe file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

Week-7
 a. Write a java program that displays the number of characters, lines and words in a text file.
 b. Write a java program that reads a file and displays the file on the screen with line number before each line.

Week-8
 a. Write a Java program that correctly implements the producer-consumer problem using the concept of inter thread communication.
 b. Develop a Java application for stack operation using Buttons and JOptionPane input and Message

dialog box.

c. Develop a Java application to perform Addition, Division, Multiplication and subtraction using the JOptionPane dialog Box and Textfields.

Week-9
a. Develop a Java application for the blinking eyes and mouth should open while blinking.
      b. Develop a Java application that simulates a traffic light. The program lets the user select one of thethree lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriatemessage with ―STOP‖ or ―READY‖ or ‖GO‖ should appear above the buttons in the selected color. Initially, there is no message shown.

Week-10
a. Develop a Java application to implement the opening of a door while opening man should present before hut and closing man should disappear.
b. Develop a Java application by using JtextField to read decimal values and converting a decimal number into a binary number then print the binary value in another JtextField.

Week-11
a. Develop a Java application that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.
 b. Develop a Java application to demonstrate the key event handlers.

Week-12
a. Develop a Java application to find the maximum value from the given type of elements using a generic function.
b. Develop a Java application that works as a simple calculator. Use a grid layout to arrange buttonsfor the digits and for the +, -,*, % operations. Add a text field to display the result.
c . Develop a Java application for handling mouse events.

Week-13
a. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using java and display the information of the students at front end.

References:
1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007
3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.
4. Sachin Malhotra, SaurabhChaudhary, "Programming in Java", Oxford University Press, 5th Edition, 2010.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
IoT Using Python
(Skill Oriented Course-1)

Course Code:20A30507   **Semester III(R20)**   **L T P C : 1 0 2 2**

Course Objectives:
- To introduce the concept of Internet of Things.
- To Practice programs and build real time applications.
- Students will be explored to the interconnection and integration of the physical world.
- Students will gain practical experience in the development of Cloud-based IoT systems.
- To get knowledge on cloud platforms

Course Outcomes (CO):

CO1:   Design reliable real time applications using microcontrollers and microprocessors .

CO2:   Extend the programming functionality and design new modules.

CO3:   Able to design & develop IOT Devices.

Experiment -1

    a. Introduction to Internet of Things and Arduino UNO

    b.Knowing more about Arduino board description

    c. Arduino Software Installation.

Experiment -2

    a. Write an Arduino program to blink led

    b. Write an Arduino program to control led by integer, character and string.

    c. Write an Arduino program to control the brightness of an led using potentiometer

    d. Write an Arduino program to fast and slow blinking of an led

    e. Write an Arduino program for fading

    f. Write an Arduino program for traffic light controlling

Experiment -3

    a. Write an Arduino program to control led and buzzer by button and we can find how many times we can pressing the button

    b. Write an Arduino program to control RGB by giving the user input

    c. Write an code for servo motor interfacing with arduino

    d. Write an Arduino program to control motor using npn transistor

    e. **Control Servo motor with RGB and Arduinouno**

Experiment -4

    a. Introduction to Sensors

    b. Write a program for Interfacing LDR sensor with Arduino

    c. Write a program for Interfacing IR and PIR sensor with Arduino

    d. Write a program for Interfacing Ultrasonic HC-05 with Arduino UNO

    e. **Implementing real time applications using sensors**

Experiment -5

    a.   Write a program for Interfacing Gas sensor with arduino

    b.   Write a program for Interfacing Temperature sensor with Arduino

    c.   Write a program for Interfacing Flex Sensor

    d.   Write a program for Interfacing Ambient light sensor

    e.   **Implementing real time application using sensors**

Experiment -6

    a. Introduction to Displays

b. LCD Introduction and its working description

c. Write a Arduino program to display a data on LCD

d. **Print a Sensor data on LCD display**

Experiment -7

a. Introduction to 7-Segment both Anode and Cathode mode

b. Write a program to control keypad using Arduino UNO

c. Traffic light system using Arduino , 7-Segment and servo motor

Experiment -8

a. Bluetooth interfacing with Arduino

b. Introduction to MIT APP Inventor

c. Control Led or any sensor by using MIT App Inventor

d. Build an IoT application using MIT App Inventor

Experiment -9

a. Introduction to NodeMCU and its board description

b. Write a NodeMCU program to control led

c. Introduction to ThingSpeak and its working

d. Upload a sensor data to ThingSpeak cloud and controlling by it

e. **Publish and Retrive the sensor data using Thingspeak**

Experiment -10

a. Introduction to Blynk cloud

b. Creating an app and controlling it by using nodemcu

c. Develop an Home Automation using NodeMCU and Blynk**-**

Experiment -11

a. Raspberry PI Introduction, OS Installation, Linux basics, Python programming

b. Write a Raspberry pi program for controlling LED

c. Write a Raspberry pi program for controlling button

d. Write a Raspberry pi program for controlling motor

e. Write a Raspberry pi program for controlling DHT11 Sensor

f. **Implementing a sensor application that can be controlled by the user** .

Experiment -12

a. Write a Raspberry pi program for controlling LED by using Socket (server and client) Communication

b. SSH

c. VNC

d. Controlling LED by Socket communication.

Experiment -13

a. Creating AWS Cloud account logins and its introduction

b. Checking the services and how SNS service ny using Raspberry PI

c. Introducing Lambda Function and its working principle

d. IoT Core Service introduction and creating policies, things, certificates.

e. Checking DHT11 sensor data in AWS cloud by using IoT Core service and can know how to publish and retrieve the sensor data

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Universal Human Values
Common to EEE, ECE, CSE

Mandatory non-credit Course-II

Course Code:20A1901   Semester III(R20)   L T P C : 3 0 0 0

Course Objectives:
- Exposure to the value of life, society and harmony
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns

Course Outcomes:
CO1:   Analyze th terms like Natural Acceptance, Happiness and Prosperity
CO2:   Understand awareness of oneself, and one's surroundings (family, society nature)
CO3:   Apply what they have learnt to their own self in different day-to-day   settings in real life
CO4:   Relate human values with human relationship and human society.
CO5:   Justify the need for universal human values and harmonious existence
CO6:   Develop as socially and ecologically responsible engineers

UNIT – I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
Universal Human Values-I - Self-Exploration - content and process; 'Natural Acceptance' and Experiential Validation - self-exploration - Continuous Happiness and Prosperity - Human Aspirations - current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II: Understanding Harmony among Human Beings & Self Harmony!
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
Humanistic Education - Competence in professional ethics: professional competence - people friendly and eco-friendly production systems - appropriate technologies and management patterns for above production systems. Individuals as socially and ecologically responsible engineers, technologists and managers.

Textbooks:
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
2. 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

Reference Books:
1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999
2. HumanValues, A.N.Tripathi, NewAgeIntl.Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
5. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
6. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English)

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
PROBABILITY AND STATISTICAL METHODS
Course Code:20A45103   Semester IV(R20)   L T P C : 3 0 0 3

Course Objectives:
- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various engineering applications

Course Outcomes:
CO1: make use of the concepts of probability and their applications (L3)
CO2: apply discrete and continuous probability distributions (L3)
CO3: classify the concepts of data science and its importance (L4)
CO4: interpret the association of characteristics and through correlation and regression tools (L4)
CO5: Design the components of a classical hypothesis test (L6)
CO6: infer the statistical inferential methods based on small and large sampling tests (L6)

UNIT – I: Descriptive statistics and methods for data science
Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

UNIT – II: Probability
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT – III: Probability distributions
Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality).Approximation of the binomial distribution to normal distribution.

UNIT – IV: Estimation and Testing of hypothesis, large sample tests
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT – V: Small sample tests
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes**.**

Textbooks:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.

2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand *&* Sons Publications, 2012.

Reference Books:
1**.** S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.
4. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
COMPUTER ORGANIZATION

Course Code:20A40501   **Semester IV(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To understand the structure and behavior of various functional modules of a computer.
- To learn the techniques that computers use to communicate with I/O devices
- To acquire the concept of pipelining and exploitation of processing speed.
- To learn the basic characteristics of multiprocessors

Course Outcomes:
CO1: Understand computer architecture concepts related to the design of modern processors, memories and I/Os
CO2: Identify the hardware requirements for cache memory and virtual memory
CO3: Design algorithms to exploit pipelining and multiprocessors
CO4: Understand the importance and trade-offs of different types of memories.
CO5: Identify pipeline hazards and possible solutions to those hazards

UNIT – I: Basic Structure of Computer, Machine Instructions and Programs
Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.
Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

UNIT – II: Arithmetic, Basic Processing Unit
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT – III: The Memory System
The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT – IV: Input/Output Organization
Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

UNIT – V: Pipelining, Large Computer Systems
Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.

Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education, 2013.

Reference Books:

1. M.Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, "Computer Organization and Architecture", CENGAGE Learning.
3. SmrutiRanjanSarangi, "Computer Organization and Architecture", McGraw Hill Education.
4. John P.Hayes, "Computer Architecture and Organization", McGraw Hill Education

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
DATABASE MANAGEMENT SYSTEMS

Course Code:20A40502　　　　　　　　**Semester IV(R20)**　　　　　　**L T P C : 3 0 0 3**

Course Objectives:
- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagrams for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on concurrency techniques
- Demonstrate the organization of Databases

Course Outcomes:
CO1: Demonstrate the basic elements of a relational database management system
CO2: Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
CO3: Apply normalization for the development of application software
CO4: Define transactions that preserve the integrity of the database
CO5: Evaluate the expression and estimate statistics of expression results

UNIT – I: Introduction, Introduction to Relational Model
Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators,
Introduction to Relational Model:Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT – II: Introduction to SQL, Advanced SQL
Introduction to SQL:Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.
Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

UNIT – III: Database Design and the E-R Model, Relational Database Design
Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.
Relational Database Design:

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT – IV: Query Processing, Query optimization
Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.
Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT – V: Transaction Management, Concurrency Control, Recovery System
Transaction Management:
Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.
Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols.
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.

Textbooks:
1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019

Reference Books:
1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3.Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
OPERATING SYSTEMS

Course Code:20A40503   **Semester IV(R20)**   **L T P C : 3 0 0 3**

Course Objectives:

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Explore the concept of file-system and Implement various schemes for achieving

system protection and security**Course Outcomes:**

- CO1: Analyze how applications interact with operating system and functioning of a kernel in an Operating system.
- CO2: Summarize resource management in operating systems
- CO3: Analyze various scheduling algorithms
- CO4: Apply memory management techniques in the design of operating systems
- CO5: Understand the functionality of the file system and deadlock prevention and avoidance.
- CO6: Understand Perform administrative tasks on Linux based systems.

UNIT – I: Operating Systems Overview, System Structures

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT – II: Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT – III: Memory-Management Strategies, Virtual Memory Management

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT – IV: Deadlocks, File Systems
Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation

UNIT – V: System Protection, System Security
System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Textbooks:
1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.
(Topics: Inter-process Communication and File systems.)

Reference Books:
1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
SOFTWARE ENGINEERING

Course Code:20A40504 **Semester IV(R20)** **L T P C : 3 0 0 3**

Course Objectives:
- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To understand and learn the concepts of software quality

Course Outcomes:
CO1: Obtain basic software life cycle activity skills.
CO2: Design software requirements specifications for given problems.
CO3: Implement structure, object oriented analysis and design for given problems.
CO4: Design test cases for given problems.
CO5: Apply quality management concepts at the application level.

UNIT – I: Basic concepts in software engineering and software project management
Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

UNIT – II: Requirements analysis and specification
The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification.

UNIT – III: Software Design
Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

UNIT – IV: Coding and Testing
Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

UNIT – V: Software quality, reliability, and other issues
Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Textbooks:
1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
2. Pressman R, "Software Engineering- Practioner Approach", McGraw Hill.

Reference Books:
1. Somerville, "Software Engineering", Pearson 2.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. JalotePankaj, "An integrated approach to Software Engineering", Narosa.

Department of Computer Science & Engineering
Database Management Systems Lab

Course Code:20A40505   **Semester IV(R20)**   **L T P C: 0 0 3 1.5**

Course Objectives:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors usingPL/SQL.
- To design and implementation of a database for an organization

Course Outcomes:

CO1: Design databases
CO2: Define SQL queries and Retrieve information from data bases
CO3: Apply the constraints in queries
CO4: Implement PL/SQL programs
CO5: Investigate for data inconsistency

Week-1: CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

   a. Add a column commission with domain to the Employee table.
   b. Insert any five records into the table.
   c. Update the column details of job
   d. Rename the column of Employ table using alter command.
   e. Delete the employee whose empno is19.

2. Create department table with the following structure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into thetable.
c. List the records of emp table grouped bydeptno.
d. Update the record where deptno is9.
e. Delete any column data from thetable

3. Create a table called Customertable

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into thetable.
b. Add salary column to thetable.
c. Alter the table columndomain.
d. Drop salary column of the customertable.
e. Delete the rows of customer table whose ust_city is 'hyd'.
f. Create a table called branchtable.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.
   a. Add and drop a column to the branch table.
   b. Insert values to the table.
   c. Update the branch name column
   d. Delete any two columns from the table
5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

a. Add column age to the sailor table.
b. Insert values into the sailor table.
c. Delete the row with rating>8.
d. Update the column details of sailor.
e. Insert null values into the table.
6. Create a table called reserves table

Name	Type
Boat	Integer

id	
sid	Integer
day	Integer

    a.   Insert values into the reservestable.
    b.   Add column time to the reservestable.
    c.   Alter the column day data type todate.
    d.   Drop the column time in thetable.
    e.   Delete the row of the table with somecondition.

Week-2: QUERIES USING DDL AND DML

1.   a. Create a user and grant all permissions to theuser.
    b. Insert the any three records in the employee table and use rollback. Check theresult.
    c. Add primary key constraint and not null constraint to the employeetable.
    d. Insert null values to the employee table and verify theresult.
2.   a. Create a user and grant all permissions to theuser.
    b. Insert values in the department table and usecommit.
    c. Add constraints like unique and not null to the departmenttable.
    d. Insert repeated values and null values into thetable.
3.   a. Create a user and grant all permissions to theuser.
    b. Insert values into the table and use commit.
    c. Delete any three records in the department table and use rollback.
    d. Add constraint primary key and foreign key to thetable.
4.   a. Create a user and grant all permissions to theuser.
    b. Insert records in the sailor table and usecommit.
    c. Add save point after insertion of records and verify save point.
    d. Add constraints not null and primary key to the sailortable.
5.   a. Create a user and grant all permissions to theuser.
    b. Use revoke command to remove userpermissions.
    c. Change password of the usercreated.
    d. Add constraint foreign key and notnull.
6.   a. Create a user and grant all permissions to theuser.
    b. Update the table reserves and use savepointandrollback.
    c. Add constraint primary key , foreign key and not null to the reserves table
    d. Delete constraint not null to the tablecolumn

Week-3:QUERIES USING AGGREGATE FUNCTIONS

1.   a. By using the group by clause, display the enames who belongs to deptno 10 alongwithaveragesalary.
    b. Display lowest paid employee details under eachdepartment.
    c. Display number of employees working in each department and their departmentnumber.
    d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname for each row, do the required thing specified above.
    e. List all employees which start with either B or C.
    f. Display only these ename of employees where the maximum salary is greater than

or equalto 5000.

2. a. Calculate the average salary for each differentjob.
   b. Show the average salary of each job excludingmanager.
   c. Show the average salary for all departments employing more than threepeople.
   d. Display employees who earn more than thelowest salary in department 30
   e. Show that value returned by sign (n)function.
   f. How many days between day of birth to currentdate

3. a. Show that two substring as singlestring.
   b. List all employee names, salary and 15% rise insalary.
   c. Display lowest paid emp details under eachmanager
   d. Display the average monthly salary bill for eachdeptno.
   e. Show the average salary for all departments employing more than twopeople.
   f. By using the group by clause, display the eid who belongs to deptno 05 along withaverage salary.

4. a. Count the number of employees in department20
   b. Find the minimum salary earned byclerk.
   c. Find minimum, maximum, average salary of allemployees.
   d. List the minimum and maximum salaries for each jobtype.
   e. List the employee names in descendingorder.
   f. List the employee id, names in ascending order byempid.

5. a. Find the sids ,names of sailors who have reserved all boats called"INTERLAKE
      Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
   b. Find the sname , bid and reservation date for eachreservation.
   c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
   d. List in alphabetic order all sailors who have reserved redboat.
   e. Find the age of youngest sailor for each ratinglevel.

6. a. List the Vendors who have delivered products within 6 months from orderdate.
   b. Display the Vendor details who have supplied both Assembled and Subparts.
   c. Display the Sub parts by grouping the Vendor type (Local or NonLocal).
   d. Display the Vendor details in ascendingorder.
   e. Display the Sub part which costs more than any of the Assembledparts.
   f. Display the second maximum cost Assembledpart

Week-4: PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swaptwonumbers.
   b. Write a PL/SQL program to find the largest of threenumbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display thegrade.
   b. Write a PL/SQL program to find the sum of digits in a givennumber.
3. a. Write a PL/SQL program to display the number in reverseorder.
   b. Writea PL/SQLprogramtocheckwhetherthegivennumberisprimeornot.
4. a. Write a PL/SQL program to find the factorial of a givennumber.
   b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius andarea.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the worldHello).

b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than
or equal to 10. Else display an error message. Otherwise Display the remainderin words.

Week-5: PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a givenyear.
3. Create a function to find the factorial of a given number and hence findNCR.
4. Write a PL/SQL block o pint prime Fibonacci series using localfunctions.
5. Create a procedure to find the lucky number of a given birthdate.
6. Create function to the reverse of givennumber

Week-6: TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and newvalues:

   CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.
   Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
   a. Write a Insert Trigger to check the Passport_id is exactly six digits ornot.
   b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passengerrespectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETEoccurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert orupdate.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and

time ofdelete.

6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted orupdated

Week-7:PROCEDURES

1. Create the procedure for palindrome of givennumber.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD isfound.
3. Write the PL/SQL programs to create the procedure for factorial of givennumber.
4. Write the PL/SQL programs to create the procedure to find sum of N naturalnumber.
5. Write the PL/SQL programs to create the procedure to find Fibonacciseries.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect ornot

Week-8: CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paidemployees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item mastertable.
3. Write a PL/SQL block that will display the employee details along with salary usingcursors.
4. To write a Cursor to display the list of employees who are working as a ManagersorAnalyst.
5. To write a Cursor to find employee with given job anddeptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we getamessage 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

Week-9: CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.
A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do thefollowing:
1. Analyze the datarequired.

2. Normalize theattributes.
Create the logical data model using E-R diagrams

Week-10: CASE STUDY GENERAL HOSPITAL

AGeneralHospitalconsistsofanumberofspecializedwards(suchasMaternity,Pediatric,Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their ownGP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the datarequired.
2. Normalize theattributes.
Create the logical data model using E-R diagrams

Week-11: CASE STUDY: CAR RENTAL COMPANY

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special creditcard facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do thefollowing:

1. Analyze the datarequired.
2. Normalize theattributes.
Create the logical data model using E-R diagrams

Week-12: CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons.) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching

duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programs have compulsory modules. The database is also to contain some information about studentsincludingtheirnumbers,names,addresses,degreestheyreadfor,andtheirpastperformance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the datarequired.
2. Normalize theattributes.
3. Create the logical data model i.e., ERdiagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys whereverrequired.
5. Insert values into the tables created (Be vigilant about Master- Slavetables).
6. Display the Students who have taken M.Sccourse
7. Display the Module code and Number of Modules taught by eachLecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English 'module.
10. Retrieve the Prerequisite Courses offered by every Department (with Departmentnames).
11. Present the Lecturer ID and Name who teaches'Mathematics'.
12. Discover the number of years a Module istaught.
13. List out all the Faculties who work for 'Statistics'Department.
14. List out the number of Modules taught by each ModuleLeader.
15. List out the number of Modules taught by a particularLecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and itsname).
17. Update the credits of all the prerequisite courses to
18. Delete the Module 'History' from the Moduletable

References:

1. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
OPERATING SYSTEMS LAB

Course Code:20A40506   **Semester IV(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:

- To familiarize students with the architecture of OS.
- To provide necessary skills for developing and debugging CPU Scheduling algorithms.
- To elucidate the process management and scheduling and memory management.
- To explain the working of an OS as a resource manager, file system manager, process manager, memory manager, and page replacement tool.
- To provide insights into system calls, file systems and deadlock handling.

Course Outcomes:

After completion of the course, students will be able to

CO1: Trace different CPU Scheduling algorithms (L2).
CO2: Implement Bankers Algorithms to Avoid and prevent the Dead Lock (L3).
CO3: Evaluate Page replacement algorithms (L5).
CO4: Illustrate the file organization techniques and shared memory process (L4).
CO5: Design new scheduling algorithms (L6)

List of Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls
   Fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
5. Implement a dynamic priority scheduling algorithm.
6. Assume that there are five jobs with different weights ranging from 1 to 5.
   Implement round robin algorithm with time slice equivalent to weight.
7. Implement priority scheduling algorithm. While executing, no process should
   wait for more than 10 seconds. If the waiting time is more than 10 seconds that
   process has to be executed for at least 1 second before waiting again.
8. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
9. Simulate how parent and child processes use shared memory and address space.
10. Simulate sleeping barber problem.
11. Simulate dining philosopher's problem.
12. Simulate producer-consumer problem using threads.
13. Implement the following memory allocation methods for fixed partition
    a) First fit b) Worst fit c) Best fit
14. Simulate the following page replacement algorithms
    a) FIFO b) LRU c) LFU etc.,

15. Simulate Paging Technique of memory management
16. Simulate Bankers Algorithm for Dead Lock avoidance and prevention
17. Simulate the following file allocation strategies
                a)   Sequential b) Indexed c) Linked

18. Simulate all File Organization Techniques
     a) Single level directory b) Two level c) Hierarchical d) DAG

References:
1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth
Edition, John Wiley.
2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009,
   Pearson Education
3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.
4. "Operating Systems", S.Haldar, A.A.Aravind, Pearson Education.
5. "Principles of Operating Systems", B.L.Stuart, Cengage learning, India Edition.2013-2014
6. "Operating Systems", A.S.Godbole, Second Edition, TMH.
7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI.

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
SOFTWARE ENGINEERING LAB

Course Code:20A40507   **Semester IV(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- To learn and implement the fundamental concepts of Software Engineering.
- To explore functional and non-functional requirements through SRS.
- To practice the various design diagrams through the appropriate tool.
- To learn to implement various software testing strategies.

Course Outcomes:
CO1: Acquaint with historical and modern software methodologies
CO2: Understand the phases of software projects and practice the activities of each phase
CO3: Practice object oriented metrics by coding
CO4: Design the document using different types of diagrams
CO5: Adopt skills of unit testing, system testing, integration testing

List of Experiments:
1. Draw the Work Breakdown Structure for the system to be automated
2. Schedule all the activities and sub-activities Using the PERT/CPM charts
3. Define use cases and represent them in use-case document for all the stakeholders of the system to be automated
4. Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated
5. Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause& Effect Diagram)
6. Define Complete Project plan for the system to be automated using Microsoft Project Tool
7. Define the Features, Vision, Businessobjectives, Business rules and stakeholders in the vision document
8. Define the functional and non-functional requirements of the system to be automated by using Use cases and document in SRS document
9. Define the following traceability matrices :
    1. Use case Vs. Features
    2. Functional requirements Vs. Usecases
10. Estimate the effort using the following methods for the system to be automated:
    1. Function point metric
    2. Usecase point metric
11. Develop a tool which can be used for quantification of all the non-functional requirements
12. Write C/C++/Java/Python program for classifying the various types of coupling.
13. Write a C/C++/Java/Python program for classifying the various types of cohesion.
14. Write a C/C++/Java/Python program for object oriented metrics for design proposed by Chidamber and Kremer. (Popularly called CK metrics)
15. Convert the DFD into appropriate architecture styles.
16. Draw a complete class diagram and object diagrams using Rational tools
17. Define the design activities along with necessary artifacts using Design Document.
18. Reverse Engineer any object-oriented code to an appropriate class and object diagrams.

19. Test a piece of code that executes a specific functionality in the code to be tested and asserts a certain behavior or state using Junit.
20. Test the percentage of code to be tested by unit test using any code coverage tools
21. Define appropriate metrics for at least 3 quality attributes for any software application of your interest.
22. Define a complete call graph for any C/C++ code. (Note: The student may use any tool that generates call graph for source code)

References:

1. Software Engineering? A Practitioner" s Approach, Roger S. Pressman, 1996, MGH.
2. Software Engineering by Ian Sommerville, Pearson Edu, 5th edition, 1999
3. An Integrated Approach to software engineering by PankajJalote , 1991 Narosa

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Computer Science & Engineering
Skill Oriented Course-II
Exploratory Data Analytics with R

Course Code:20A40508   **Semester IV(R20)**   **L T P C : 1 0 2 2**

Course Objectives:

- How to manipulate data within R and to create simple graphs and charts used in introductory statistics.
- The given data using different distribution functions in R.
- The hypothesis testing and calculate confidence intervals; perform linear regression models for data analysis.
- The relevance and importance of the theory in solving practical problems in the real world.

Course Outcomes:

CO1: Install and use R for simple programming tasks.
CO2: Extend the functionality of R by using add-on packages
CO3: Extract data from files and other sources and perform various data manipulation tasks on them.
CO4: Explore statistical functions in R.
CO5: Apply the knowledge of R gained to data Analytics for real-life applications.

List of Experiments:

1: INTRODUCTION TO COMPUTING
    a. Installation of R
    b. The basics of R syntax, workspace
    c. Matrices and lists
    d. Subsetting
    e. System-defined functions; the help system
    f. Errors and warnings; coherence of the workspace

2: GETTING USED TO R: DESCRIBING DATA
    a. Viewing and manipulating Data
    b. Plotting data
    c. Reading the data from console, file (.csv) local disk and web
    d. Working with larger datasets

3: SHAPE OF DATA AND DESCRIBING RELATIONSHIPS
    a. Tables, charts and plots.
    b. Univariate data, measures of central tendency, frequency distributions, variation, and Shape.
    c. Multivariate data, relationships between a categorical and a continuous variable,
    d. Relationship between two continuous variables – covariance, correlation coefficients, comparing multiple correlations.
    e. Visualization methods – categorical and continuous variables, two categorical variables, two continuous variables.

4: PROBABILITY DISTRIBUTIONS

a. Sampling from distributions – Binomial distribution, normal distribution

b. tTest, zTest, Chi Square test
c. Density functions
d. Data Visualization using ggplot – Box plot, histograms, scatter plotter, line chart, bar chart, heat maps

5: EXPLORATORY DATA ANALYSIS Demonstrate the range, summary, mean, variance, median, standard deviation, histogram, box plot, scatter plot using population dataset.

6: TESTING HYPOTHESES
    a. Null hypothesis significance testing
    b. Testing the mean of one sample
    c. Testing two means

7: PREDICTING CONTINUOUS VARIABLES
    a. Linear models
    b. Simple linear regression
    c. Multiple regression
    d. Bias-variance trade-off – cross-validation

8: CORRELATION
    a. How to calculate the correlation between two variables.
    b. How to make scatter plots.
    c. Use the scatter plot to investigate the relationship between two variables

9: TESTS OF HYPOTHESES
    a. Perform tests of hypotheses about the mean when the variance is known.
    b. Compute the p-value.
    c. Explore the connection between the critical region, the test statistic, and the p-value

10: ESTIMATING A LINEAR RELATIONSHIP Demonstration on a Statistical Model for a Linear Relationship
    a. Least Squares Estimates
    b. The R Function lm
    c. Scrutinizing the Residuals

11: APPLY-TYPE FUNCTIONS
    a. Defining user defined classes and operations, Models and methods in R
    b. Customizing the user's environment
    c. Conditional statements
    d. Loops and iterations

12: STATISTICAL FUNCTIONS IN R
    a. Write Demonstrate Statistical functions in R
    b. Statistical inference, contingency tables, chi-square goodness of fit, regression, generalized linear models, advanced modeling methods.

References:

1. SandipRakshit, "Statistics with R Programming", McGraw Hill Education, 2018.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "AN Introduction to Statistical Learning: with Applications in R", Springer Texts in Statistics, 2017.
3. Joseph Schmuller, "Statistical Analysis with R for Dummies", Wiley, 2017.
4. K G Srinivasa, G M Siddesh, ChetanShetty, Sowmya B J, "Statistical Programming in R", Oxford Higher Education, 2017.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Mandatory non-credit Course-III
Design Thinking for Innovation
Common to All Branches

Course Code:20A49102   **Semester IV(R20)**   **L T P C : 2 1 0 0**

Course Objectives:

- The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:

CO1: Define the concepts related to design thinking.
CO2: Apply the design thinking techniques for solving problems in various sectors.
CO3: Analyze to work in a multidisciplinary environment
CO4: Evaluate the value of creativity
CO5: Formulate specific problem statements of real time issues

UNIT – I: Introduction to Design Thinking
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design.Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II: Design Thinking Process
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III: Innovation
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations.Creativity to Innovation.Teams for innovation, Measuring the impact and value of creativity.
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV: Product Design
Problem formation, introduction to product design, Product strategies, Product value, Product

planning, product specifications. Innovation towards product design Case studies.
Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business Processes
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, About maintenance, Relibility and plan for startup.
Textbooks:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, IdrisMootee, 2013, John Wiley & Sons.
Reference Books:
1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William Lidwell, Kritinaholden, Jill Butter.
4. The era of open innovation – Chesbrough.H

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Formal Languages and Automata Theory

Corse Code:20A50501   **Semester V(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- Introduce languages, grammars, and computational models
- Explain the Context Free Grammars
- Enable the students to use Turing machines
- Demonstrate decidability and un-decidability for NP Hard problems

Course Outcomes (CO):
   CO1:   Apply formal machines, languages and computations
   CO2:   Design finite state machines for acceptance of strings
   CO3:   Develop context free grammars for formal languages
   CO4:   Build pushdown automata for context free grammars
   CO5:   Validate decidability and undesirability

UNIT – I: Finite Automata
Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT-2: Regular Expressions
Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

UNIT-III: Context Free Grammars
Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars

UNIT-IV: Pushdown Automata
Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence   of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT-V: Turing Machine

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine.

Decidable and Undecidable Problems: NP, NP-Hard and NP-Complete Problems.

Textbooks:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007.

Reference Books:

1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Computer Science & Engineering
Computer Networks

Corse Code: 20A50502   **Semester V(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- Introduce the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes (CO):
    CO1: Identify the software and hardware components of a Computer network
    CO2: Design software for a Computer network
    CO3: Develop new routing, and congestion control algorithms
    CO4: Analyze the functionality of each layer of a computer network
    CO5: Employ the appropriate transport protocol based on the application requirements

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, Networks under attack, History of Computer Networking and the Internet.

UNIT-II: **Application Layer**
Principles of Network Applications, The web and HTTP, Electronic mail in the internet, DNS-The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks

UNIT-III:**Transport Layer**
Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, Connectionless Transport: UDP, Principles of Reliable Data transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control

UNIT-IV:**The Network Layer**
Data Plane: Overview of Network Layer, the Internet Protocol (IP): IPv4, Addressing, IPv6, Generalized Forwarding and SDN,
Control Plane: Introduction, Routing Algorithms, Intra-AS Routing in the Internet: OSPF, Routing Among the ISPs: BGP, The SDN Control Plane, ICMP: The Internet Control Message Protocol, Network Management and SNMP,

UNIT-V:**The Link Layer and LANs**
Introduction to the Link Layer, Error-Detection and – Correction Techniques, Multiple Access

Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a link Layer, Data Center Networking, Retrospective: A Day in the life of a Web Page Request.

TEXTBOOK:
1.James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:
1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
3. YouluZheng, ShakilAkthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Design and Analysis of Algorithms

Corse Code: 20A50503　　　**Semester V(20)**　　　　　**L T P C : 3 0 0 3**

Course Objectives:

- To analyze the asymptotic performance of algorithms.
- To understand the write rigorous correctness proofs for algorithms.
- To familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcomes (CO):

CO1: Explain the basic concepts of time and space complexity

CO2: Explain the basic concepts of divide-and-conquer Strategy, dynamics   programmings.

CO3:Greedy and Algorithm

CO4:Describe the methodologies of how to analyze the following applications by Dynamics

CO5:Programming Algorithm.

CO6:Discuss the concept of graph coloring and back tracking

CO7:Analyze the performance of algorithms

UNIT-I: **Introduction**

Introduction: Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi-connected components.

UNIT-II:**Divide and Conquer**

General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT-III:**Dynamic Programming**

General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT-IV:**Backtracking**

General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT-V:**Branch and Bound**

General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

Textbooks:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam, Universities Press
2. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, spinger
     Introduction to Algorithms, second edition, T.H Cormen, C.E.Leiserson,
R.L.Rivest and C.Stein, PHI Pvt.Ltd.

Reference Books:
1. Introduction to the Design and Analysis of Algorithms, AnanyLevitin, PEA
2.Design and Analysis of Algorithms, Pearson Education Parag Himanshu Dave, Himansu
    Dave, HimansuBalachandra Dave
3. Introduction to Design and Analysis of Algorithms A strategic approach,
    R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc GrawHill.
4. Design and Analysis of algorithms, Pearson education, Aho, Ullman and Hopcroft.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Professional Elective-I
Introduction to Artificial Intelligence

Corse Code:20A50504a   **Semester V (R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- AI programming focuses on three cognitive skills
- learning, reasoning and self-correction.
- AI is a research field that studies how to realize the intelligent human behaviors on a computer.

Course Outcomes (CO):
  CO1: Solve basic AI based problems.
  CO2: Define the concept of Artificial Intelligence.
  CO3: Apply AI techniques to real-world problems to develop intelligent systems.

UNIT-I:Fundamentals of AI

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II:Solving Problems by searching
Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT-III:Reinforcement Learning
Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT-IV:Natural Language for Communication
Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition

Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT-V:Robotics
Introduction, Robot Hardware, Robotic Perception, Planning to move, Planning uncertain

movements, Moving, Robotic software architectures, application domains

Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed

Textbooks:

1.Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1.Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Professional Elective-I
Object Oriented Analysis Design

Corse Code: 20A50504b   **Semester V (R20)**   L T P C : 3 0 0 3

Course Objectives:
- Understand the basic concepts of object-oriented techniques
- Build the Model of the software system using UML diagrams
- Elucidate design patterns as templates for good design
- Learn the object-oriented methodology in software design
- Demonstrate activity diagram and their modelling techniques.

Course Outcomes (CO):
CO1: Analyze the problem from object oriented perspective
CO2: Model complex systems using UML Diagrams
CO3: Determine the suitable design patterns in software design
CO4: Adapt Object-Oriented Design Principles
CO5: Apply basic structural modeling concepts for designing real-time applications

UNIT-I:**Basic concepts**
Basic concepts: objects, classes, abstract classes, data types, ADT, encapsulation and information hiding, inheritance, association, aggregation, composition, polymorphism, dynamic binding, object-oriented principles
UNIT-II:
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT-III:
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams
Basic Behavioral Modeling-I: Interactions, Interaction diagrams.
Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT-IV:
Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-V:
Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application

Textbooks:

1.Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018

Reference Books:
1.Rumbaugh and Blaha, Object-oriented Modeling and design with UML, Pearson, 2007
2. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2009

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Professional Elective-I
OPTIMIZATION TECHNIQUES

Corse Code:20A50504c   **Semester V (R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- The basic concepts of Optimization
- The emphasis of this course is on different classical Optimization techniques linearprogramming and simplex algorithms.
- About optimality of balanced transportation Problems
- About Constrained and unconstrained nonlinear programming.
- About principle of optimality and dynamic programming

Course Outcomes (CO):
- To know how to formulate statement of optimization problem with or without constraints
- To know about classification of single and multivariable optimization problems
- To know about necessary and sufficient conditions in defining the optimization problems
- To understand how to formulate Kuhn-Tucker conditions and to solve numerical problems

UNIT-I: **Introduction and Classical Optimization Techniques:**
Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum /maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions – Numerical examples.

UNIT-II:**Linear Programming**
Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm – Numerical examples.

UNIT-III:**Nonlinear Programming – One Dimensional Minimization methods**
Introduction, Unimodal function, Elimination methods- Unrestricted Search, Exhaustive Search, Dichotomous Search, Fibonacci Method, Golden Section Method and their comparison; Interpolation methods - Quadratic Interpolation Method, Cubic Interpolation Method and Direct Root Methods – Numerical examples.

UNIT-IV:**Unconstrained & Constrained Nonlinear Programming**
Unconstrained Optimization Techniques: Introduction- Classification of Unconstrained Minimization Methods, General Approach, Rate of Convergence, Scaling of Design Variables;

Direct Search methods- Random Search Methods, Grid Search Method, Pattern Directions, Powell's Method and Simplex Method

Constrained Optimization Techniques: Introduction, Characteristics of a Constrained Problem, Direct Search Methods - Random Search Methods, Basic Approach in the Methods of Feasible Directions, Rosen's Gradient Projection Method, Generalized Reduced Gradient Method and Sequential Quadratic Programming.

UNIT-V:**Dynamic Programming**

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution – Numerical examples.

Textbooks:

1.S . S. Rao, "Engineering optimization": Theory and practice 3rd edition, New Age International (P) Limited, 1998.

2. H.S. Kasana& K.D. Kumar, "Introductory Operations Research Springer (India)", 2004

Reference Books:

1.R Fletcher, "Practical Methods of Optimization" , 2 ndEdition, Wiley Publishers, 2000.

2. Jorge Nocedal and Wright S, "Numerical Optimization Springer", 1st Edition, 1999.

3. by K.V. Mital and C. Mohan, "Optimization Methods in Operations Research and systems Analysis" 3 rdEdition, New Age International (P) Limited, 1996.

4. by S.D. Sharma, "Operations Research", Kedar Nath, 2012.

5. by H.A. Taha, "Operations Research", 9 thEdition, An Introduction Pearson, 2010.

6. G. Hadley, "Linear Programming", Narosa, 2002.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
OPEN ELECTIVE-I
Common to All Branches
INTRODUCTION TO JAVA PROGRAMMING
Course Code:20A50505   Semester V(R20)   L T P C : 3 0 0 3
Course Objectives:

- To understand object-oriented concepts and problem-solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes:
CO6: Solve real-world problems using OOP techniques.
CO7: Apply code reusability through inheritance, packages and interfaces
CO8: Solve problems using java collection framework and I/O classes.
CO9: Develop applications by using parallel streams for better performance and develop applets for web applications.
CO10: Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT – I: **Introduction**
Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT – II: **Inheritance, Packages, Interfaces**
Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT – III: **Exception handling, Stream based I/O**
Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT – IV: **Multithreading, The Collections Framework**

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT – V: **Applet, GUI Programming with Swings, Accessing Databases with JDBC**
Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets
GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog.
Accessing Databases with JDBC:
Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:
1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:
9. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
10. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
11. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press
12. Introduction to Java programming, Y. Daniel Liang, Pearson Education

JNTUA College of Engineering(Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Computer Networks Lab
Course Code:20A50506   **Semester V(R20)**   **L T P C : 0 0 3 1.5**
Course Objectives:

- Understand the different types of networks
- Discuss the software and hardware components of a network
- Enlighten the working of networking commands supported by operating system
- Impart knowledge of Network simulator 2/3
- Familiarize the use of networking functionality supported by JAVA
- Familiarize with computer networking tools.

Course Outcomes:

After completion of the course, students will be able to

CO1: Design scripts for Wired network simulation (L6)

CO2: Design scripts of static and mobile wireless networks simulation (L6)

CO3: Analyze the data traffic using tools (L4)

CO4: Design JAVA programs for client-server communication (L6)

CO5: Construct a wired and wireless networks using the real hardware (L3)

List of Experiments:
   1.
- Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect
   the cables.
- Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of
   Different ports.
- Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN
   And Wireless LAN. Consider both adhoc and infrastructure mode of operation.

2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname,
Nbtstat, netdiag, and Nslookup

3. Use Sniffers for monitoring network communication (Ethereal)

4. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.

5. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.

6. Use Packet tracer software to build network topology and configure using Link State routing protocol.

7. Using JAVA RMI Write a program to implement Basic Calculator
8. Implement a Chatting application using JAVA TCP and UDP sockets.
9. Hello command is used to know whether the machine at the other end is working or not.
Echo command is used to measure the round trip time to the neighbour. Implement Hello and Echo commands using JAVA.
10. Use Ethereal tool to capture the information about packets.
11. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
12. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
13. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss**.**

References Books:
1. **Shivendra S.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials A Lab-Based Approach", Cambridge University Press, 2004.**
2. **Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.**
3. Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
4. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Design and Analysis of Algorithms Lab

Course Code:20A50507   **Semester V(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- Implement the various algorithms that are being studied in Design and Analysis of Algorithms subject in C++/Java.
- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes:

After completion of the course, students will be able to

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis
- Explain what competitive analysis is and to which situations it applies. Perform competitive analysis

List of Experiments:
1. Write a program that implements Prim's algorithm to generate minimum cost spanning tree.
2. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree.
3. Write a program to implement Huffman's algorithm for text compression.
4. Write a program to implement Dijkstra's algorithm for Single source shortest path problem.
5. Write a program to implement Floyd's algorithm for the All pairs shortest path problem.
6. Write a program to implement Floyd's algorithm for the All pairs shortest path problem.
7. Write a program to implement greedy algorithm for job sequencing with deadlines.
8. Write programs for the implementation of bfs and dfs for a given graph.
9. Write a program to find Minimum Cost Binary Search Tree.
10. Write a program to implement Dynamic Programming algorithm for 0/1 Knapsack problem.
11. Write a program to implement the Backtracking algorithm for the sum of subsets problem.
12. Write programs to implement backtracking algorithms for
    a) N-queens problem
    b) The Hamiltaonian cycles problem
    c) The m-colourings graph problem

Reference Books:

1. Data structures and Algorithms in java,3rdedition,A.Drozdek,Cengage Learning.
2. Data structures with Java,J.R.Hubbard,2ndedition,Schaum'sOutlines,TMH.
3. Data structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Data structures, Algorithms and Applications in C++, 2nd Edition, S.Sahani, Universities Press.
7. Data structures and Algorithm Analysis in C++,2nd Edition,M.A.Weiss,Pearson education.
8. Design and Analysis of Algorithms, P.H.Dave and H.B.Dave, Pearson education.
9. Data structures and java collections frame work,W.J.Collins,Mc Graw Hill.
10. A Practical guide to Data structures and Algorithms using Java,Goldman&Goldman, Chapman and Hall/CRC,Taylor and Francis Group.

Skill Advanced Course-III
Soft Skills

Course Code:20A55502   Semester V(R20)   **L T P C : 1 0 2 2**

Course Objectives:
- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes:

- Define various elements of effective communicative skills
- Understanding people using emotional intelligence
- apply critical thinking skills in problem solving
- ·analyse the needs of an organization for team building
- ·Assess the situation and take necessary decisions as a leader
- Creating a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being

UNIT – I: Soft Skills & Communication Skills

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills -   Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Inter personal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II: Critical Thinking
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

Activities

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT – III:Problem Solving & Decision Making

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT – IV: Emotional Intelligence & Stress Management

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V: Leadership Skills

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities

Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making , Group discussion etc.

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.

2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:

1.Personality Development and Soft Skills (English, Paperback, Mitra Barun K.) Publisher : Oxford University Press; Pap/Cdr edition (July 22, 2012)

2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:
1. Soft skills: personality development for life success by prashantsharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6.   Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher : Vayu   Education Of India

Online Learning Resources:

1.https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q

2.https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

3.https://youtu.be/-Y-R9hDl7lU

4.https://youtu.be/gkLsn4ddmTs

5.https://youtu.be/2bf9K2rRWwo

6.https://youtu.be/FchfE3c2jzc

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Compiler Design
Course Code20A60501   Semester VI(20)   L T P C : 3 0 0 3
Course Objectives:
- This course in Computer Science, as it combines skills in software design, programming, data structures and algorithms, theory of computing, documentation, and machine architecture to produce a functional compiler. Realize that computing science theory can be used as the basis for real.

Course Outcomes:
- Able to understand the various phases of compiler and analyze the lexical tool.
- Students should be in a position to understand the different types of parsing Techniques and apply
- Lex tool & YAAC tools.
- Design syntax directed translations for semantic analysis of various language features and produce intermediate code.
- Students should be able to understand and design different code generation technique and algorithms.
- Apply various optimization techniques to the intermediate code/machine code.

UNIT – I: Introduction & Lexical Analysis
Language processors, Phases of a compiler, Pass and phase, Bootstrapping, Compiler construction tools, Applications of compiler technology.
Lexical Analysis: Role and Responsibility, Input buffering, Specification of tokens, Recognition of tokens, LEX tool.

UNIT – II: Syntax Analysis, Top Down Parsing, Bottom up parsing
Syntax Analysis: Role of the parser, Context Free Grammars: Definition, Derivations, Parse trees, Ambiguity, Eliminating ambiguity, Left recursion, Left factoring.
TOP Down Parsing: Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars, Error recovery in predictive parsing.
Bottom up Parsing: Handle pruning, Shift-Reduce parsing, Conflicts during shifts- reduce parsing, SLR Parsing, Canonical LR (1) parsers, LALR parsers, Using ambiguous grammars, YACC tool.

UNIT – III: Syntax Directed Translations, Intermediate Code Generation
Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders for SDD's, Application of SDT, SDT schemes
Intermediate Code Generation: Need for intermediate code, Types of intermediate code, Three address code, Quadruples, Triples, Type expressions, Type equivalence, Type checking, Translation of expressions, control flow statements, switch statement, procedures, back patching.

UNIT – IV: Run Time Storage Organization, Code Generation
Run Time Storage Organization: Storage Organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Symbol table organization.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, A Simple Code Generator.

UNIT – V: Code Optimization
Principle source of Optimization, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Introduction to Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Textbooks:
1. Compilers Principles, Techniques and Tools, Second Edition, Alfred V.Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson

Reference Books:
I. Compiler Construction‖, K.V.N. Sunitha, Pearson, 2013
II. EngineeringACompiler‖,SecondEdition,KeithD.Cooper&LindaTorczon.,MK(MorganKaufmann)(ELSEVIER)
III.   Compilers Principles and Practice‖, ParagH. Dave, HimanshuB. Dave.,PEARSON
IV.   CompilerDesign‖, SandeepSaxena, RajkumarSinghRathore, S.Chandpublication
V. Compiler Design‖, SantanuChattopadhyay., PHI

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Machine Learning

Course Code:20A60502   **Semester VI(R20)**   **L T P C: 3 0 0 3**

Course Objectives:
- Understand the basic theory underlying machine learning
- Formulate machine learning problems corresponding to different applications.
- Illustrate a range of machine learning algorithms along with their strengths and weaknesses
- Apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

CO1: Identify machine learning techniques suitable for a givenproblem.
CO2: Solve the real world problems using various machine learningtechniques.
CO3: Apply Dimensionality reductiontechniques for data preprocessing.
CO4: Explain what is learning and why it is essential in the design of intelligent machines.
CO5: Implement Advanced learning models for language, vision, speech, decision making etc.

UNIT – I: Introduction
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT – II: Neural networksand genetic Algorithms
Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

UNIT – III: Bayesian and computational learning
Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT - IV: Instance based learning
K- Nearest Neighbor Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT – V: Advanced learning
Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm –Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

Textbooks:
1. T.M. Mitchell, "Machine Learning", McGraw-Hill,1997.

Reference Books:
1. EthernAlpaydin, "Introduction to Machine Learning", MIT Press,2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Cryptography and network Security

Course Code:20A60503   **Semester VI(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- Introduce the basic categories of threats to computers and networks
- Illustrate various cryptographic algorithms.
- Demonstrate public-key cryptosystem.
- Discuss the fundamental ideas of public-key cryptography.

Course Outcomes:
CO1: Identify various type of vulnerabilities of a computer network
CO2: Illustrate various cryptographic algorithms.
CO3: Demonstrate public-key cryptosystem.
CO4: Discuss the fundamental ideas of public-key cryptography.
CO5: Explore Web security threats and protection mechanisms .

UNIT – I: Attacks on Computers and Computer Security,Cryptography: Concepts and Techniques

Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security. Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II: Symmetric key Ciphe, Asymmetric key Ciphers
Symmetric key Ciphe: rs Block Cipher principles &Algorithms (DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution
Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman,ECC), Key Distribution.

UNIT – III: MessageAthentication Algorithms and Hash Functions
Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

UNIT – IV: E-Mail Security, IP Security
E-Mail Security: Pretty Good Privacy, S/MIME
IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, combining security associations, key management.

UNIT – V: Web Security, Intruders, Virus and Firewalls,Case Studies on Cryptography and security
Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction
Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls
Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site

Scripting Vulnerability, Virtual Elections.

Textbooks:
- William Stallings, "Cryptography and Network Security", 5th Edition, Pearson Education, 2011.
- AtulKahate, "Cryptography and Network Security", 2nd Edition, Mc Graw Hill, 2010.
- Bernard Menezes "Network Security and Cryptography", 1stEdition, CENGAGE Learning, 2010.

Reference Books:

- C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, "Cryptography and Network Security",1st Edition, Wiley India Pvt Ltd, 2011.
- ForouzanMukhopadhyay "Cryptography and Network Security", 2nd Edition , Mc Graw Hill, 2010.
- Mark Stamp, Wiley India, "Information Security, Principles and Practice", 2nd Edition, Wiley, 2011.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Software testing
Professional Elective-II

Course Code:20A60504   **Semester VI(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- Finding defects which may get created by the programmer while developing the software.
- Gaining confidence in and providing information about the level of quality.
- To prevent defects.
- To make sure that the end result meets the business and user requirements.
- Execute specific software tests with well-defined objectives and targets.

Course Outcomes (CO):
Upon completion of the course, the students should be able to:
CO1: Acquire knowledge on distinct types of testing methodologies.
CO2: Describe the principles and procedures for designing test cases.
CO3: Understand the stages of testing from Development to acceptance testing
CO4: Formulate test cases for testing different programming constructs.
CO5: Test the applications using different testing methods and automation tools.

UNIT – I: **Introduction, Flow graphs and Path testing**
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.
Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT – II: **Transaction Flow Testing, Dataflow testing**
Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.
Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

UNIT – III: **Domain Testing**
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

UNIT – IV: **Paths, Path products and Regular expressions, Logic Based Testing**
Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

UNIT – V: **State, State Graphs and Transition Testing, Graph Matrices and Application**
State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.
Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools.

Textbooks:
1. Boris Beizer, "Software testing techniques", Dreamtech, second edition, 2002.

Reference Books:
1. Brian Marick, "The craft of software testing", Pearson Education.
2. Yogesh Singh, "Software Testing", Camebridge
3. P.C. Jorgensen, "Software Testing" 3rd edition, Aurbach Publications (Dist.by SPD).
4. N.Chauhan, "Software Testing", Oxford University Press.
5. P.Ammann&J.Offutt, "Introduction to Software Testing" , Cambridge Univ. Press.
6. Perry, "Effective methods of Software Testing", John Wiley, 2nd Edition, 1999.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Fundamentals of AR/VR
Professional Elective-II

Course Code:20A60504b   Semester VI(R20)   L T P C : 3 0 0 3

Course Objec**tives**:
1. To Teach about human interaction with computers
2. To Demonstrate Virtual reality
3. To introduce to the current state of VR Hardware and Software.
4. To explain how to apply VR/MR/AR for various applications.

Course Outcomes:
- CO1:   Study the fundamentals of VR, AR and MR
- CO2:   Select appropriate software and hardware for developing VR Applications
- CO3:   Design audio and video interaction paradigms
- CO4:   Design VR Applications
- CO5:   Create game objects using unity.

UNIT – I: **Introduction to Virtual Reality**
What is Virtual Reality, Modern VR experiences, History Repeats.
Unity: Virtually Everything for you, what is virtual reality to you, types of head-mounted displays: Desktop VR, Mobile VR, The difference between virtual reality and augmented reality, Applications vs Games, Types of VR experiences, and Technical skills that are important to VR.
UNIT – II: **Bird's-Eye View**
Hardware, Software, Human Physiology and Perception.
Unity: Objects and Scale: Getting started with unity, creating a simple Diorama, Measurement tools, First Person Character: Understanding the Unity characters, Unity standard assets.
UNIT – III: **The Geometry of Virtual Worlds & Light and Optics:**
Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations.
Light and Optics: Basic behavior of light, lenses, Optical Aberrations**,** Human Eye, Cameras, and Displays.
UNIT – IV: **The Physiology of Human Vision**
From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR.
UNIT – V: **Motion in Real and Virtual Worlds**
Motion in Real and Virtual Worlds :The Vestibular System, Physics in the Virtual World.
Audio: The Physics of Sound, the Physiology of Human Hearing, Auditory Perception.

Textbooks:
1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

Reference Books:
   1..Unity Virtual reality Projects, Jonathan Linowes, PACKT Publishing.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
IMAGE AND VIDEO PROCESSING
Professional Elective-II

Course Code:20A60505   **Semester VI(R20)**   **L T P C : 3 0 0 3**

Course Objectives:

- Comprehend the image processing fundamentals and enhancement techniques in spatial and frequency domain.
- Describe the color image fundamentals, models and various restoration techniques.
- Design and Analyze the image compression systems.
- Outline the various image segmentation and morphology operations.

Course Outcomes:

- After completion of this course, students will be able to –
- Understand theory and models in Image and Video Processing.
- Explain the need of spatial and frequency domain techniques for image compression.
- Illustrate quantitative models of image and video segmentation.
- Apply the process of image enhancement for optimal use of resources.

UNIT-I: Digital image fundamentals
A simple image formation model, Image sampling and quantization, Some basic relationships between pixels, Basic intensity transformation functions, Sampling and fourier transform of sampled functions, The discrete fourier transform of one variable, Extensions to functions of two variables(2-D discrete fourier transform, Properties of 2-D DFT and IDFT, 2-D Discrete Convolution Theorem.

UNIT-II: Image Enhancement(spatial domain)
Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters,The Laplacian-use of second order derivative for image sharpening, The Gradient-use of first order derivative for image sharpening
Image Enhancement(frequency domain): Basics of filtering in frequency domain, Image smoothing using lowpass frequency domain filters, Image sharpening using highpass filters

UNIT-III: Image restoration
Noise Models, Restoration in the presence of noise only – Spatial filters, Periodic noise reduction using Frequency domain filtering, Estimating the degradation function, inverse filtering, Minimum Least square error filtering,constrained least square filters
Wavelet and Multiresolution processing: Matrix-based transform, Walsh-Hadamard Transform, Slant transform, Haar transform

UNIT- IV: Image compression
Lossy and lossless compression schemes: Huffman coding, Run-length coding, Arithmetic coding, Block transform coding, JPEG
Image Morphology: Fundamental operations, Morphological Algorithms
Image segmentation: Point, Line and Edge detection, Canny edge detection, Hough Transform,Edge linking, Thresholding, Region-based segmentation, Pixel-based segmentation.

UNIT-V: Feature Extraction
Boundary preprocessing, Boundary feature descriptor, Region feature descriptor, Principal components as feature descriptor, Whole image feature
Video Processing: Video Formats, Video Enhancement and Restoration, Video Segmentation

Text Books:
1. Digital Image Processing, R. C. Gonzalez and R. E. woods, Pearson Education.
2. Handbook of Image and Video Processing, AL Bovik, Academic Press.

References:
1. Digital Image Processing and Analysis, B. Chanda and D. Dutta Mazumdar, PHI.
2. Digital Image Processing, W. K. Pratt, Wiley-Interscience.
3. Fundamentals of Digital Image Processing, A. K. Jain, Pearson India Education.
4. Pattern Classification and Scene Analysis, R. O. Duda and P. E. Hart, Wiley.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Introduction to Linux Programming
Common to All Branches
Open Elective-II
Course Code:20A60505   **Semester VI(R20)**   **L T P C : 3 0 0 3**
Course Objectives:
- To study the commands according to user requirements.
- To utilize Shell scripts to perform the given task.
- To enable writing own programs in UNIX.
- To know AWK programs.

Course Outcomes:
CO1: Develop text data processing applications using Unix commands and filters.
CO2: Design and develop text based user interface components
CO3: Understand user management, network management and backup utilities
CO4: Use the system calls for file management
CO5: Understands the Concept of Process Threads and File Structure.

UNIT-I: Introduction,Unix File System,Unix Commands
Operating System, History of UNIX, Overview and Features of Unix System,Structure of Unix System, Unix Environment. **Unix File System**: Introduction of Files, Organization of File Systems, Accessing File Systems, Structure of File Systems. **Unix Commands**: Basic Commands, Advanced Unix Commands: File Access Permissions, Pipe Operator, cut, paste, wc, sort, head, tail, diff, cmp, uniq, comm, time, Conversions between DOS and Unix, man.

UNIT-II: File management and Compression Techniques,Manipulating Processes and Signals
Managing and Compressing Files, Computer Devices, Disk related Commands, Compression and Uncompressing Files, Important Unix System Files, Shell Variables, Export of Local and Global Shell Variables.
Manipulating Processes and Signals: Process Basics, Processes States and Transitions, Zombie Process, Context switching, Threads, ps-status of Process.

UNIT-III: System calls
Introduction, File-related System calls (open, create, read, write, lseek), File-related System calls (close, mknod, link and unlink, access, and chown, chmod), Directory Handling System calls (mkdir, rmdir, chdir, opendir, readdir, telldir, closedir), Process related System calls (exec, fork, wait,exit).
Editors in Unix: introduction, Stream editor, Emacs Editor.

UNIT-IV: AWK Script,Burne Shell
AWK Command, print, printf, Displaying Content of Specified Patterns, Comparison Operators, Compound Expressions, Arithmetic Operators, Begin and end Sections, User-defined Variables, if else Statement, Built-in Variables, Changing Input Filed Separator, Functions, Loops, Getting Input from User, Search and Substitute Functions, Copying results into Another file.
Bourne Shell: Introduction, beginning Bourne Shell Scripting, Writing Shell Scripts, Command Line Parameters, read, for Loop, While Loop, if Statement, Bourne Shell Commands.

UNIT-V: InterprocessCommunicaation, Unix System Administration and Networking
Interprocess Communication, Synchronization, Filters.
Unix System Administration and Networking: Unix Booting Procedure,Mounting Unix File System, Unmounting Unix File System, Managing User Accounts, Networking Tools, mail Command, Distributed File System, Firewalls, Backup and Restore.

TEXT BOOKS
1. "UNIX and SHELL Programming", B.M. HARWANI, OXFORD UNIVERSITY PRESS.

REFERENCES
1. "UNIX and Linux System Administration Handbook", Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, PHI

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Cryptography & Network Security Lab

Course Code:20A60506   **Semester VI(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:

- o understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.
- To implement Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool
- To implement front end of the compiler by means of generating Intermediate codes.

Course Outcomes:

CO1:   o understand the working principle of various communication protocols.
CO2:   To analyze the various routing algorithms.
CO3:   To know the concept of data transfer between nodes.
CO4:   To implement Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool

List of Experiments:

1. Working with Sniffers for monitoring network communication (Ethereal)
2. Understanding of cryptographic algorithms and implementation of the same in C or C++
3. Using openssl for web server - browser communication
4. Using GNU PGP
5. Performance evaluation of various cryptographic algorithms
6. Using IPTABLES on Linux and setting the filtering rules
7. Configuring S/MIME for e-mail communication .
8. Understanding the buffer overflow and format string attacks
9. Using NMAP for ports monitoring
10. Implementation of proxy based security protocols in C or C++ with features like confidentiality, integrity and authentication.

Online Learning Resources:

Following are some of the web links, which help to solve the above assignments
http://linuxcommand.org/man_pages/openssl1.html
http://www.openssl.org/docs/apps/openssl.html
http://www.queen.clara.net/pgp/art3.html
http://www.ccs.ornl.gov/~hongo/main/resources/contrib/gpg-howto/gpg-howto.html
https://netfiles.uiuc.edu/ehowes/www/gpg/gpg-com-0.htm
http://www.ethereal.com/docs/user-guide/

JNTUA College of Engineering(Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Software Testing Lab
Professional Elective-II

Course Code:20A60507a   **Semester VI(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- To discuss the distinctions between validation testing and defect testing.
- To describe the principles of system and component testing .
- To describe strategies for generating system test cases.
- To understand the essential characteristics of tool used for test automation.

Course Outcomes:
CO1: Identify suitable tests to be carried out.
CO2: Prepare test planning based on the document.
CO3: Document test plans and test cases designed
CO4: Use automatic testing tools.
CO5: Develop and validate a test plan.

List of Experiments:
1. 1.Understand The Automation Testing Approach (Theory Concept).
2. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
3. Understanding Test Automation. Using Selenium write a simple test script to validate each field of the registration page (Eg: Facebook Registration Page)
4. Install Selenium server and demonstrate it using a script in Java/PHP.
5. Conduct a test suite for any two web sites.
6. Write and test a program to login a specific web page.
7. Write test cases to validate a mobile number using one time pin identification(OTP)
8. Write and Test a program to find out list of employees having salary greater than Rs 50,000 and age between 30 to 40 years.
9. Write and test a program to update 10 student records into table into Excel file.
10. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
11. Write and test a program to provide total number of objects present / available on the page.
12. Write and test a program to get the number of list items in a list / combo box.
13. Write and test a program to count number of items present on a desktop.
14. Understanding the use of bug tracking and testing tool Bugzilla and Jira
15. Open ended Experiment: Mini Project – Not for exam but to compulsory to be included in Record. (Test cases for Admission form, Shopping cart, Travel Booking, Hotel Booking, Utility Bill Payment)

Reference Books:
- Testing in 30+ Open Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117)
- http://seleniumhq.org/
- http://sourceforge.net/projects/sahi/
- http://testng.org/doc/index.html

JNTUA College of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Fundamentals of AR/VR Lab
Professional Elective-II

Course Code:20A60507b   **Semester VI(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:

- The objective of this course is to explore the concepts of Virtual reality and develop 3D virtual environment.

Course Outcomes:

CO1: Create and deploy a VR application
CO2: understand the physical principles of VR
CO3: Create a comfortable, high-performance VR application using Unity
CO4: Identify, examine and develop software that reflects fundamental techniques for the design and deployment of VR experiences.

List of Experiments:

I.   Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.
II. Demonstration of the working of HDMs
III. Develop a scene in Unity that includes:
     i. a cube, plane and sphere, apply transformations on the 3 game objects. ii. add a video and audio source
IV. Develop a scene in Unity that includes a cube, plane and sphere. Create a new material and texture separately for three Game objects. Change the colour, material and texture of each Game object separately in the scene. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically onbutton click.
V.   Develop a scene in Unity that includes a sphere and plane . Apply Rigid body component, material and Box collider to the game Objects. Write a C# program to grab and throw the sphere using vr controller.
VI. Develop a simple UI(User interface) menu with images, canvas, sprites and button. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction display a score on scene.
VII.   Create a Simple Mini Project

Reference Book:
1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Image and Video Processing Lab
Professional Elective-II

Course Code:20A60507c   **Semester VI(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- The objective of this course is to explore the concepts of Virtual reality and develop 3D virtual environment.
- Provide the student with the fundamentals of image processing
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.

Course Outcomes:

CO1:   Be able to implement basic image processing algorithms in MATLAB.

CO2:   Have the skill base necessary to further explore advanced topics of Digital Image Processing.

CO3:   Be in a position to make a positive professional contribution in the field of Digital Image Processing

List of Experiments:

1.To study the Image Processing concept.

CO1:   To obtain histogram equalization image.

CO2:   To Implement smoothing or averaging filter in spatial domain.

CO3:   Program for opening and closing of the image.

CO4:   To fill the region of interest for the image.

CO5:   Program for edge detection algorithm.

CO6:   Program of sharpen image using gradient mask.

CO7:   Program for morphological operation: erosion and dilation

CO8:   Program for DCT/IDCT computation.

References:
1. Digital Image Processing and Analysis, B. Chanda and D. Dutta Mazumdar, PHI.
2. Digital Image Processing, W. K. Pratt, Wiley-Interscience.
3. Fundamentals of Digital Image Processing, A. K. Jain, Pearson India Education.
4. PatternClassification and Scene Analysis, R. O. Duda and P. E. Hart, Wiley.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Machine Learning Lab

Course Code:20A60508   **Semester VI(R20)**   **L T P C : 0 0 3 1.5**

Course Objectives:
- Make use of Data sets in implementing the machine learning algorithms.

Implement the machine learning concepts and algorithms in any suitable language of choice

Course Outcomes (CO):

CO1:   Understand the implementation procedures for the machine learning algorithms.

CO2:   Design Java/Python programs for various Learning algorithms.

CO3:   Apply appropriate data sets to the Machine Learning algorithms.

CO4:   Identify and apply Machine Learning algorithms to solve real world problems.

Description (if any):

The programs can be implemented in either JAVA or Python

For problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.

List of Experiments:

1. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set   of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.

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

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

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

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

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

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

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Reference Books:

1. EthernAlpaydin, "Introduction to Machine Learning", MIT Press,2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition,
Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python:A Guide for Data Scientists",Oreilly.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Full Stack Development
Skill Advanced Course -IV

Course Code:20A60509   **Semester VI(R20)**   **L T P C : 1 0 2 2**

Course Objectives:
- Develop front end website architecture
- Design user interactions on web pages
- Develop back end website applications
- Create servers and databases for functionality
- Develop adaptive content for multiple devices (cell phone, tablets, etc.)Ensure cross-platform optimization for mobile phones
- Use their learned skills, knowledge and abilities to develop web sites for the internet
- Apply basic design principles to present ideas, information, products, and services on websites
- Apply basic programming principles to the construction of websites
- Effectively manage website projects using available resource.

Course Outcomes:
CO1:   Analyze th terms like Natural Acceptance, Happiness and Prosperity
CO2:   Understand awareness of oneself, and one's surroundings (family, society nature)
CO3:   Apply what they have learnt to their own self in different day-to-day   settings in real life
CO4:   Relate human values with human relationship and human society.
CO5:   Justify the need for universal human values and harmonious existence
CO6:   Develop as socially and ecologically responsible engineers

UNIT – I: The Modern Web,Planning your Work
The Modern Web: Rise of the Web , Mobile Web , The State of HTML,   Applications vs Web Sites, Keeping Up.
Planning Your Work : Identifying Requirements, Defining the Work, Tracking the WorkContinuous Improvement, Prioritization &Estimation , Managing Bugs , Continuous Delivery
User Experience : Information Architecture , Getting the User Experience Right , Polishing the User Experience, Implementing the User Experience.

UNIT – II: Designing Systems
System Architectures, Identifying Concepts, Identifying User Interactions, Handling Commonalities, Working with Legacy and External Dependencies, Component Interactions, Applications vs. Modules, Cross-Functional Requirements, Caching , Designing for Failure, Designing Modules, Refactoring, Tools, Changing Your Architecture.
Ethics: Privacy, Cognitive Load, Energy Usage, Trust.
Front End: HTML, From Server to Browser, Styling, Components, Responsive Design, Progressive Enhancement To Progressively Enhance, or Not? , Mobile First, Feature Detection , Progressive Enhancement of Style, When Not Using Progressive Enhancement, Search Engine Optimization, Build Tools.

UNIT – III:Testing,JavaScript

Test-Driven Development, Test Pyramid, Behavior-Driven Development, Three Amigos, Manual Testing, Visual Testing, Cross-Functional Testing,

JavaScript: Asynchronicity, JavaScript in the Browser, Offline-First Development, Document Object Model, Server-Side JavaScript, Table of Contents viii JavaScript Modules, Structuring Your JavaScript , JavaScript Types , Object-Oriented Programming, Functional Programming, Communicating Between Components, Connecting Components Together , Testing, Build Tools.

Accessibility: Accessible from the Start, Working with Assistive Technologies, Dealing with Interactive UI, Testing for Accessibility , Avoiding Common Mistakes.

UNIT – IV: **APIs,StoringData,Security**

APIs:API Responsibilities, Designing a REST API, Securing Your API, Event-Based APIs, Discovering APIs , Using APIs

Storing Data: Types Of Databases,ToSQL?Where to store your data,Accessing data from your App,managing your Data, Protecting Your Data.

Security: Trust and Secrets, responding To Incidents, The Golden Rule,Threats,Security,Passwoerds,Indirect Attacks.

UNIT – V: Deployment,InProduction,ConstantLrarning

Deployment :Twelve Factor Apps, Developer Machines, Production Environments, Moving Code into Production, Configuring Your Box, Infrastructure, Immutable Infrastructure, Continuous Delivery & Continuous Deployment.

In Production: Fire Drills, Run Books, Monitoring, Responding to Incidents

Constant Learning: Collecting Analytics, Experiments, Analyzing Results, Hypothesis-Driven.

Textbooks:
   1.Chris Northwood, The full Stack Developer, Apress , Copy Right, 2018.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
INDIAN CONSTITUTION
Course Code: 20A65901   Semester VI(R20)   L T P C : 2 0 0 0

Course Objectives:
- **To Enable the student to understand the importance of constitution**
- **To understand the structure of executive, legislature and judiciary**
- **To understand philosophy of fundamental rights and duties**
- **To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.**
- **To understand the central-state relation in financial and administrative control**

Syllabus

UNIT-I: Introduction to Indian Constitution
Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES: -After completion of this unit student will

a. Understand the concept of Indian constitution
b. Apply the knowledge on directive principle of state policy
c. Analyze the History and features of Indian constitution
d. Learn about Preamble, Fundamental Rights and Duties

UNIT-II Union Government and its Administration
Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES: -After completion of this unit student will

a. Understand the structure of Indian government
b. Differentiate between the state and central government
c. Explain the role of President and Prime Minister
d. Know the Structure of supreme court and High court

UNIT-III State Government and its Administration
Structure of the State Govt. - Governor - Role and Position -CM and Council of Ministers – State Secretariat- Organization Structure and Functions

LEARNING OUTCOMES: -After completion of this unit student will

a. Understand the structure of state government
b. Analyze the role of Governor and Chief Minister
c. Explain the role of State Secretariat
d. Differentiate between structure and functions of state secretariat

UNIT-IV Local Administration

District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Panchayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO, ,ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES: -After completion of this unit student will

1. Understand the local Administration
2. Compare and contrast district administration's role and importance
3. Analyze the role of Mayor and elected representatives of Municipalities
4. Learn about the role of Zilla Parishath block level organization

UNIT-V Election Commission

Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

LEARNING OUTCOMES: -After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions viz SC/ST/OBC and women

TEXT BOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCES:

1**.** J.A. Siwach, Dynamics of Indian Government & Politics
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. .J.C. Johari, Indian Government and Politics, Hans India
4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Agile Methodologies
Professional Elective Course– III

Course Code:20A70501a   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and API's.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

Course Outcomes:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

UNIT – I:Agile Methodology
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT – II: Agile Processes
Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT – III: Agility and Knowledge Management

Agile Information Systems – Agile Decision Making - Earls Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition,Refinement, Distribution, Deployment, leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model

(SMM).

UNIT – IV: Agility and Requirements Engineering

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modelling and Generation – Concurrency in Agile Requirements Generation.

UNIT – V: Agility and Quality Assurance

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Textbooks:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

Reference Books:
1.Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley, 2004.
   2.Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Cloud Computing
Professional Elective III
Course Code:20A7501b   Semester VII(R20)   L T P C: 3 0 0 3
Course Objectives:
>   1.To develop cloud applications.
>   2.To demonstrate the design of the architecture for a new cloudapplication.
>   3.To teach how to re-architect the existing application for the cloud.

Course Outcomes:
- CO1: Outline the procedure for Cloud deployment
- Investigate different cloud service models and deployment models
- Compare different cloud services.
- Design applications for an organization that use a cloud environment.
-

UNIT – I: Introduction
Introduction to Cloud Computing, Characteristics of Cloud Computing, Cloud Models, Cloud Services Examples, Cloud based services and Applications, Cloud Concepts and Technologies, Virtualization, Load Balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined networking, Network function virtualization, Map Reduce, Identity and Access Management, Service Level Agreements, Billing.

UNIT – II: Cloud Services and Platforms
Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment and Management Services, Identity and Access Management Services, Open Source Private Cloud Software, Apache Hadoop, Hadoop MapReduce Job Execution, Hadoop Schedulers, Hadoop Cluster Setup.

UNIT – III: Cloud Application Design

Cloud Application Design: Design Considerations, Reference Architectures, Cloud Application Design Methodologies, Data StorageApproaches,
Multimedia Cloud: Introduction, Case Study: Live Video Streaming App, Streaming Protocols, Case Study: Video Transcoding APP.

UNIT – IV:Python for cloud computing
Python for Amazon Web Services, Python for Google Cloud Platform, Python for Windows Azure, Python for MapReduce, Python Packages of Interest, Python Web Application Framework – Django, Designing a RESTful Web API.

UNIT – V: Code Generation
Cloud Application Development in Python, Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App, Cloud Application Benchmarking and Tuning, Cloud Security, Cloud Computing for Education.

Textbooks:

1.Arshadeep Bhaga, Vijay Madisetti, "Cloud Computing AHandson Approach", Universities Press, 2018.

Reference Books:

- Chris Hay, Brian Prince, "Azure in Action" Manning Publications [ISBN: 9781935182481],2010.
- Henry Li, "Introducing Windows Azure" Apress; 1 edition [ISBN: 978-14302-2469-3],2009.
- Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" Microsoft Press; 1 edition [ISBN: 9780735656062],2010.
- Eugene Ciurana, "Developing with Google App Engine" Apress; 1 edition [ISBN: 978-1430218319],2009.
- Charles Severance, "Using Google App Engine" O'Reilly Media; 1 edition, [ISBN: 978-0596800697], 2009.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Pattern Recognition
Professional Elective Course–III

Course Code:20A70501c   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:

- To understandthePRimportance in various real time applications
- To understand the basic model and fundamental steps of PR system
- To understand the use of different classifiers/algorithms/tech
- To learn the different methods for combining classifiers.
- To provide an introduction to various clustering algorithms

Course Outcomes:

- Explain the paradigms for PR problems
- Classify the patterns using NN, Bayes, HMM, Decision trees and SVM classifiers
- Apply ensemble of classifiers for certain PR problems
- Differentiate between supervised and unsupervised classifiers.
- Design an application: Handwritten Digit Recognition

UNIT – I: IntroductiontoPatternRecognition

IntroductiontoPatternRecognition: DataSetsforPatternRecognition,DifferentParadigmsforPattern Recognition,
PatternRepresentation: DataStructuresforPatternRepresentation,RepresentationofClusters,Proximity Measures,SizeofPatterns,AbstractionsoftheDataSet,Feature,FeatureSelection, EvaluationofClassifiers,EvaluationofClustering

UNIT – II: Classifier
Nearest Neighbour Based Classifiers: Nearest Neighbour Algorithm, Variants of the NNAlgorithm, Use of the Nearest Neighbour Algorithm for Transaction Databases, EfficientAlgorithms,DataReduction, PrototypeSelection,
Bayes Classifier: Bayes Theorem, Minimum error rate classifier, Estimation of Probabilities,ComparisonwiththeNNC,NaiveBayesClassifier,BayesianBeliefNetwork.

UNIT – III: Pattern Recognition Models
HiddenMarkovModels: MarkovModelsforClassification,HiddenMarkovModels,ClassificationUsingH MMs, ClassificationofTest Patterns.
DecisionTrees: Introduction,DecisionTreesforPatternClassification,ConstructionofDecision   Trees, Splitting at the Nodes, Over fitting and Pruning, Example of Decision TreeInduction.

UNIT – IV: SVM & Combination of Classifiers
SupportVectorMachines: Introduction,LinearDiscriminantFunctions,LearningtheLinear Discriminant Function, Neural Networks, SVM for Classification, Linearly SeparableCase,Non-linearlySeparableCase.
CombinationofClassifiers:Introduction,MethodsforConstructingEnsemblesofClassifiers,Methods forCombiningClassifiers,EvaluationofClassifiers,EvaluationofClustering.

UNIT – V: Clustering

Clustering: Clustering and its Importance, Hierarchical Algorithms, Partitional Clustering,ClusteringLarge Data Sets, An Application to Handwritten Digit Recognition: Description oftheDigitData,Pre-processingofData,ClassificationAlgorithms,SelectionofRepresentativePatterns.

Textbooks:

1. PatternRecognitionanIntroduction,V.SusheelaDeviM.NarasimhaMurty,UniversityPress (India) Pvt Ltd, 2011.
2. PatternRecognition,SegriosTheodoridis, KonstantinosKoutroumbas,FourthEdition, Academic Press, 2009

Reference Books:

1. PatternClassification,R.O.Duda,P.E.HartandD.G.Stork,JohnWiley, 2002.
2. Andrew Webb, "Statistical Pattern Recognition", Arnold publishers, London, 1999
3. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Professional Elective Course–IV
Dev Ops

Course Code:2070502a   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- Explain the DevOps Concepts for business cases.
- Prepare the model canvas for DevOps use cases.
- Introduce the virtual machines and containers for designing of applications.
- Familiar with cloud provisioning and management services.
- Testing the code with various aspects in continuous deployment / development.

Course Outcomes:

CO1:   Understands the DevOps concepts in continuous delivery / development of applications.
CO2:   Create the DevOps applications using various tools and technologies.
CO3:   Examine the virtual machines and containers for managing the files.
CO4:   Apply cloud services for deployment the applications in a real-time.
CO5:   Perform web security and testing the code with appropriate tools.

UNIT – I: **DevOps Concepts**
Understanding DevOps movement, DevOps with changing time, the water fall model, Agile Model, Collaboration, Why DevOps, Benefits of DevOps, DevOps life cycle- all about continuous, Build Automation, Continuous Integration, Continuous Management, Continuous Delivery / Continuous Development, The agile wheel of wheels.

UNIT – II: **DevOps Tools and Technologies**
Code Repositories : Git, Differences between SVN and Git, Build tools – Maven, Continuous integration tools – Jenkins, Container Technology – Docker, Monitoring Tools – Zenoss, Continuous integration with Jenkins 2, Creating built-in delivery pipelines, Creating Scripts, Creating a pipeline for compiling and executing test units, Using the Build Pipeline plugin, Integrating the deployment operation, Getting started with Chef, Overview of hosted Chef, Installing and configuring a Chef workstation. Converging a Chef node using a Chef workstation, installing software

UNIT – III: **Docker Containers**
Overview of Docker containers, Understanding the difference between virtual machines and containers, Installation and configuration of Docker on CentOS, creating your first Docker container, managing containers, creating a Docker image from Docker file, an overview of Docker's elements, creating a Docker file, writing a Docker file, Building and running a container on a local machine, testing a container locally, Pushing an image to Docker Hub

UNIT – IV: **Cloud Provisioning and Configuration Management with Chef, Managing Containers Effectively with Kubernetes**

Chef and cloud provisioning, installing knife plugins for Amazon EC2 and Microsoft Azure, Creating

and configuring a virtual machine in Amazon Web Services, Creating and configuring a virtual machine in Microsoft Azure, Managing Docker containers with Chef, Prerequisite – deploying our application on a remote server, Deploying the application on AWS, Deploying the application on Microsoft Azure, Deploying the application in a Docker container.

Kubernetes architecture overview, Installing Kubernetes on a local machine, Installing the Kubernetes dashboard, Kubernetes application deployment, Using AKS, creating an AKS service, configuring kubectl for AKS,the build and push of the image in the Docker Hub,Advantages of AKS, Creating a CI/CD pipeline for Kubernetes with Azure Pipelines,

UNIT – V: **Testing the Code**

Manual testing, Unit testing, JUnit in general and JUnit in particular, A JUnit example, Automated integration testing, Docker in automated testing,Performancetesting,Automated acceptance testing, Automated GUI testing, Integrating Selenium tests in Jenkins, JavaScript testing, Testing backend integration points, Test-driven development,A complete test automation scenario,Manually testing our web application, Security and Performance Tests: Applying web security and penetration testing with ZAP, Running performance tests with Postman

Textbooks:
1. Mitesh Soni, DevOps for Web Development, Packet Publishing, 2016.
2. Mikael Krief, Learning DevOps- The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps, Packet Publishing, 2019.

Reference Books:
3. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
4. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
5. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press
6. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
7. Object Oriented Programming through Java, P. Radha Krishna, University Press.
8. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.
9. Java Programming and Object-oriented Application Development, R.A. Johnson,
10. Cengage Learning.

Department of Computer Science & Engineering
Advance Network Technologies
Professional Elective Course– IV

Course Code: 2070502b   Semester VII(R20)   **L T P C : 3 0 0 3**

Course Objectives:
- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To know the various types of Market Structures & pricing methods and its strategies
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

Course Outcomes:
CO1: Define the concepts related to Managerial Economics, financial accounting and management.
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3: Apply the concepts of production, cost and revenues for effective business decisions
CO4: Analyze how to invest their capital and maximize returns
CO5: Evaluate the capital budgeting techniques
CO6: Develop theaccounting statements and evaluate the financial performance of business entity.

UNIT-I: Network Layer
Network layer: Network Layer Services, Packet Switching, Performance, provided transport layers, implementation connectionless services, implementation connection-oriented services, comparison of virtual –circuit and datagram subnets. IPV4 Address, Forwarding of IP Packets, Internet Protocol, ICMP v4, Mobile IP

UNIT-II: Routing Algorithms
Routing Algorithms–Distance Vector routing, Link State Routing, Path Vector Routing, Unicast Routing Protocol-Internet Structure, Routing Information Protocol, Open-Source Path First, Border Gateway Protocol V4, Broadcast routing, Multi casting routing, Multicasting Basics, Intradomain Multicast Protocols, IGMP.

UNIT-III: IPv6
IPv6 Addressing, IPv6 Protocol, Transition from IPv4 to IPv6.Transport Layer Services, connectionless versus connection-oriented protocols. Transport Layer Protocols: Simple Protocol, Stop and Wait, Go-Back-N, Selective repeat, Piggy Backing. UDP: User datagram, Services, Applications. TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.

UNIT- IV: SCTP
SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control. QUALITY OF SERVICE: flow characteristics, flow control to improve QOS: scheduling, traffic shaping,

resource reservation, admission control.

UNIT-V:Internet

WWW and HTTP, FTP, Telnet, Domain name system, SNMP, Multimedia data, Multimedia in the Internet.

Text Books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

References:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Department of Computer Science & Engineering
Design Patterns
Professional Elective Course– IV

Course Code:20A70502c   Semester VII(R20)   L T P C : 3 0 0 3

Course Objectives:

- Understand design patterns and their underlying objects-oriented concepts.
- Learn the day-to-day problems faced by object-oriented designers and how design patterns solve them
- Provide an interface for creating families of related objects without specifying their concrete classes.
- To know the consequences of combining patterns on the overall quality of a system

Course Outcomes:

CO1: Define the Concepts related to the Entrepreneurship and Incubators

CO2: Understand the concept of Entrepreneurship and challenges in the world of competition.

CO3: Apply the Knowledge in generating ideas for New Ventures.

CO4: Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.

CO5: Evaluate the role of central government and state government in promoting Entrepreneurship.

CO6: Create and design business plan structure through incubations.

UNIT-I: Design Patterns

DesignpatternsinSmalltalkModel/View/Controller,describing design patterns, the catalog of design patterns, Organizing the catalog, Design patterns to solve design problems, select a design pattern, Use a designpattern.

UNIT-II: **Document Editor**

Designing a document editor, Design problems, Document structure,Formatting,Embellishingtheuserinterface,supporting multiple look-and-feel standards, supporting multiple window systems,Useroperationsspellingcheckingandhyphenation

UNIT-III:Creational Patterns

Abstract Factory, Builder, Factory method, Prototype, Singleton, Discussion of creational patterns.

UNIT-IV: Structural Patterns

Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion of structural patterns.

UNIT-V: Behavioural Patterns

Chain of responsibility, Command, Interpreter, Iterator,Mediator, Memento,Observer,State,Strategy,Templatemethod,Visitor

TEXT BOOKS

1. D F Kuratko and T V Rao, Entrepreneurship - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)

2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

REFERENCES
1. VasantDesai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwan‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.
4. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Deep Learning
Professional Elective Course– v (MOOC)

Course Code:20A70503a   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- ☐ To make the student understand the principles of business ethics
- ☐ To enable them in knowing the ethics in management
- ☐ To facilitate the student's role in corporate culture
- ☐ To impart knowledge about the fair-trade practices
- ☐ To encourage the student in creating knowing about the corporate governance

Course Outcomes:
CO1: Define the Ethics and Types of Ethics.
CO2: Understand business ethics and ethical practices in management
CO3: Understand the role of ethics in management
CO4: Apply the knowledge in cross cultural ethics
CO5: Analyze   law and ethics
CO6: Evaluate corporate governance

UNIT-I: Linear Algebra & Probability and Information Theory
Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.
Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT-II: Machine Learning

Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture. Design, Back-Propagation and other Differentiation Algorithms.

UNIT-III: Regularization for Deep Learning
Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT- IV: Convolutional Networks

The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks

UNIT -V: Sequence Modelling
Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text books.
1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. BholananthDutta, S.K. Podder – Corporation Governance, VBH.

Reference books
1. Dr. K. Nirmala, Karunakara Reddy: Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal : Indian Ethos and Values for Managers

JNTUA College of Engineering(Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Block Chain Technology and Applications
Professional Elective - V(MOOC)
Course Code:20A70503b   **Semester VI(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To present a problem oriented introductory knowledge of Digital circuits and its applications.
- Explain the elements of digital system abstractions such as digital representations of information, digital logic, Boolean algebra, state elements and finite state machine (FSMs).
- Design simple digital systems based on these digital abstractions, using the "digital paradigm" including discrete sampled information.
- Work in a design team that can propose, design, successfully implement and report on a digital systems project.
- Train the students to build IoT systems using sensors, single board computers and open source IoT platforms.

Course Outcomes:
    CO1: Design, Test and evaluate various combinational circuits such as adders, subtractors, multipliers, comparators, parity generators, multiplexers and de-Multiplexers.
    CO2: Construct flips-flops, counters and shift registers and verify its functionality
    CO3: Realize and implementation of Asynchronous and Synchronous counters using Flip-Flop IC's .
    CO4: Implementation of different combinational logic circuits using IC's.
    CO5: Design and develop IoT based sensor systems.

UNIT-I: Introduction
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT-II: Blockchain Concepts
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT-III: Architecting Blockchain solutions
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach

for Designing Blockchain Applications.

UNIT-VI: Ethereum Blockchain Implementation
Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEther Wallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

UNIT-V: Hyperledger Blockchain Implementation
Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.
Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential

References:
1. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
2. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

Natural Language Processing
Professional Elective Course– V(MOOC)

Course Code:20A70503c   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- The course is designed to develop skills to design and analyze simple linear and non linear data structures.
- It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:
   CO1: Able to design and analyze the time and space efficiency of the data structure.
   CO2: Be capable to identity the appropriate data structure for given problem.
   CO3: Have practical knowledge on the applications of data structures.

UNIT-I: Introduction to Natural language
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT-II: Grammars and Parsing
Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsingwith Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

UNIT-III: Grammars for Natural Language
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions inContext Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences inParsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-VI:
Semantic Interpretation
   Semantic & Logical form, Word senses & ambiguity, the basic logical form language, Encodingambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.
   Language Modelling
   Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems,
Multilingual and Cross lingual Language Modelling.

UNIT-V:
   Machine Translation
Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, BriefHistory, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background,

Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval
Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.
Multilingual Automatic Summarization
Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:

a. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
b. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M. Bikel and ImedZitouni, Pearson Publications.
c. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice–Hall of India.

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Cyber Security
Common to All Branches
(Open Elective Course– III)

Course Code:20A70504   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes:
CO1: Recognize the Java programming environment.
CO2: Select appropriate programming constructs to solve a problem.
CO3: Develop efficient programs using multithreading.
CO4: Design reliable programs using Java exception handling features.
CO5: Extend the programming functionality supported by Java.

UNIT-I: Cybercrime

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-II: Cyber Offenses
Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-III: Cybercrime in Mobile and Wireless Devices

Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT-VI: Tools and Methods Used in Cybercrime

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks

UNIT-V: Cyber Forensics, Cybercrime in Real-World
Forensics of Computer and Handheld Devices: Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBIL edit.
Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

References:
3. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
4. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
Introduction to Database Management Systems
Common to All Branches
(Open Elective Course– IV)

Course Code:20A70505   **Semester VII(R20)**   **L T P C : 3 0 0 3**

Course Objectives:
- To introduce the concept of Internet of Things.
- To Practice programs and build real time applications.
- Students will be explored to the interconnection and integration of the physical world.
- Students will gain practical experience in the development of Cloud-based IoT systems.
- To get knowledge on cloud platforms

Course Outcomes (CO):
CO1:   Design reliable real time applications using microcontrollers and microprocessors .
CO2:   Extend the programming functionality and design new modules.
CO3:   Able to design & develop IOT Devices.

UNIT-I: Introduction

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMS
system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMS
system architecture, challenges in building a DBMS, various components of a DBMS

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system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
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system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
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DBMS.
Introduction to database systems, Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data
Independence, DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

UNIT-II: E/R Model
Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship
types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples
Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship
types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples
Conceptual Data Modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples.

UNIT-III: Relational Data Model
Concepts of relations, schema-instance distinction, keys, referential integrity & foreign keys, converting the database specification in ER notation to the relational schema, Relational algebra operators: selection, projection, cross product, various types of joins, division, set operations, example queries, tuple relational calculus, domain relational calculus, Fundamentals of SQL.

UNIT-VI: Relational Database Design
Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, Normalization, Normal Forms - INF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, multi valued dependencies and 4NF, join dependencies and 5NF, Concept of Denormalization.

UNIT-V: Transaction Processing,Data Storage & Indexing
Transaction processing and Error recovery-Concepts of transaction processing, ACID properties, concurrency control, Serializability, locking based protocols, Timestamp based protocols, recovery and logging methods.
Data Storage and Indexes - File organizations, primary, secondary index structures, various index structures - hasb based, dynamic hashing techniques, multi-level indexes, B and B-trees.

References:
5. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
6. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
MANAGEMENT SCIENCE
Common to All Branches
(Human Elective)

Course Code:20A75401a   **Semester VII(R20)**   **L T P C : 3 0 0 3**

COURSE OBJECTIVES:
- To provide fundamental knowledge on management, administration, organization & its concepts.
- To make the students understand the role of management in Production process and marketing management
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes (CO): At the end of the course, students will be able to
- Define the Management, and its Functions
- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry

- Analyse the concepts of HRM in Recruitment, Selection and Training & Development.

- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyse the business through SWOT.
- Create   Modern technology in management science.

UNIT - I   **INTRODUCTION TO MANAGEMENT**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Systems Theory - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end if the Unit, the learners will be able to
➢ Understand the concept of management and organization
➢ Analyze the organization chart & structure for an enterprise.
➢ Apply the concepts & principles of management in real life industry.
➢ Evaluate and   interpret the theories and the modern organization theory.

UNIT - II   OPERATIONS & MARKETING MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), - Statistical Quality Control- **Materials Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to
- ➢ Understand the core concepts of Management Science and Operations Management
- ➢ Apply the knowledge of Method of Production principles in real life industry.
- ➢ Analyze Marketing Mix Strategies for an enterprise
- ➢ Evaluate Materials departments & Determine EOQ
- ➢ Create and design advertising and sales promotion

UNIT - III   HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Evolution of HRM - Definition and Meaning – Nature - Managerial and Operative functions - - Job Analysis - Human Resource Planning (HRP) – Process of Recruitment & Selection - Training and Development - Performance Appraisal - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

LEARNING OUTCOMES: At the end if the Unit, the learners will
- ➢ Understand the concepts of HRM in Recruitment, Selection, Training & Development
- ➢ Apply Managerial and operative Functions of HRM
- ➢ Analyze the need of training
- ➢ Evaluate performance appraisal Techniques
- ➢ Design the basic structure of salaries and wages Administration.

UNIT - IV   STRATEGIC & PROJECT MANAGEMENT

Strategy Definition & Meaning - Vision - Mission - Goals - Steps in Strategy Formulation and Implementation - SWOT Analysis **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to
- ➢ Understand Mission, Objectives, Goals & strategies for an enterprise
- ➢ Apply SWOT Analysis to strengthen the project
- ➢ Analyze Strategy formulation and implementation
- ➢ Evaluate PERT and CPM Techniques
- ➢ Creative in completing the projects within given time

UNIT - V   Contemporary Issues In Management

The concept of Management Information System (MIS) - Materials Requirement Planning (MRP) - Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Business Process Outsourcing (BPO) - Business Process Re-engineering - knowledge Management.

LEARNING OUTCOMES At the end if the Unit, the learners will be able to
- ➢ Understand modern management techniques
- ➢ Apply Knowledge in Understanding in modern management techniques
- ➢ Analyze Concept of CRM, MRP, TQM
- ➢ Evaluate Six Sigma concept and SCM

Textbooks:
1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

Reference Books:
1. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Online Learning Resources:
www.slideshare.net/jhayabesamis/chapter-1-the-nature-and-concept-of-management-122625641?
www.slideshare.net/vivekpratapsingh14/school-of-management-thoughts?
https://www.slideshare.net/89ajpaul/organizational-design-anf-structure
https://www.slideshare.net/sujeet2685/plant-layout-46555840#
https://www.slideshare.net/drmadhurverma/materials-38395397
https://www.slideshare.net/ShaliniShetty3/introduction-to-marketing-management-72210724?
https://www.slideshare.net/srinidhiraman/human-resource-management-ppt-43320777
https://www.slideshare.net/wicaksana/training-and-development-33535063
https://www.slideshare.net/ayushijain107/strategic-management-ppt-58012275

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
BUSINESS ENVIRONMENT
(Human Elective)
Common to All Branches

Course Code:20A75401b   Semester VII(R20)   **L T P C : 3 0 0 3**

Course Objectives:
   1.   To make the student understand about the business environment

   2.   To enable them in knowing the importance of fiscal and monitory policy

   3   To facilitate them in understanding the export policy of the country

   4.   To Impart knowledge about the functioning and role of WTO

   5.   To Encourage the student in knowing the structure of stock markets

Course Outcomes (CO): At the end of the course, students will be able to
   • Define Business Environment and its Importance.
   • Understand various types of business environment.
   • Apply the knowledge of Money markets in future investment
   • Analyse   India's Trade Policy
   • Evaluate fiscal and monitory policy
   • Develop a personal synthesis and approach for identifying business opportunities

 UNIT - I   **Overview of Business Environment**
Introduction – meaning Nature, Scope, significance, functions and advantages. Types - Internal &
External, Micro and Macro. Competitive structure of industries - Environmental analysis -
advantages & limitations of environmental analysis & Characteristics of business.
Learning Outcomes: - After completion of this unit student will
   ➢ Understand the concept of Business environment
   ➢ Classify various types of business environment
   ➢ Evaluate the environmental analysis in business
   ➢ Discuss the Characteristics of Business.

UNIT - II   **Fiscal Policy**
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public
Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of
recent fiscal policy of GOI. Highlights of Budget - Monetary Policy - Demand and Supply of
Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance
Commission.
Learning Outcomes: - After completion of this unit student will
   ➢ Understand the concept of public revenue and public Expenditure
   ➢ Identify the functions of RBI and its role
   ➢ Analyze the Monitory policy in India

- Know the recent trends and the role of Finance Commission in the development of our country
- Differentiate between Fiscal and Monitory Policy

UNIT - III   **India's Trade Policy**

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: - After completion of this unit student will
- Understand the role of Indian international trade
- Understand and explain the need for Export and EXIM Policies
- Analyze causes for Disequilibrium and correction measure
- Differentiate between Bilateral and Multilateral Trade Agreements

UNIT - IV   **World Trade Organization**

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes: - After completion of this unit student will
- Understand the role of WTO in trade
- Analyze Agreements on trade by WTO
- Understand the Dispute Settlement Mechanism
- Compare and contrast the Dumping and Anti-dumping Measures.

UNIT - V   **Money Markets and Capital Markets**

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes: - After completion of this unit student will
- Understand the components of Indian financial system
- Know the structure of Money markets and Capital markets
- Analyze the Stock Markets
- Apply the knowledge in future investments
- Understand the role of SEBI in investor protection.

Textbooks:

1.Business Environment Text & Cases: JUNE 2017
2. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.
3. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

Online Learning Resources:
https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/jitenparmar313/fiscal-policy-65521889
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/prateeknepal3/ppt-mo

JNTUA College Of Engineering (Autonomous),Ananthapuramu
Department of Computer Science & Engineering
ORGANIZATIONAL BEHAVIOUR
(Human Elective)
Common to All Branches

Course Code:20A75401c   **Semester VII(R20)**   **L T P C : 3 0 0**
3

Course Objectives:
- To make them aware of concepts & analysis in organizational behaviour
- To offer knowledge to students on self-motivation, leadership and management

- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

COURSE OUTCOMES: At the end of the course, students will be able to
- Define the Organizational Behaviour, its nature and scope
- Understand the nature and concept of Organizational behaviour
- Apply theories of motivation to analyse the performance problems
- Analyse the different theories of leadership
- Evaluate group dynamics
- Develop as powerful leader

UNIT - I   **Introduction Of Organizational Behavior and Various Concepts**

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective - Understanding Individual Behavior – Attitude - Perception - Learning – Personality.

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Organizational Behavior
- ➢ Contrast and compare Individual & Group Behavior and attitude
- ➢ Evaluate personality types

UNIT - II   **Motivation and Organization Outcome**

Theories of Motivation - Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy - McClelland's theory of needs – Mc Gregor's theory X and theory Y – Adam's equity theory – Locke's goal setting theory –

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Motivation
- ➢ Analyze the Theories of motivation
- ➢ Explain how employees are motivated according to Maslow's Needs Hierarchy

UNIT - III   **Leadership**
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits
Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good
Leader - Alderfer's ERG theory – traits - Leaders Vs Managers.

Conflict Management - Evaluating Leader - Women and Corporate leadership.

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the concept of Leadership
- ➢ Contrast and compare Trait theory and Managerial Grid
- ➢ Distinguish the difference between Transactional and Transformational Leadership
- ➢ Evaluate the qualities of good leaders

UNIT - IV   **Organizational Culture**
Introduction – Nature, Meaning, scope, definition and functions - Organizational Culture -
Changing the Culture – Change Management – Work Stress Management - Organizational
management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the importance of organizational change and development
- ➢ Apply change management in the organization
- ➢ Analyze work stress management
- ➢ Evaluate Managerial implications of organization

UNIT - V   **Organizational Change and Development**
Introduction – Nature, Meaning, scope, definition and functions - Organizational Culture -
Changing the Culture – Change Management – Work Stress Management - Organizational
management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

- ➢ Understand the importance of organizational change and development
- ➢ Apply change management in the organization
- ➢ Analyze work stress management
- ➢ Evaluate Managerial implications of organization

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011
2. P Subba Rao, Organisational Behaviour, Himalya Publishing House 2017

Reference Books:
- McShane, Organizational Behaviour, TMH 2009
- Nelson, Organisational Behaviour, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.
- Aswathappa, Organisational Behaviour, Himalaya, 2009

https://www.slideshare.net/payalrchhabra/organisational-behavior-15668552
https://www.slideshare.net/nilendrakumar7/motivation-and-team-building
https://www.slideshare.net/Knight1040/organizational-culture-9608857
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/kohlisudeep18/organisational-developmet

Department of Computer Science & Engineering
Skill Oriented Course-V
Mobile Application Development

Course Code: 20A70506　　　　　**Semester VII(R20)**　　　　　**L T P C : 1 0 2 2**

Course Objectives:
- Exposure to the value of life, society and harmony
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns

Course Outcomes:
CO1:　Analyze th terms like Natural Acceptance, Happiness and Prosperity
CO2:　Understand awareness of oneself, and one's surroundings (family, society nature)
CO3:　Apply what they have learnt to their own self in different day-to-day　settings in real life
CO4:　Relate human values with human relationship and human society.
CO5:　Justify the need for universal human values and harmonious existence
CO6:　Develop as socially and ecologically responsible engineers

Week - 1:

Mobile web presence, Mobile applications, Marketing, App as a mobile web app; User interface design - Effective use of screen real estate, Mobile application users, Mobile information design, Mobile platforms, Tools of mobile interface design.
Task: Test the android development environment by performing the followingoperations.

- Add the sample application to a project in Androidstudio.
- Create an Android Virtual Device (AVD) for sampleproject.
- Create a launch configuration for sampleproject.
- Run a sample application in AndroidEmulator.

Week - 2:

Android versions, Features and architecture, required tools, Android application launching.
Task: Develop a program which will implement Activities in androidapplication.

Week - 3:

Activities, linking activities using intents, Calling Built – In Applications Using Intents, displaying notifications, Components of a screen, adapting to display orientation

Task: Develop a program which will implement Intents in androidapplication.

Week - 4:

Managing changes to screen orientation, Utilizing the action bar, Listening for UI notifications.

Task: Develop a program which will implement screen orientation in androidapplication.

Week - 5:

Basic views, Picker views, List view, Image view, Menus with views, Web view.
Task: Develop a program which will implement Sub menu in androidapplication.

Week - 6:

Saving and loading user preferences, persisting data to files, Creating and using databases.

Task: Develop a program to insert, delete, display, and update the employeedetails using AndroidSQLite.

Week - 7:
SMS messaging, sending e-mail, getting location data, Consuming web services using HTTP.
Task: Develop a program to implement a Custom Button and handle the displayed message on buttonpress.

Week - 8:

Layouts (Linear, Relative, Table, Absolute, Table).

Task: Develop a program to implement Email service by using All Layout Views with differentattributes

Week 9:
Google maps and its child views displaying maps, monitoring a location.
Task: Develop Google Maps application by using Linear Layout Views with differentattributes.

Week 10:
List and Picker views and Date views.
Task: Develop a program to implement the List View in androidapplication.

Week 11:
Services, Communication between a service and an activity, Binding activities to services.
Task: Design and develop a program to create sign-up and sign-in pages and maintain the user details withSQLite.

Week 12:
Threading, preparing for publishing, Deploying APKfiles.

Task: Develop the following applications using Android.

- Alarm   b. Calculator c. Weather application d. VideoPlayer

Week 13:
Database Connectivity with MySql: Establish a database Connection using mysqli, Prepare SQL Statement, bind parameters, Execute the statement, bind the result.
Task: Develop a program which will implement databases in androidapplication

Week 14:
HTTP is a Stateless Protocol: Handling Cookies and Sessions, Implementation of JSON Web Tokens (JWT), SMS API.
Task: Design and develop a User Authentication System (Login-Logout functionality) using cookies, sessions, JSON using Android studio.

Textbooks:
1. J. F. DiMarzio, "Beginning Android Programming with Android Studio," Wiley India, Fourth Edition,2017.
2.Wei – Meng Lee, ―Beginning Android 4 Application Development‖, Wrox,2017.

References:
1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999
2. HumanValues, A.N.Tripathi, NewAgeIntl.Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
5. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
6. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English)

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Edge and Fog Computing

Course Code:20A05H11   **Honor Degree(R20)**   **L T P C : 3 1 0 4**

Course Objectives:

- To move computing and storage away from the confines of a centralized data center and distribute those resources to one or more additional locations across the wider networked environment. Ideally, the decentralized resources will be closer to the point where work is being performed. This work could be data collection or user request processing

Course Outcomes:

CO1: Explore research, frameworks, applications in edge and fog computing.

C02: Review underlying technologies, limitations, and challenges along with future research direction and discuss generic conceptual framework for optimization problems in fog computing.

CO3: Design and develop simulation scenarios for Edge and Fog Computing using network simulator

UNIT – I:

Internet of Things (IoT) and New Computing Paradigms: Introduction, Relevant Technologies, Fog and Edge Computing Completing the Cloud, Advantages of FEC: SCALE, How FEC Achieves These Advantages: SCANC, Hierarchy of Fog and Edge Computing, Business Models, Opportunities and Challenges.

Addressing the Challenges in Federating Edge Resources: Introduction, The Networking Challenge, The Management Challenge, Miscellaneous Challenges.

Integrating IoT + Fog + Cloud Infrastructures: System Modeling and Research Challenges: Introduction, Methodology, Integrated C2F2T Literature by Modeling Technique, Integrated C2F2T Literature by Use-Case Scenarios, Integrated C2F2T Literature by Metrics.

UNIT – II:Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds
Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds Network Slicing Management in Edge and Fog.

Optimization Problems in Fog and Edge Computing: Introduction, Background / Related Work, Preliminaries, The Case for Optimization in Fog Computing, Formal Modeling Framework for Fog Computing, Metrics, Further Quality Attributes, Optimization Opportunities along the Fog Architecture, Optimization Opportunities along the Service Life Cycle, Toward a Taxonomy of Optimization Problems in Fog Computing, Optimization Techniques

Middlewares: Introduction, Need for Fog and Edge Computing Middleware, Design Goals, State-of-the-Art Middleware Infrastructures, System Model, Proposed Architecture

UNIT – III   A Lightweight Container Middleware for Edge Cloud
Introduction, Background/RelatedWork, Clusters for Lightweight Edge Clouds, Architecture Management – Storage and Orchestration, IoT Integration, Security Management for Edge Cloud Architectures.

Data Management in Fog Computing : Introduction, Background , Fog Data Management

Predictive Analysis to Support Fog Application Deployment: Introduction, Motivating Example: Smart Building, Predictive Analysis with Fog Torch Motivating Example (continued).

Using Machine Learning for Protecting the Security and Privacy of Internet of Things (IoT) Systems: Introduction Background, Survey of ML Techniques for Defending IoT Devices, Machine Learning in Fog Computing

Fog Computing Realization for Big Data Analytics: Introduction, Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation, Architecture.

UNIT – IV Exploiting Fog Computing in Health Monitoring
Introduction, An Architecture of a Health Monitoring IoT-Based System with Fog Computing, Fog Computing Services in Smart E-Health Gateways, System Implementation Case Studies, Experimental Results, and Evaluation, Discussion of Connected Components, Related Applications in Fog Computing 313
Smart Surveillance Video Stream Processing at the Edge for Real-Time Human Objects Tracking : Introduction, Human Object Detection, Object Tracking, Lightweight Human Detection.

Fog Computing Model for Evolving Smart Transportation Applications :Introduction, Data-Driven Intelligent Transportation Systems, Mission-Critical Computing Requirements of Smart Transportation Applications, Fog Computing for Smart Transportation Applications, Case Study: Intelligent Traffic Lights Management (ITLM) System, Fog Orchestration Challenges and Future Directions .

UNIT – V Testing Perspectives of Fog-Based IoT Applications
Introduction, Background, Testing Perspectives
Legal Aspects of Operating IoT Applications in the Fog : Introduction, Related Work, Classification of Fog/Edge/IoT Applications, Restrictions of the GDPR Affecting Cloud, Fog, and IoT Applications, Data Protection by Design Principles
Modeling and Simulation of Fog and Edge Computing Environments Using iFogSim Toolkit:
Introduction ,iFogSim Simulator and Its Components, Installation of iFogSim, Building Simulatio with iFogSim, Example Scenarios, Simulation of a Placement Policy, A Case Study in Smart Healthcare
Textbooks:
1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.

Reference Books:
1. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE.
2. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Quantum Computing

Course Code:20A05H12   Honor Degree(R20)   **L T P C : 3 1 0 4**

Course Objectives:

- Quantum computers have the potential to revolutionize computation by making certain types of classically intractable problems solvable. While no quantum computer is yet sophisticated enough to carry out calculations that a classical computer can't, great progress is under way.

Course Outcomes (CO):

    CO1: Concepts of Classical Vs Quantum Computing Systems.
    CO2:Quantum theory and Quantum Circuits, Quantum Algebra in relation to Computer Science.
    CO3: Quantum bits, super position, entanglement, Quantum gates.
    CO4: Significance of Quantum Algorithms.
    CO5: Quantum Programming Languages.
    CO6: Quantum Computing Use cases.

UNIT – I   **Introduction**

    Introduction – The leap from classical to Quantum, Classical deterministic systems, Probabilistic Systems, Quantum Systems, Assembling systems, Global Perspectives- History of Quantum computation and Quantum information, Nomenclature and Notation- Linear Algebra and Quantum Mechanics, Information theory and probability, frequently used quantum gates and circuit symbols, Quantum supremacy.

UNIT – II   **Basic Quantum theory**

    Quantum states: Superposition, Entanglement, the role of Quantum Physics: Quantum interference, Quantum entanglement, Quantum decoherence, Quantum bit: Qubit, Multiple Qubits, The state of Quantum system, Observables, Measurements, Quantum Dynamics, Assembling Quantum systems, Super conducting Quantum Interface Devices (SQUID), Superconducting Qubits.

UNIT – III   **Quantum model of computation**

    Classical Gates, Reversible gates, Quantum gates, Quantum circuit model, Quantum Gates: 1-Qubit Gates, Controlled-U Gates, Universal Sets of Quantum Gates, Measurements with Quantum Circuits, Quantum Error Correction, Introduction to Quantum Communication and Quantum Cryptography.

UNIT – IV   **Quantum Algorithms**

    Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Simon's periodicity Algorithm, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum computing use cases: Search, Quantum Simulations, Optimization, Cryptography, Image Processing, Healthcare, Finance, Chemical and biological engineering, Artificial Intelligence.

UNIT – V **Quantum Programming Languages**

Programming in Quantum world, Quantum Assembly Programming, Quantum Turing Machine, Quantum Random Access Memory Model (QRAM), Quantum Hardware Interface (QHI), Higher-level Quantum Programming, Introduction to Qiskit and IBM Quantum Experience, Introduction to Quantum python Library Pennylane.

Textbooks:

[1] Quantum Computing for Computer Scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press,2008.

[2] An Introduction to Quantum Computing, Phillip Kaye, Raymond Laflamme, Michele Mosca, Oxford University press, 2007.

[3] Quantum Computing in Practice with Qiskit and IBM Quantum Experience, HassiNorlen, 2020.

Reference Books:

[1] Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac, I. Chuang, Cambridge University Press, 2010.

[2] Swayam NPTEL, https://onlinecourses.nptel.ac.in/noc22_cs79/

[3] A cross platform Python library for differential Programming of Quantum computers, Pennylane

Online Learning Resources:

https://pennylane.ai/

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Introduction to Autonomous Navigation Systems

Course Code:20A5H13   Honor Degree(R20)   L T P C : 3 1 0 4

Course Objectives:

Practical advances in Artificial Intelligence are ushering in a new era of digital automation. In the forth coming years, drones, robotics and driverless vehicles and artificial intelligence will used to transport goods, perform surveillance, transport people in efficient and safe way. This course will enable the students to under the concepts and algorithms that underlie an autonomous vehicle's understanding of itself and the world around it.

Course Outcomes (CO):

CO1:Concepts of UAV/Drones, UGV/Robotics and Autonomous vehicles.
CO2:Overall understanding of significant elements of UAV/UGV and Autonomous vehicles, the basics of flight, navigation, guidance, sensors, design concepts etc., and various AI algorithms useful in building the Autonomous systems.
CO3:Build/integrate small to medium size UAV/UGV.
CO4:Concepts of various sensor elements, data collection, processing and various software tools.
CO5:Understanding of AI algorithms for autonomous systems, followed by design and development of autonomous systems and algorithms as a case study system.

UNIT – I

Introduction to Autonomous systems: Definition, Characteristics, differences between non autonomous Vs autonomous, Types of vehicles, Introduction to navigation and communication.

UNIT – II

Basics of navigation (Aerial and Ground) : Different types of flight vehicles; Components and functions of an airplane; Forces acting on Airplane; Physical properties and structure of the atmosphere; Aerodynamics – aerofoil nomenclature, aerofoil characteristics, Angle of attack, Mach number, Lift and Drag, Propulsion and airplane structures.

UNIT – III

UAV Elements: DGCA Classification of UAVs; Types and Characteristics of Drones: Fixed, Multi-rotor, and Flapping Wing; Applications: Defense, Civil, Environmental monitoring. Components: Arms, motors, propellers, electronic speed controller (ESC), flight controller; Propulsion; Flight controller Software, MAVLINK protocol

UNIT – IV

Unmanned Ground Vehicles/Robotics : Introduction to Unmanned Ground Vehicles: Back ground, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing, Robotic Operating System, Robotic Programming Languages.

UNIT – V

Navigation and guidance: Data Link; Sensors and Payloads: GPS, IMU, Light Detection and Ranging (LiDAR), Imaging cameras, Classification of payload based on applications; Hyper-spectral sensors; Laser Detection and Range (LiDAR); cameras; ultra-sonic detectors; Case study on payloads. Introduction to navigation systems and types of guidance; Mission Planning and Control.

Textbooks:

1. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

2. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

3. DGCA RPAS Guidance Manual, Revision 3 – 2020

Reference Books:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence

2.Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.

3. John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Reinforcement Learning
Course Code:20A05H14   Honor Degree(R20)   L T P C : 3 1 0 4
Course Objectives

Reinforcement Learning is a subfield of Machine Learning, but is also a general-purpose formalism for automated decision-making and AI.
This course introduces you to statistical learning techniques where an agent explicitly takes actions and interacts with the world.

Course Outcomes (CO):

CO1: Formulate Reinforcement Learning problems
CO2: Apply various Tabular Solution Methods to Markov Reward Process Problems
CO3: Apply various Iterative Solution methods to Markov Decision Process Problems
CO4: Comprehend Function approximation methods

UNIT – I

Introduction: Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).

UNIT – II

Evaluative Feedback - Multi-Arm Bandit Problem: An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs

UNIT – III

Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.
Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP , Generalized Policy Iteration.
UNIT – IV

Monte Carlo Methods for Prediction and Control: Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monto Carlo Control, On policy and off policy learning, Importance sampling.
Temporal Difference Methods: TD Prediction, Optimality of TD(0), TD Control methods - SARSA, Q-Learning and their variants.

UNIT – V

Eligibility traces: n-Step TD Prediction, Forward and Backward view of TD(λ), Equivalence of forward and backward view, Sarsa(λ),, Watkins's Q(λ), Off policy eligibility traces using

importance of sampling.

Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods, control with function approximation

.

Textbooks:
1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press.
2. CsabaSzepesvari – Algorithms for Reinforcement Learning – Morgan & Claypool, 2010.

Reference Books:
1. Reinforcement Learning By Richard S. (University Of Alberta) Sutton,Andrew G. (Co-Director Autonomous Learning Laboratory) Barto

Department of Computer Science & Engineering
MINOR DEGREE (R20)
Introduction to Data Science

Course Code20A05M11   **L T P C : 3 1**
0 4
Course Objectives:
- The objective of the data scientist is to explore, sort and analyze mega data from various sources in order to take advantage of them and reach conclusions to optimize business processes or for decision support.

Course Outcomes:
After completion of the course, students will be able to
- Students will develop relevant programming abilities.
- Students will demonstrate proficiency with statistical analysis of data.
- Students will develop the ability to build and assess data-based models.
- Students will execute statistical analyses with professional statistical software.
- Students will demonstrate skill in data management.
- Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

UNIT – I
High dimension space: introduction, the law of large numbers, the geometry of high dimensions, properties if the unit ball, generating points uniformly at random from a ball, Gaussians in high dimension, random projection and Johnson lindenstrauss lemma, separating gaussians, fitting a spherical Gaussian to data
Best fit subspaces and singular value decomposition: introduction, preliminaries, singular vectors, SVD, best rank-k approximations, left singular vectors, and power method for singular value decomposition, singular vectors and Eigen vectors, applications of SVD
UNIT – II
Random walks and Markov chains: stationary distribution, markov chain Monte carlo, areas and volumes, convergence of random walks on undirected graphs, electrical networks and random walks ,random walks on undirected graphs with unit weight edge weights, random walks in Euclidean space, the web as a markov chain.

UNIT - III
Machine learning: introduction, the perceptron algorithm, kernel functions and non linearly separable data, generalizing to new data, Vc-dimension, Vc-dimension and, machine learning, other measures of complexity, deep learning, Gradient descent, online learning, boosting
Algorithm for massive data problems: sampling, streaming, and sketching introduction, frequency moments, matrix algorithms using sampling, sketches of documenting.
UNIT – IV
Machine learning: introduction, the perceptron algorithm, kernel functions and non linearly separable data, generalizing to new data, Vc-dimension, Vc-dimension and, machine learning, other measures of complexity, deep learning, Gradient descent, online learning, boosting
Algorithm for massive data problems: sampling, streaming, and sketching introduction, frequency moments, matrix algorithms using sampling, sketches of documenting.
UNIT – IV

Clustering: introduction, k-means clustering-center clustering, finding low error clustering, spectral clustering, approximation stability, high density clustering, kernel methods, recursive clustering based on sparse cuts, dense submatrics and communities, community finding and graph partitioning, spectral clustering applied to social networks

Random graphs: the G(n,p) Model, phase transitions, Giant component, cycle and full connectivity, phase transitions for increasing properties branching process, CNF-SAT, non uniform models for Random Graphs, growth models, small world graphs.

UNIT - V

Topic models: An idealized model, Nonnegative matrix factorization, NMF with Anchor terms, Hard and soft clustering, the latent Dirichlet Allocation model for topics, the Dominant Admixture model, formal assumptions, finding the term topic matrix, hidden markov models, graphical models and belief propagation, Bayesian or belief networks, markov random fields, factor graphs, Tree algorithms, message passing in general graphics, warning propagation, correlation between variables.

Textbooks:

1 .Fundamentals of data science by Arvim Blum, john hope croft, Ravindran Kannan

Reference Books:

1. High-Dimensional Probability: An Introduction with Applications in Data Science: 47 (Cambridge Series in Statistical and Probabilistic Mathematics, Series Number 47) by Roman Vershynin Hardcover.

2. Understanding Machine Learning: From Theory to Algorithms by shaiselvshawrtaz, shai ben David

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Introduction to AI/ML

Course Code 20A05M12   **MINOR DEGREE (R20)**   **L T P C : 3 1 0 4**

Course Objectives:
- AI programming focuses on three cognitive skills learning, reasoning and self-correction.
- AI is a research field that studies how to realize the intelligent human behaviors on a computer.
- Understand the basic theory underlying machine learning
- Formulate machine learning problems corresponding to different applications.

Course Outcomes:

After completion of the course, students will be able to

CO1: Solve basic AI based problems.

CO2: Define the concept of Artificial Intelligence.

CO3: Apply AI techniques to real-world problems to develop intelligent systems.

CO4: Identify machine learning techniques suitable for a given problem.

CO5: Solve the real world problems using various machine learning techniques.

UNIT – I: **Fundamentals of AI**
   Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
   Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT – II: **Solving Problems by searching**
   Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT – III: **Reinforcement Learning**
   Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
   Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT – IV: **Introduction**
Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT – V: **Neural networks and genetic Algorithms**
   Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.

Textbooks:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

2. T.M. Mitchell, "Machine Learning", McGraw-Hill, 1997.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.

2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

3. EthernAlpaydin, "Introduction to Machine Learning", MIT Press, 2004.
4. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Data Analytics with R

Course Code:20A05M13   **MINOR DEGREE (R20)**   **L T P C : 3 1 0 4**

Course Objectives:
- How to manipulate data within R and to create simple graphs and charts used in introductory statistics.
- The given data using different distribution functions in R.
- The hypothesis testing and calculate confidence intervals; perform linear regression models for data analysis.
- The relevance and importance of the theory in solving practical problems in the real world.

Course Outcomes:
- Install and use R for simple programming tasks.
- Extend the functionality of R by using add-on packages
- Extract data from files and other sources and perform various data manipulation tasks on them.
- Explore statistical functions in R.
- Use R Graphics and Tables to visualize results of various statistical operations on data.
- Apply the knowledge of R gained to data Analytics for real-life applications.

UNIT – I: **INTRODUCTION TO COMPUTING**
a. Installation of R
b. The basics of R syntax, workspace
c. Matrices and lists
d. Subsetting
e. System-defined functions; the help system
f. Errors and warnings; coherence of the workspace
UNIT-II: **GETTING USED TO R: DESCRIBING DATA**
a. Viewing and manipulating Data
b. Plotting data
c. Reading the data from console, file (.csv) local disk and web
d. Working with larger datasets
UNIT-III: **SHAPE OF DATA AND DESCRIBING RELATIONSHIPS**
a. Tables, charts and plots.
b. Univariate data, measures of central tendency, frequency distributions, variation, and Shape.
c. Multivariate data, relationships between a categorical and a continuous variable,
d. Relationship between two continuous variables – covariance, correlation coefficients, comparing multiple correlations.
e. Visualization methods – categorical and continuous variables, two categorical variables, two continuous variables.
UNIT-IV: **PROBABILITY DISTRIBUTIONS**
a. Sampling from distributions – Binomial distribution, normal distribution
b. tTest, zTest, Chi Square test

c. Density functions

d. Data Visualization using ggplot – Box plot, histograms, scatter plotter, line chart, bar chart, heat maps

UNIT-V: **EXPLORATORY DATA ANALYSIS**

 Demonstrate the range, summary, mean, variance,

median, standard deviation, histogram, box plot, scatter plot using population dataset.

UNIT-VI: **TESTING HYPOTHESES**

a. Null hypothesis significance testing

b. Testing the mean of one sample

c. Testing two means

UNIT-VII: **PREDICTING CONTINUOUS VARIABLES**

a. Linear models

b. Simple linear regression

c. Multiple regression

d. Bias-variance trade-off – cross-validation

UNIT-VIII**: CORRELATION**

a. How to calculate the correlation between two variables.

b. How to make scatter plots.

c. Use the scatter plot to investigate the relationship between two variables

UNIT-IX**: TESTS OF HYPOTHESES**

a. Perform tests of hypotheses about the mean when the variance is known.

b. Compute the p-value.

c. Explore the connection between the critical region, the test statistic, and the p-value

UNIT-X: **ESTIMATING A LINEAR RELATIONSHIP**

Demonstration on a Statistical Model for

a Linear Relationship

a. Least Squares Estimates

b. The R Function lm

c. Scrutinizing the Residuals

UNIT-XI**: APPLY-TYPE FUNCTIONS**

a. Defining user defined classes and operations, Models and methods in R

b. Customizing the user&# 39 ; s environment

c. Conditional statements

d. Loops and iterations

UNIT-XII: **STATISTICAL FUNCTIONS IN R**

a. Write Demonstrate Statistical functions in R

b. Statistical inference, contingency tables, chi-square goodness of fit, regression, generalized linear models, advanced modeling methods.

Reference Books:

1. SandipRakshit, "Statistics with R Programming", McGraw Hill Education, 2018.

2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "AN Introduction to Statistical Learning: with Applications in R", Springer Texts in Statistics, 2017.

3. Joseph Schmuller, "Statistical Analysis with R for Dummies", Wiley, 2017.

4. K G Srinivasa, G M Siddesh, ChetanShetty, Sowmya B J, "Statistical Programming in R", Oxford Higher Education, 2017.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering
Software project Management
Course Code:20A05M14   MINOR DEGREE (R20)   L T P C : 3 1 0 4

Course Objectives:

● Understanding the specific roles within a software organization as related to project and process management

● Learn the principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management).

● Understanding the basic infrastructure competences (e.g., process modeling and measurement)Analyze the basic steps of project planning, project management, quality assurance, and process management and their relationships

Course Outcomes:

 After completion of the course, students will be able to

CO1: Understand the purpose and importance of project management from the perspectives of planning, tracking and completion of project.

CO2: Apply, analyze, design and develop the software project and design various estimation levels of cost and effort.

CO3: Compare and differentiate organization structures and project structures.

CO4:   Acquire the knowledge of managing, economics for conventional, modern and future software projects. Sketch various artifacts sets for better understanding of software development

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.
Model based software architectures: A Management perspective and technical perspective.

UNIT – IV: **Work Flows of the process**
Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning
guidelines, cost and schedule estimating, Interaction planning process, Pragmatic planning. Project
Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation: Automation Building Blocks, The Project Environment

UNIT – V: **Project Control and Process instrumentation**
The server care Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates, Example. Future
Software Project Management: Modern Project Profiles Next generation Software economics, modern Process transitions.

Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Textbooks:
1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,Tata Mc-Graw Hill

Reference Books:
1. Applied Software Project Management, Andrew Stellman& Jennifer Greene, O‟Reilly,2006
2. Head First PMP, Jennifer Greene & Andrew Stellman, O‟Reilly,2007
3. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, second edition,Wiley India, 2004.
4. Agile Project Management, Jim Highsmith, Pearson education, 2004 5. The art of Project management, Scott Berkun, O‟Reilly, 2005.
6. Software Project Management in Practice, Pankaj Jalote, Pearson Education,2002

JNTUA College of Engineering (Autonomous), Ananthapuramu
Department of Computer Science & Engineering

MOOC I   **Design and Analysis of Algorithms**
Course Code:20A5M15a   **MINOR DEGREE (R20)**   **L T P C :0 0 0 2**

Course Objectives:
- To analyze the asymptotic performance of algorithms.
- To understand the write rigorous correctness proofs for algorithms.
- To familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:
Course Outcomes (CO):
After completion of the course, students will be able to
- Explain the basic concepts of time and space complexity
- Explain the basic concepts of divide-and-conquer Strategy, dynamic programming,
- Greeedy and Algorithm.
- Describe the methodologies of how to analyze the following applications by Dynamic
- Programming Algorithm.
- Discuss the concept of graph coloring and back tracking
- Analyze the performance of algorithms

UNIT – I: **Introduction**
Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components.
UNIT-II:
Divide and Conquer, General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.
UNIT-III: **Dynamic Programming**
  General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design
UNIT-IV: **Backtracking**
General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.
UNIT-V: **Branch and Bound**

General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

Textbooks:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharam, Universities Press
2. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer
3. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson,R.L.Rivest and C.Stein, PHI Pvt. Ltd

Reference Books:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA
2. Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, HimansuBalachandra Dave
3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc GrawHill.
4. Design and Analysis of algorithms, Pearson education, Aho, Ullman and Hopcroft.

Computer Science & Engineering

MOOC II   Deep Learning
Course Code:20A05M16a   MINOR DEGREE (R20)   L T P C :0 0 0
2

Course Objectives:
- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyperparameters in a neural network's architecture

Course Outcomes:
After completion of the course, students will be able to
- Demonstrate the mathematical foundation of neuralnetwork
- Describe the machine learningbasics
- Differentiate architecture of deep neuralnetwork
- Build a convolutional neuralnetwork Build and train RNN andLSTMs

UNIT-I**: Linear Algebra & Probability and Information Theory**
Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.
Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT-II: **Machine Learning**
Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT-III: **Regularization for Deep Learning**
Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT-IV: **Convolutional Networks**
The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

UNIT-V: **Sequence Modelling**
Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent

Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Textbooks:

1) Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press,2016.

2) Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition,2017.

Reference Books:

1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers,2019.

2) Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O'Reilly, Shroff Publishers,2019.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I Civil
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Experimental Stress Analysis	L	T	P	C
20A50105		3	0	0	3
	Semester		V		

Course Objectives:
1. To understand different methods of experimental stress analysis
2. To understand the use of strain gauges for measurement of strain
3. To be exposed to different Non destructive methods of concrete
4. To understand the theory of photo elasticity and its applications in analysis of structures
5. To understand different methods of photo elasticity

Course Outcomes (CO):
1. Understand different methods of experimental stress analysis
2. Understand the use of strain gauges for measurement of strain
3. Expose to different Non destructive methods of concrete
4. Understand the theory of photo elasticity and its applications in analysis of structures
5. Understand different methods of photo elasticity

UNIT - I
PRINCIPLES OF EXPERIMENTAL APPROACH:Merits of Experimental Analysis Introduction, uses of experimental stress analysisAdvantages of experimental stress analysis, Different methods –Simplification of problems.

UNIT - II
STRAIN MEASUREMENT USING STRAIN GAUGES :Definition of strain and its relation of experimental Determinations Properties of Strain-
Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – Various types –Gauge factor – Materials of adhesion base.

UNIT - III
STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:
Introduction – The three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge.
Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.

UNIT - IV
THEORY OF PHOTOELASTICITY: Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polar scope for various arrangements – Fringe Sharpening. Brewster's Stress Optic law.
UNIT - V
TWO DIMENSIONAL PHOTOELASTICITY:Introduction – Isochramic Fringe patterns-Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials.

Textbooks:
  1. Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises2005
       2. Experimental stress analysis by Dr.SadhuSingh.khanna Publishers 4th edition

Reference Books:
  1. Experimental Stress analysis by U.C.Jindal, Pearson Pubilications 2012 edition
  2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.

Online Learning Resources:

Course Code	ELECTRIC VEHICLE ENGINEERING		L	T	P	C
20A50205	**(OE-I) EEE**		**3**	**0**	**0**	**3**
Pre-requisite	AC & DC Machines	**Semester**	**V**			

Course Objectives: The student will be able to:
- Understand latest trends in Electric Vehicles; parameters used in EV and types of EVs.
- Analyze various energy sources available to run EV like batteries, fuels cells etc.
- Analyze the dynamics and the propulsion system used in EVs, working of fuel cells, battery charging concept.
- Design a electromechanical system using various control techniques.

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

CO1: Understand the difference between conventional and latest trends in Electric Vehicles; understand the various parameters used in EV, types of HEVs.

CO2: Analyze various energy sources available to run EV like batteries, fuels cells etc.

CO3: Analyze the propulsion system of EV, its dynamics and the concept of battery charging.

CO4: Design EV system with battery charger using various fundamental concepts.

UNIT - I	INTRODUCTION TO EV SYSTEMS AND PARAMETERS	Lecture Hrs: 10

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT - II	EV AND ENERGY SOURCES	Lecture Hrs: 08

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT - III	EV PROPULSION AND DYNAMICS	Lecture Hrs: 10

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

UNIT - IV	FUEL CELLS	Lecture Hrs: 10

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.
Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

UNIT - V	BATTERY CHARGING AND VEHICLE CONTROL	Lecture Hrs: 10

Battery charging: Battery Chemistry, Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Battery Management System: Introduction and BMS functionality, Battery pack topology, Voltage, Temperature and Current Sensing.

Control: Introduction, modelling of electro mechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle
Textbooks:C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.   1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:
   1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
   2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.
   3. Tom Denton, "Electric and Hybrid Vehicles", TAYLOR & FRANCIS; 2nd edition, CBS PUBLISHERS, 2nd Edition, 2020.
   4. MehrdadEhsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
   5. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.

Online Learning Resources:
1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

Open Elective Course – I Mechanical
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
2050305	**OPTIMIZATION TECHNIQUES**	3	0	0	3

Course Objectives:
   To introduce various optimization techniques i.e classical, linear programming,

   Transportation problem, simplex algorithm, dynamic programming Constrained and unconstrained optimization techniques for solving and optimizing.
   Electrical and electronic engineering circuits design problems in real world situations.
    To explain the concept of Dynamic programming and its applications to project
   Learn the knowledge to formulate optimization problems

UNIT - I

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints– method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT - II

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT - III

Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems

UNIT – IV

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT V

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam and general optimization model of a machining process.

Course Outcomes:

After completion of this course, the student will be able to explain the need of optimization of engineering systems

   understand optimization of electrical and electronics engineering problems

apply classical optimization techniques, linear programming, simplex algorithm,

• transportation problem apply unconstrained optimization and constrained non-linear programming anddynamic programming Formulate optimization problems.

TEXT BOOKS:

Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers

Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

Engineering Optimization – S.S.Rao, New Age Publishers

REFERENCES:

1.Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers

Genetic Programming- Koza

Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I ECE
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BASICS OF ELECTRONICS AND	L	T	P	C
20A50405	COMMUNICATION ENGINEERING	3	0	0	3
	Semester V				

Pre-requisite
Applied Physics
Course Objectives:
- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

Course Outcomes (CO): At the end of this course, the students will be able to
- Understand the basic principle, construction and operation of semiconductor devices.
- Learn the real time applications of semiconductor devices.
- Comprehend the binary number systems, logic gates and digital logic circuits.
- Understand the basic principles of communication systems and their applications.
- Measure the physical parameters using Sensors and Transducers.

UNIT - I
Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

UNIT - II
Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

UNIT - III
Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

UNIT - IV
Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

UNIT - V
Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Textbooks:
1. Millman J, Halkias C.C and Jit S, "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition.
2. Mano M.M., "Digital Design", Prentice-Hall, 3rd Edition. 2002
3. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", DhanpatRai& Co. 3rd edition Delhi, 2010.
4. Kennedy G. and Davis B., "Electronic Communication Systems", Tata McGraw-Hill, 4th 2008 Edition.

Reference Books:
1. Tomasi W., "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, 6th 2004 Edition.
2. Boylstead R.L. and Nashelsky L., "Electronic Devices and Circuit Theory", Pearson, 10th 2009 Edition.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I CSE
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
INTRODUCTION TO JAVA PROGRAMMING
Course Code:20A50505   Semester V(R20)   L T P C : 3 0 0 3

Course Objectives:
- To understand object-oriented concepts and problem-solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes:
CO6: Solve real-world problems using OOP techniques.
CO7: Apply code reusability through inheritance, packages and interfaces
CO8: Solve problems using java collection framework and I/O classes.
CO9: Develop applications by using parallel streams for better performance and develop applets for web applications.
CO10: Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT – I: Introduction
Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT – II: Inheritance, Packages, Interfaces
Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT – III: Exception handling, Stream based I/O
Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.
Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT – IV: Multithreading, The Collections Framework
Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.
The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT – V: **Applet, GUI Programming with Swings, Accessing Databases with JDBC**
Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets
GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog.
Accessing Databases with JDBC:
Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:
1.   Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2.   Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:
  13. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
  14. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
  15. Java Programming for core and advanced learners, Sagayaraj, Dennis, KarthikandGajalakshmi, University Press
  16. Introduction to Java programming, Y. Daniel Liang, Pearson Education

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I Chemical
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code		L	T	P	C
20A50805	**ENERGY CONVERSION AND STORAGE DEVICES**	3	0	0	3

Pre-requisite

Course Objectives:
1. Understand the fundamentals of fossil energy sources, solar, biomass and electrochemical energy etc
2. Understand the basics of photosynthetic, photocatalytic and photoelectrochemical systems and devices for the efficient energy and fuels production.
3. Learn the principles and operations of electrochemical energy storage devices,

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

CO1   Understand the need of energyconversion and the various methods of energy storage

CO2   Identify Winds energy as alternateform of energy and to know how itcan be tapped

CO3   Understand the nuclear and bio energy, its mechanism of production and its applications

CO4   Analyse chemical, electrochemical energy storage devices and interpret the conversion efficiencies

CO5   Explain bio gas generation and itsimpact on environment

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT - I
Outline of the course. Introduction and scope of energy conversion. World Energy Production and Balance. Motivations for studying future energy systems (e.g. pollution, climate change, energy security).

UNIT - II
Fossil Energy: Overview of fossil fuel resources and energy contents. Cycle analysis (Rankine, Brayton, combined cycles, cogeneration)

Nuclear Energy: nuclear reaction and energy conversion physics (fission and fusion), nuclear power systems

UNIT - III

Solar-thermal energy: solar thermal radiation physics, Active and passive solar-thermal energy collection and conversion systems

Photoelectric energy: Photoelectric physics. Solar photovoltaic cell materials and technology

Wind Energy: Wind interaction with objects fluid dynamics. Wind harvesting devices and systems

UNIT - IV

Biomass and Waste to Energy: Potential and resources of biomass and waste energy. Thermal-chemical and bio-chemical conversion methods

Overview of Climate Control, CO_2 Sequestration and Energy Sustainability

UNIT - V

Basic of Electrochemical energy conversion and storage, Fundamentals of Fuel Cells, Basics of Fusion power, Energy Storage Technologies, Mechanical storage, Chemical storage, Electrical storage

Textbooks:

Energy Systems Engineering, F.M. Vanek, L.D Albright, and LargusAngenent, Second Edition, McGraw-Hill, Inc., 2012,

Reference Books:

- AngèleReinders, Pierre Verlinden, Wilfried van Sark, Alexandre Freundlich, Photovoltaic Solar Energy:From Fundamentals to Applications, JOHN WILEY.
- Alexander P. Kirk, Solar Photovoltaic Cells: Photons to Electricity, ELSEVIER
- Francesco Dalena, Angelo Basile, Claudio Rossi, Bioenergy Systems For The Future: Prospects ForBiofuels And Biohydrogen, 1st Edition, ELSEVIER
- Jean-Marie Tarascon, Patrice Simon, ELECTROCHEMICAL ENERGY STORAGE,
- Electrochemistry by Carl H. Hamann, Andrew Hamnett and Wolf Vielstich, Wiley VCH, 1998.
- Modern Electrochemistry 1. Volume 1 and 2, by J. O'M. Bockris and A. K. N. Reddy, Kluwer Academic,2000.
- Electrochemical Methods, by A. J. Bard and L. R. Faulkner, John Willey, 1980
- John Love and John A. Bryant, Biofuels and Bioenergy, John Wiley
- Anju Dahiya, Bioenergy: Biomass to Biofuels, Elsevier

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I Mathematics
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Optimization Methods	L	T	P	C
20A55101	B.Tech III Year (Common for all) Open elective course -1	0	3	0	3
Pre-requisite	--	Semester	I		

Course Objectives:	
This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.	
Course Outcomes (CO): Student will be able to	

- formulate a linear programming problem and solve it by various methods.
- give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
- identify strategies in a game for optimal profit.
- implement project planning.

UNIT - I		8 Hrs
Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.		

UNIT - II		8 Hrs
Transportation problems- assignment problems-Game theory.		

UNIT - III		9 Hrs
CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.		

UNIT - IV		8 Hrs
Sequencing Problems-Replacement problems-Capital equipment- Discounting costs-Group replacement .		

UNIT - V		9 Hrs
Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.		

Textbooks:
1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.

3. Operations Research, Nita H Shah, Ravi M Gor, HardikSoni, PHI publishers
Reference Books:
1. Problems on Operations Research, Er. Premkumargupta, Dr.D.S. Hira, Chand publishers 2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav
Online Learning Resources:
https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf https://slideplayer.com/slide/7790901/ https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I Physics
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
20A55201	**MATERIALS CHARACTERIZATION TECHNIQUES**	3		-	3

COURSE OBJECTIVES	
1	To provide an exposure to different characterization techniques.
2	To explain the basic principles and analysis of different spectroscopic techniques.
3	To elucidate the basic principle of Scanning electron microscope along with its limitations and applications.
4	To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
5	To educate the uses of advanced electric and magnetic instruments for characterization.

COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To explain the structural analysis by X-ray diffraction.
CO2	To understand the morphology of different materials using SEM and TEM.
CO3	To recognize basic principles of various spectroscopic techniques.
CO4	To apprehend the electric and magnetic properties of the materials.
CO5	To make out which technique has to be used to analyse a material

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3   **Hours of teaching: - 45 H**

UNIT-I   **9H**

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure,Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT-II   **9H**

Microscopy technique -1 –Scanning Electron Microscopy (SEM)
Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (SecondaryElectron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT-III   **9H**

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy,Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT-IV   **9H**

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy(ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT-V   **9H**

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method,Vibrating sample Magnetometer (VSM) and SQUID.

TEXT BOOKS:

1. Material Characterization: Introduction to Microscopic and Spectroscopic   Methods –Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008

2. Hand book of Materials Characterization -by **Sharma** S. K. - S**pringer**

REFERENCES:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, PrenticeHall, 2001 – Science

3. Materials Characterization: Introduction to Microscopic and Spectroscopic

Methods-Yang

Leng- John Wiley & Sons

4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley(Bp)

5. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan,John Wiley & Sons Ltd., 2008.

NPTEL courses

https://nptel.ac.in/courses/115/103/115103030/
https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Course Code	**E-Business**	**L**	**T**	**P**	**C**
20A55401		**3**	**0**	**0**	**3**

Pre-requisite

Course Objectives:

1.	To provide knowledge on emerging concept on E-Business related aspect.
2.	To understand various electronic markets models which are trending in India
3.	To give detailed information about electronic payment systems net banking.
4.	To exact awareness on internet advertising, market research strategies and supply chain management.
5.	To understand about various internet protocols-security related concept.

Course Outcomes (CO):

1	They will be able to identify the priority of E-Commerce in the present globalised world.
2	Will be able to understand E-market-Models which are practicing by the organization
3.	Will be able to recognize various E-payment systems & importance of net banking.
4.	By knowing E-advertisement, market research strategies, they can identify the importance of customer role.
5.	By understanding about E-security, they can ensure better access control to secure the information
6	Develop a personal synthesis and approach towards E-Business

 UNIT – I   **Electronic Business**

Definition of Electronic Business - Functions of Electronic Commerce (EC) - Advantages of

E-Commerce – E-Commerce and E-Business Internet Services Online Shopping-Commerce

Opportunities for Industries.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the concept of E-Business
- ➢ Contrast and compare E-Commerce E-Business
- ➢ Analyze Advantages of E-Commerce
- ➢ Evaluate opportunities of E-commerce for industry

UNIT - II   Electronic Markets and Business Models

E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals - Business Models-Business to Business(B2B)-Business to Customers(B2C)-Business to Government(B2G)-Auctions-B2B Portals in India

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the concept of business models
- ➢ Contrast and compare Vertical portal and Horizontal portals
- ➢ Analyze Advantages of portals
- ➢ Explain the B2B,B2C and B2G model

UNIT - III   III Electronic Payment Systems

Digital Payment Requirements-Designing E-payment System- Electronic Fund Transfer (EFT)-Electronic Data Interchange (EDT)-Credit Cards-Debit Cards-E-Cash-Electronic Cheques -Smart Cards-Net Banking-Digital Signature.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the Electronic payment system
- ➢ Contrast and compare EFT and EDT
- ➢ Analyze debit card and credit card
- ➢ Explain the on Digital signature

UNIT - IV   E-Security

Internet Protocols - Security on the Internet –Network and Website Security – Firewalls – Encryption – Access Control – Secure Electronic transactions.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand E-Security
- ➢ Contrast and compare security and network
- ➢ Analyze Encryption
- ➢ Evaluate electronic transitions

UNIT - V   E-Marketing

Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Online Market Research–   Data mining and Marketing   Research Marketing Strategy On the Web – E-Customer Relationship Management(e-CRM) –E- Supply Chain Management.(e-SCM) –New Trends in Supply

Chain Management.

LEARNING OUTCOMES:- After completion of this unit student will

- ➢ Understand the concept of online marketing
- ➢ Analyze advantages of online marketing
- ➢ Compare the e-CRM and e-SCM
- ➢ Explain the New trends in supply chain management

Textbooks:
1. **E-Commerce by C.S.V Murthy** Himalaya publication house, 2002.

2. **E-Commerce by** P.T.S Joseph, Fourth Edition, Prentice Hall of India 2011

Reference Books:
1. **E-Commerce: by** KamaleshKBajaj,DebjaniNa, Second Edition TataMcGrwHills 2005

2. **E-Commerce E-Management: by Dave Chaffey** – Second Edition, Pearson, 2012.

3. **E-Commerce Fundamentals and Application; by** Henry Chan, Raymond Lee,Tharm Wiley India 2007

4. **E-Commerce: by** S. Jaiswall Galgotia Publication Pvt Ltd 2003.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – I
III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
20A55301	**CHEMISTRY OF ENERGY MATERIALS**	2	1	-	3

COURSE OBJECTIVES	
1	To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2	To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
3	To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
4	Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
5	To understand and apply the basics of calculations related to material and energy flow in the processes.

COURSE OUTCOMES	
CO1	Solve the problems based on electrode potential,Describe the Galvanic Cell Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2	Describe the working Principle of Fuel cell,Explain the efficiency of the fuel cell Discuss about the Basic design of fuel cells,Classify the fuel cell
CO3	Differentiate Chemical and Physical methods of hydrogen storage,Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures Describe the liquification methods
CO4	Apply the photo voltaic technology,Demonstrate about solar energy and prospects Illustrate the Solar cells,Discuss about concentrated solar power
CO5	Differentiate between Photo and Photo electrochemical Conversions,Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT-1: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batterie**s.-**

UNIT-2: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,

UNIT-3: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

UNIT-4: Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells   .

UNIT-5: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

References :
1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II Civil
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Disaster Management	L	T	P	C
20A60105		3	0	0	3

Course Objectives:
1. To give knowledge types of disasters and stages in disaster rehabilitation process.
2. To make awareness on change in climates and their impacts on occurrence of environmental disasters.
3. To impart knowledge on Consideration of wind and water effects as per codal provisions to withstand disasters.
4. To familiarize the student with the Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. To illustrate the methodology in Planning and design considerations of various structures constructing in disaster prone areas.

Course Outcomes (CO):
1. About various types of disasters and stages in disaster rehabilitation process.
2. Impact of change in climates and their impacts on occurrence of environmental disasters.
3. Adopting suitable codal provisions to study the effect of wind and water effects on various structures constructed at disaster prone areas.
4. Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. Adopt suitable Planning and design considerations of various structures constructing in disaster prone areas.

UNIT - I
Brief introduction to different types of natural disaster, Occurrence of disaster in different climatic and geographical regions, hazard (earthquake and cyclone) map of the world and India, Regulations for disaster risk reduction, Post disaster recovery and rehabilitation (socioeconomic consequences)

UNIT - II
Climate change and its impact on tropical cyclone, Nature of cyclonic wind, velocities and pressure, Cyclone effects, Storm surge, Floods, Landslides. Behavior of structures in past cyclones and wind storms, case studies. Cyclonic retrofitting, strengthening of structures and adaptive sustainable reconstruction. Life–line structures such as temporary cyclone shelter.

UNIT - III
Basic wind engineering, aerodynamics of bluff bodies, vortex shedding and associated unsteadiness along and across wind forces. Lab: Wind tunnel testing, its salient features. Introduction to Computational fluid dynamics. General planning/design considerations under

wind storms & cyclones; Wind effects on buildings, towers, glass panels etc, & wind resistant features in design. Codal Provisions, design wind speed, pressure coefficients; Coastal zoning regulation for construction & reconstruction phase in the coastal areas, innovative construction material & techniques, traditional construction techniques in coastal areas.

UNIT - IV

Causes of earthquake, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release and ground motions. Earthquake effects – On ground, soil rupture, liquefaction, landslides. Performance of ground and building in past earthquakes: Behavior of various types of buildings, structures, and collapse patterns; Behavior of Non-structural elements like services, fixtures, mountings- case studies. Seismic retrofitting- Weakness in existing buildings, aging, concepts in repair, restoration and seismic strengthening.

UNIT - V

General Planning and design consideration; Building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.; Seismic effects related to building configuration. Plan and vertical irregularities, redundancy and setbacks. Various Types and Construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under-ground – overhead tanks, staircases and isolation of structures; innovative construction material and techniques; Local practices: traditional regional responses; Computational investigation techniques.

Textbooks:
1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Management by R.B. Singh (Ed) Rawat Publication, New Delhi, 2000

Reference Books:
1. Natural disasters. By Abbott, L. P. (2013) 9th Ed. McGraw-Hill.
2. Earthquake Resistant Design of Structures. By Agarwal, P. and Shrikhande, M. (2009). New Delhi : PHI Learning.
3. Mapping Vulnerability: Disasters, Development and People. byBankoff, G., Frerks, G. and Hilhorst, D. (2004). London :Earthscan.
4. Improving Earthquakes and Cyclone Resistance of Structures:Guidelines for the Indian Subcontinent. TERI
5. Disaster Mitigation, preparedness, recovery and Response. By Sinha, P. C. (2006). New Delhi : SBS Publishers.
6. World Bank. (2009). Handbook for Reconstructingafter Natural Disasters.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II EEE
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	RENEWABLE ENERGY SYSTEMS		L	T	P	C
20A60205	(OE-II)		3	0	0	3
Pre-requisite		Semester	VI			

Course Objectives: To make the students learn about:

- Various sources of Energy and the need of Renewable Energy Systems.
- The concepts of Solar Radiation, Wind energy and its applications.
- Operation of Solar thermal and solar PV systems
- The concept of geo thermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

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

CO 1 Understand various alternate sources of energy for different suitable application requirements.
CO 2 Analyze the concepts of solar energy generation strategies and wind energy system
CO 3 Design Solar and Wind energy systems.
CO 4 Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

UNIT - I	SOLAR ENERGY	Lecture Hrs: 10

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT - II	PV ENERGY SYSTEMS	Lecture Hrs: 10

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT - III	WIND ENERGY	Lecture Hrs: 10

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT - IV	GEOTHERMAL ENERGY	Lecture Hrs: 8

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT - V	MISCELLANEOUS ENERGY TECHNOLOGIES	Lecture Hrs: 10

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business-models
https://www.slideshare.net/RiteshGoyal/electronic-payment-system
https://www.slideshare.net/WelingkarDLP/electronic-security
https://www.slideshare.net/Ankitha2404/emarketing-ppt

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II Mechanical
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
20A60305	**SOLAR ENERGY SYSTEMS**	3	0	0	3

Course objectives

Learning the fundamental principles of solar radiation and geographic distribution of solar radiation.

Study of various solar energy technologies with different types of concentrating collectors.

Comparative study of different solar cells with respect to properties and applications of solar cells in nano technology.

Understanding the basics of economics involves in the solar system.

Learning the concepts and designing aspects in thermal power. 6. Study of solar pond and solar stills and their applications.

UNIT – I
SOLAR RADIATION:
Sources of radiation –sun earth relationship, Solar Time and angles, day length, angle of incidence on tilted surface; Sun path diagram, Solar Radiation: Extraterrestrial Radiation; Effect of earth atmosphere; Estimation of solar radiation on horizontal and tilted surfaces. Geographic Distribution of solar radiation, Phyrellio, pyranometer, equation of time-estimation of average radiation falling on tilled.

UNIT-II
SOLAR ENERGY TECHNOLOGIES:
Performance analysis of a liquid Flat-plate collector, Total loss coefficient and heat losses: Top loss coefficient, Bottom loss coefficient, Side loss coefficient. Solar concentrating collectors, types of concentrating collectors, Parabolic Dish System, The central power tower system, The Parabolic Trough System, Tracking CPC and Solar Swing, Performance analysis of cylindrical parabolic collector, Compound parabolic concentrator (CPC).

UNIT-III
SOLAR CELLS:
Solar cell fundamentals, solar cell classification, solar cell, module, panel array construction, maximum power pint trackers(MPPT), solar PV applications, The Recent developments in Solar cells, Role of Nano-Technology in Solar cells.

UNIT – IV
ECONOMICS:
Discounted Cash Flow-light cycle, coasting of solar system, production function and optimization

UNIT – V
THERMAL POWER:
The power concepts- design aspects, thermo-chemical reactor.
SOLAR POND AND SOLAR STILLS:
Working Principle-Construction-operating difficulties and remedies, Agriculture and
Domestic applications: Still, timber drying, crop drying, cooker.
Course Outcomes :
 Illustrate the fundamental principles of solar radiation and geographic distribution of solar
radiation.
 Obtaining the performance analysis of liquid flat plate collector and cylindrical parabolic
collector.
 Developing solar cells in the field of nano technology.
 Calculating the cash flow and costs involves in the solar energy systems.
 Designing and developing of thermo chemical reactor with respect to thermal power.

Reference Books:
  Solar Energy Thermal Process Diffice and Beckman
  Solar Heating and Cooling by Kreith and Kreider
  Solar Energy Utilization by G.D.Rai
 Solar Energy Utilization by G.D.Rai , Khanna Publishers.
 Renewable Energy Sources and Emerging Technologies- By D.P. Kothari, PHI Pub.,
 Applied Solar Energy by Meinel and Meinel
 Non-Conventional Energy Resources by B.H . Khan, Tata McGraw Hill
Energy Resources Utilization and Technologies ByAnjaneyulu, BS Pub.

Course Code	BASICS OF INTEGRATED CIRCUITS	L	T	P	C
20A60405	APPLICATIONS	3	0	0	3

\Pre-requisite
Basics of Electronics and Communication Engineering

Course Objectives:
- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes (CO): At the end of this course, the students will be able to
- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications.
- Develop, apply and analyze circuits for advanced applications using Op-Amps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT - I
Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II
Op-Amp, IC-555 & IC 565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT - III
Data Converters: Introduction, Basic DAC techniques, Different types of DACs- Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL

Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic ICs and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:
1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:
1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
3. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II CSE
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Introduction to Linux Programming

Course Code:20A60505   **L T P C : 3 0 0 3**

Course Objectives:
- To study the commands according to user requirements.
- To utilize Shell scripts to perform the given task.
- To enable writing own programs in UNIX.
- To know AWK programs.

Course Outcomes:
CO1: Develop text data processing applications using Unix commands and filters.
CO2: Design and develop text based user interface components
CO3: Understand user management, network management and backup utilities
CO4: Use the system calls for file management
CO5: Understands the Concept of Process Threads and File Structure.

UNIT-I: Introduction,Unix File System,Unix Commands
Operating System, History of UNIX, Overview and Features of Unix System,Structure of Unix System, Unix Environment. **Unix File System**: Introduction of Files, Organization of File Systems, Accessing File Systems, Structure of File Systems. **Unix Commands**: Basic Commands, Advanced Unix Commands: File Access Permissions, Pipe Operator, cut, paste, wc, sort, head, tail, diff, cmp, uniq, comm, time, Conversions between DOS and Unix, man.

UNIT-II: File management and Compression Techniques,Manipulating Processes and Signals
Managing and Compressing Files, Computer Devices, Disk related Commands, Compression and Uncompressing Files, Important Unix System Files, Shell Variables, Export of Local and Global Shell Variables.

Manipulating Processes and Signals: Process Basics, Processes States and Transitions, Zombie Process, Context switching, Threads, ps-status of Process.

UNIT-III: System calls
Introduction, File-related System calls (open, create, read, write, lseek), File-related System calls (close, mknod, link and unlink, access, and chown, chmod), Directory Handling System calls (mkdir, rmdir, chdir, opendir, readdir, telldir, closedir), Process related System calls (exec, fork, wait,exit).
Editors in Unix: introduction, Stream editor, Emacs Editor.

UNIT-IV: AWK Script,Burne Shell

AWK Command, print, printf, Displaying Content of Specified Patterns, Comparison Operators, Compound Expressions, Arithmetic Operators, Begin and end Sections, User-defined Variables, if else Statement, Built-in Variables, Changing Input Filed Separator, Functions, Loops, Getting Input from User, Search and Substitute Functions, Copying results into Another file.

Bourne Shell: Introduction, beginning Bourne Shell Scripting, Writing Shell Scripts, Command Line Parameters, read, for Loop, While Loop, if Statement, Bourne Shell Commands.

UNIT-V: InterprocessCommunicaation, Unix System Administration and Networking

Interprocess Communication, Synchronization, Filters.

Unix System Administration and Networking: Unix Booting Procedure,Mounting Unix File System, Unmounting Unix File System, Managing User Accounts, Networking Tools, mail Command, Distributed File System, Firewalls, Backup and Restore.

TEXT BOOKS

1. "UNIX and SHELL Programming", B.M. HARWANI, OXFORD UNIVERSITY PRESS.

REFERENCES

1. "UNIX and Linux System Administration Handbook", Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, PHI

Open Elective Course – II Chemical

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	OE2. GREEN TECHNOLOGY	L	T	P	C
20A60805		3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

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

CO1	Understand the basic knowledge of environmental issues and estimate the risk
CO2	Evaluate the exposures
CO3	To discuss the type of wastes and emissions that drive the environmental impacts
CO4	Estimation of the environmental properties, persistence, ecosystem risk,
CO5	To present approaches and methodologies for evaluating and improving the environmental performance of chemical processes and chemical products.

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

An introduction to environmental issues: Role of chemical processes and chemical products, Global environmental issues, Air and water quality issues, Ecology.

Risk concept: Description of risk, Risk assessment concept, Dose-response, Exposure assessment.

UNIT - II

Evaluating exposures: Occupational exposures: recognition, evaluation, control, Exposure assessment for chemicals in the ambient environment, Designing safer chemicals.

Green chemistry:Green chemistry methodologies, Optimization based frameworks for the design of green chemical synthesis pathway.

UNIT - III

Evaluating environmental fate: Chemical and physical property estimation, estimating environmental persistence, estimating ecosystem risk, classifying environmental risk based on chemical structure.

UNIT - IV

Life-cycle concepts: Life-cycle assessment, Life-cycle impact assessment

UNIT - V

Material flows in chemical manufacturing, Assessing opportunities for waste exchanges and by-product synergies.

Textbooks:

SHONNARD, DALLEN, D. Green Engineering: Environmentally Conscious Design of Chemical Processes.

Reference Books:

Online Learning Resources:

Course Code	Mathematical Modelling & Simulation		L	T	P	C
20A65101	(Common for CIVIL,MECH&CHEM)		0	3	0	3
Pre-requisite		Semester	II			

Course Objectives:
This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.
Course Outcomes (CO): Student will be able to
- understand basic Model Forms.   - understand basic Simulation Approaches.   - evaluate handling Stepped and Event-based Time in Simulations.   - distinguish Discrete versus Continuous Modeling.   - apply Numerical Techniques.   - calculate Sources and Propagation of Error.

UNIT - I		8 Hrs
Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modelling-Numerical Techniques-Sources and Propagation of Error		

UNIT - II		9 Hrs
Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations		

UNIT - III		8 Hrs
Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms-Handling Inter-partition Dependencies		

UNIT - IV		8 Hrs
Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise-Random Variates Generation-Sensitivity Analysis		

UNIT - V		9 Hrs
Simulations Results Analysis and Viewing Tools-Display Forms: Tables, Graphs, and Multidimensional Visualization-Terminals, X and MS Windows, and Web		

Interfaces-Validation of Model Results.
Textbooks:
1. Mathematical modeling, JN Kapur, Newage publishers 2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers by Kai Velten, Wiley Publishers
Reference Books:
1. Introduction to Mathematical Modeling and Computer Simulations By Vladimir Mityushev, WojciechNawalaniecNataliaRylko Published by Chapman and Hall/CRC.
Online Learning Resources:
http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379 https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers

Course Code	Wavelet transforms and its Applications		L	T	P	C
20A65102	(Common for EEE&ECE)		0	3	0	3
Pre-requisite	Fourier Series	Semester	II			

Course Objectives:	

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes (CO): Student will be able to

- understand wavelets and wavelet expansion systems.
- illustrate the multi resolution analysis ad scaling functions.
- form fine scale to coarse scale analysis.
- find the lattices and lifting.
- perform numerical complexity of discrete wavelet transforms.
- find the frames and tight frames using Fourier series.

UNIT - I	Wavelets	9 Hrs

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems - Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform The Discrete-Time and Continuous Wavelet Transforms.

UNIT - II	A Multiresolution Formulation of Wavelet Systems	8 Hrs

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT - III	Filter Banks and the Discrete Wavelet Transform	9 Hrs

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT - IV	Time-Frequency and Complexity	9 Hrs

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-

Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.		
UNIT - V	Bases and Matrix Examples	8 Hrs
Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.		

Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms",Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999).

Reference Books:

1. Raghuveer Rao, "Wavelet Transforms", Pearson Education, Asia.

Online Learning Resources:

https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF MATHEMATICS

Course Code	Statistical Methods for Data Science		L	T	P	C
20A65103	CSE (Data Science)			3		3
Pre-requisite		Semester	II			

Course Objectives:

This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples.

Course Outcomes (CO): Student will be able to

- Understand the basic concepts of Statistics
- Analyze data and draw conclusion about collection of data under study using Point estimation
- Analyze data and draw conclusion about collection of data under study using Interval estimation
- Analyzing the tests and types of errors for large samples
- Apply testing of hypothesis for small samples.

UNIT - I	Basic Concepts	9 Hrs

Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency – Factorization Theorem – Minimal sufficiency; Efficiency – Most efficient estimator, likelihood equivalence, Uniformly minimum variance unbiased estimator,applications of Lehmann-Scheffe's Theorem, Rao - Blackwell Theorem and applications

UNIT - II	Point Estimation	8 Hrs

Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator(without proof)- applications , Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.

UNIT - III	Interval Estimation	8 Hrs

Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT - IV	Testing of hypotheses	9 Hrs

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio

tests: Description and property of LR tests - Application to standard distributions.

UNIT - V	Small sample tests	9 Hrs

Student's t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances,CRD,RBD,LSD; Chi-square test for goodness of fit and test for independence of attributes, χ^2 test for testing variance of a normal distribution

Sign test, Signed rank test, Median test, Mann-Whitney test, Run test and One sample Kolmogorov –Smirnov test ,Kruskal – Wallis H test(Description, properties and applications only).

Textbooks:

1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of
   Hypotheses, Prentice Hall of India, 2014.
2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition,Pearson publishers,2013.

Reference Books:

1. S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
2. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.

Online Learning Resources:

1. https://www.statstutor.ac.uk/resources/uploaded/1introduction3.pdf
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996198/

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

COURSE OBJECTIVES

1 To impart the fundamental knowledge on various materials, their properties and **Applications.**

2 To provide insight into various semiconducting materials and their properties.

3 To elucidate the characteristic behavior of various semiconductor devices.

4 To provide the basics of dielectric and piezoelectric materials and their properties.

5 To explain different categories of magnetic materials, mechanism and their advanced applications.

COURSE OUTCOMES

At the end of the course the student will be able

CO1 To understand the fundamentals of various materials.

CO2 To exploit the physics of semiconducting materials

CO3 To familiarize with the working principles of semiconductor-based devices.

CO4 To understand the behavior of dielectric and piezoelectric materials.

CO5 To make use of the magnetic materials for advanced applications.

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS **Credit: 3 Hours of teaching: - 45 H**

UNIT-1   Fundamentals of Materials Science: 9H

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects.Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT-2:   Semiconductors: 9H

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT-3:   Physics of Semiconductor Devices: 9H

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium.and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT-4:   Dielectric Materials and their Applications: 9H

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties- Ferroelectricity-Applications.

UNIT-5:   Magnetic Materials and their Applications: 9H
Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Text Books
1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, DhanpatRai and Co.
Reference Books:
1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011
4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland,Chapman& Hall Pub.
6. Electrical Engineering Materials-by A.J. Dekker, PHI Pub

NPTEL courses links
https://nptel.ac.in/courses/113/106/113106062/
https://onlinecourses.nptel.ac.in/noc20_mm02/preview
https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II H& SS
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Academic Writing and Public Speaking		L	T	P	C
20A65501			3	0	0	3
Pre-requisite						

Course Objectives:
- ➢ To encourage all round development of the students by focusing on writing skills
- ➢ To make the students aware of non-verbal skills
- ➢ To develop analytical skills
- ➢ To deliver effective public speeches

Course Outcomes (CO):

By the end of the program students will be able to

- Define various elements of Academic Writing

- Understand how to paraphrase sources and avoid plagiarism

- Demonstrate the knowledge in writing a Research paper

- Analyse different types of essays

- Assess the speeches of others and know the positive strengths of speakers

- Build confidence in giving an impactful presentation to the audience

UNIT - I	Introduction to Academic Writing	Lecture Hrs
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing		

UNIT - II	**Academic Journal Article**	Lecture Hrs
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism		

UNIT - III	**Essay & Writing Reviews**	Lecture Hrs
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review-		

UNIT - IV	Public Speaking	Lecture Hrs
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events		

UNIT - V	Public Speaking and Non-Verbal Delivery	Lecture Hrs
Body Language – Kinesics – Oculesics – Proxemics – Haptics – Paralanguage		

Textbooks:

1. **Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)**

2. **A Course In Academic Writing Paperback – 1 January 2017Publisher : The Orient Blackswan; Second edition (1 January 2017)**

Reference Books:

1. **A Handbook For Academic Writing and Composition Paperback – 1 January 2014** by Nzanmongi Jasmine PattonPublisher : Pinnacle Learning; 1st edition (1 January 2014)
2. Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010Publisher : Pearson Education; First edition (1 January 2010) by Marilyn Anderson (Author)
3. Effective Academic Writing Second Edition: 1: Student Book: The Paragraph Paperback – Student Edition, 9 June 2014 by Alice Savage (Author), MasoudShafiei (Author)Publisher : Oxford University Press; Student, Workbook edition (9 June 2014)
4. A Course In Academic Writing Paperback – 1 January 2017 by Renu Gupta (Author) Publisher : The Orient Blackswan; Second edition (1 January 2017)

Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8

2. phttps://www.youtube.com/watch?v=478ccrWKY-A

3. https://www.youtube.com/watch?v=nzGo5ZC1gMw

4. https://www.youtube.com/watch?v=Qve0ZBmJMh4

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
	CHEMISTRY OF POLYMERS AND ITS APPLICATIONS	2	1	-	3

COURSE OBJECTIVES	
1	To understand the basic principles of polymers
2	To synthesize the different polymeric materials and their characterization by various instrumental methods.
3	To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
4	To enumerate the applications of polymers in engineering

COURSE OUTCOMES	
CO1	Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
CO2	Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers, Characterize the properties of polymers by IR, NMR, XRD etc.
CO3	Describe the properties and applications of polymers, Interpret the properties of cellulose, lignin, starch, rosin, latex etc., Discuss the special plastics of PES, PAES, PEEK etc., Explain modified cellulosics
CO4	Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery, Demonstrate the advanced drug delivery systems and controlled release
CO5	Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., Explain photoelectron spectroscopy, Discuss ESCA and Auger spectroscopy to the study of surfaces, Differentiate micelles and reverse micelles

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit – I: Polymers-Basics and Characterization :-

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, co polymerization and coordination. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit – II: Synthetic Polymers

Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol – formaldehyde. Melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD

Unit – III : Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit-IV: Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Unit – V: Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and

Auger spectroscopy to the study of surfaces.

References :

1. A Text book of Polymer science, Billmayer

2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall

3. Advanced Organic Chemistry, B.Miller, Prentice Hall

4. Polymer Chemistry – G.S.Mishra

5. Polymer Chemistry – Gowarikar

6. Physical Chemistry –Galston

7. Drug Delivery- Ashim K. Misra

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III CIVIL
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Building Technology for Engineers	L	T	P	C

Course Code
20A70104   **3   0   0   3**

Course Objectives :

1. To make the student familiar with varioustypes of Buildings and its components
2. To teach the students about general requirements of building regarding safety and transportation
3. To impart knowledge on various special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. To make the student familiar with the concepts of various Prefabrication systems.
5. To Teach the students about various construction equipments used in building.

Course Outcomes:
By the end of this course the student will be able to
1. Classify various types of buildings and its components.
2. Understand the general requirements of building regarding safety and transportation.
3. Understand the Special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. Familiarize with the concepts of various Prefabrication systems.
5. Understand various construction equipments used in building.

UNIT-1

Building planning: Types of Buildings — components, definitions, economy and design, Principles and aspects of building planning, Definitions and importance of Grouping and circulation; Lighting and ventilation; Sustainability and Green Buildings.

UNIT-II

General requirements: Requirements for safety against fire, termite, damping, earthquakes, Vertical transportation in building — planning of vertical transportation, Stairs, different forms of stairs, Other modes of vertical transportation.

UNIT-III

Special Requirements: Air conditioning — process and classification of air conditioning, Dehumidification. Systems of air-conditioning, ventilation, functional requirements of ventilation. Thermal insulation. Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation.

UNIT-IV
Prefabrication systems: Prefabricated walls, openings, cupboards, shelves etc., planning and modules and sizes of components in prefabrication. Plumbing services — water supply system, maintenance of building pipe line, Sanitary fittings, Design of building drainage.

UNIT-V
Construction Equipment: Introduction and Planning for construction Equipment, Earthmoving and Excavating equipment, Pile driving equipment, Lifting and Concreting Equipment.

<u>Learning Resources:</u>

Text Books:
1. Building Construction, Punmia B. C., Jain A.J., and Jain A.J., Laxmi Publication, 2016, Eleventh Edition.
2. The Text book for Building Construction, Arora S. P., and Bindra S. P., Dhanpat Rai Pubications, 2010.

Reference Books:
1. Building Construction, Varghese P.C., PHI Learning Pvt. Ltd., 2017, 2nd Edition.
2. Construction Planning, Equipment and Methods, Robert P., Clifford J. S., and Aviad S., McGrawHiII Education, 2010

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III EEE
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BATTERY MANAGEMENT SYSTEMS		L	T	P	C
20A70204	(OE-III)		3	1	0	4
Pre-requisite	Basic Electrical Engineering	Semester	VI			

Course Objectives: To make the students learn about:

- Understand the role of battery management system and the requirements of BMS.
- Interpret the concept associated with battery charging / discharging process
- Analyze various parameters of battery and battery pack
- Design the model of battery pack

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Understand and remember the basic concepts and terminologies of Cells and Batteries, charging, discharging methods, concept of cell balancing.

CO2: Analyze BMS functionality, various sensors used, control techniques, Sate of Charge estimation, cell total energy and cell total power.

CO3: Apply the equivalent circuits, physical models, empirical modelling of BMS.

CO4: Design of Battery management system considering various parameters and through simulation.

UNIT - I	INTRODUCTION	Lecture Hrs: 14

Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging

UNIT - II	BATTERY MANAGEMENT SYSTEM	Lecture Hrs: 14

Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of charge estimation, Cell total energy and cell total power

UNIT - III	BATTERY STATE OF CHARGE AND STATE OF HEALTH ESTIMATION	Lecture Hrs: 12

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing

UNIT - IV	MODELLING AND SIMULATION	Lecture Hrs: 12

Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs

UNIT - V	DESIGN OF BATTERY MANAGEMENT SYSTEMS	Lecture Hrs: 12

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Textbooks:

1. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.

Reference Books:

1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.

2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010

3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

4. RuiXiong, "Battery management Algorithm for Electric Vehicles", China Machine Press, Springer,2020.

5. Bergveid, Krujit, Notten, " Battery Management Systems: Design by Modelling", Philips Research Book Series, Kluwer Academic Publishers.

Online Learning Resources:

1. https://www.coursera.org/learn/battery-management-systems

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code	Title of the Subject	L	T	P	C
20A70304	**MODERN MANUFACTURING METHODS**	3	0	0	3

Course Objectives:

To learn the importance and basics of unconventional machining.
To understand the rapid prototyping processes.
To have the knowledge of different micro machining methods
To understand the working principles of various Non-traditional machining methods.
To learn about Non-traditional forming processes.

UNIT-I

Need for Modern Manufacturing Methods: Non-traditional machining methods and rapid prototyping methods - their relevance for precision and lean manufacturing. Classification of non-traditional processes - their selection for processing of different materials and the range of applications.

Introduction to rapid prototyping - Classification of rapid prototyping methods - sterolithography, fused deposition methods - materials, principle of prototyping and various applications.

UNIT-II

Ultrasonic machining – Elements of the process, mechanics of material removal, process parameters, applications and limitations, Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal, descriptive of equipment, process variables, applications and limitations.

UNIT-III

Electro –Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM.

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications.

UNIT-IV

Thermal Metal Removal Processes: Basic principle of spark erosion (EDM), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy - Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process

variables, scope of applications and the process limitations.

UNIT-V

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations.

Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

Course Outcomes:

At the end of this course the student should be able to understand

Technical aspects of precision machining.

Applications of rapid prototyping technologies.

Tool selection for non-traditional processes. Knowledge of economic aspects of Non traditional processes.

Fabrication of microelectronic devices.

TEXT BOOKS:

Manufacturing processes for engineering materials by SeropeKalpakjian and Steven R Schmid, 5edn, Pearson Pub.

Advanced machining processes, VK Jain, Allied publishers.

REFERENCE:

New Technology , Bhattacharya A, The Institution of Engineers, India 1984

Manufacturing Technology, Kalpakzian, Pearson

Modern Machining Process, Pandey P.C. and Shah H.S., TMH.

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Electronic & Communication Engineering

Course Code	DIGITAL ELECTRONICS	L	T	P	C
20A70404		3	0	0	3

Pre-requisite		**Semester**	**VII**

Basics of Electronics and Communication Engineering

Course Objectives:
- To learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- To understand and design various combinational logic circuits like adders and code converters.
- To know the design of various combinational circuits useful to implement logic functions.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices.

Course Outcomes (CO): At the end of this course, the students will be able to
- Learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- Understand and design various combinational logic circuits like adders and code converters.
- Know the design of various combinational circuits useful to implement logic functions.
- Gain knowledge on the design of sequential logic circuits in synchronous and asynchronous modes.
- Understand the operation and uses of programmable logic devices.

UNIT - I
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT - II
Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT - III
Combinational Logic Design 2: Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT - IV

Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers.

UNIT - V

Programmable Logic Devices:ROM, Programmable Logic Devices (PLDs), Introduction to logic families and their comparisons.

Textbooks:
1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:
1. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/coleCengage Learning, 2004.
2. Digital & State Machine Design, Comer, 3rd Edition, OXFORD.

Online Learning Resources:

Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Compute Science & Engineering
Cyber Security

Course Code:20A70504   **L T P C : 3 0 0 3**

Course Objectives:
- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes:
CO6: Recognize the Java programming environment.
CO7: Select appropriate programming constructs to solve a problem.
CO8: Develop efficient programs using multithreading.
CO9: Design reliable programs using Java exception handling features.
CO10:   Extend the programming functionality supported by Java.

UNIT-I: Cybercrime
Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-II: Cyber Offenses
Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-III: Cybercrime in Mobile and Wireless Devices
Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT-VI: Tools and Methods Used in Cybercrime
Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks

UNIT-V: Cyber Forensics, Cybercrime in Real-World
Forensics of Computer and Handheld Devices: Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices –

Smartphone forensics, EnCase, Device Seizure, MOBIL edit.

Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

References:

7. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424

8. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Chemical Engineering

Course Code	INDUSTRIAL POLLUTION CONTROL	L	T	P	C
20A70804	ENGINEERING	3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

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

CO1   Understand the different types of wastes generated in an industry, their effects on living and non-living things & environmental regulatory legislations and standards and climate changes.

CO2   Quantify, analyse and treat wastewater

CO3   Apply the different unit operations and unit processes involved in conversion of highly polluted water to potable standards

CO4   Apply the operating principles, design calculations of particulate control devices.

CO5   Estimate the different waste generated from the industries

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT - I

Types of emissions from chemical industries and effects of environment, environment legislation, Type of pollution, sources of wastewater, Effluent guidelines and standards. Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC), Oxygen sag curve, BOD curve mathematical, controlling of BOD curve, self purification of running streams, sources and characteristics of pollutants in fertilizer, paper and pulp industry, petroleum and petroleum industry.

UNIT - II

General methods of control and removal of sulfur dioxide, oxides of nitrogen and organic vapors from gaseous effluent, treatment of liquid and gaseous effluent in fertilizer industry. Air pollution sampling and measurement: Types of pollutant and sampling and measurement,ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling, and gaseous sampling. Analysis of air pollutants: Sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozones, hydrocarbons, particulate matter

UNIT - III

Air pollution control methods and equipments: Source collection methods: raw material changes, process changes, and equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional details and design aspects. Scrubbers: wet scrubbers, spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipments, adsorption by solids, equipment and the design aspects

UNIT - IV

Introduction to waste water treatment, biological treatment of wastewater, bacterial and bacterial growth curve, aerobic processes, suspended growth processes, activated aerated lagoons and stabilization ponds, attached growth processes, trickling filters, rotary drum filters, anaerobic processes.

UNIT - V

Methods of primary treatments: screening, sedimentation, flotation, neutralization, and methods of tertiary treatment. A brief study of carbon absorption, ion exchange, reverse osmosis, ultra-filtration, chlorination, ozonation, treatment and disposal. Hazardous waste management: nuclear wastes: health and environment effects, sources and disposal methods. Chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off site treatment and disposal, treatment practices in various countries. Biomedical wastes: types of wastes and their control.

Textbooks:

1. Environmental Pollution and Control Engineering, C. S. Rao – Wiley Eastern Limited, India, New Delhi, 1993.
2. Pollution Control in Process Industries, S.P. Mahajan, Tata McGraw-Hill, New Delhi, 1985.

Reference Books:

1. Wastewater Treatment, M. Narayana Rao and A.K.Datta, Oxford and IHB publ. New Delhi.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Numerical Methods for Engineers		L	T	P	C
20A75101	(Common for all Branches)		0	3	0	3
Pre-requisite	---					
Course Objectives:						
This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.						
Course Outcomes (CO): Student will be able to						
- apply numerical methods to solve algebraic and transcendental equations. - understand fitting of several kinds of curves. - derive interpolating polynomials using interpolation formulae. - Solve differential and integral equations numerically.						
UNIT - I	**Solution of Algebraic & Transcendental Equations:**	8 Hrs				
Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.						
UNIT - II	**Curve Fitting**	8 Hrs				
Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.						
UNIT - III	**Interpolation**	9 Hrs				
Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula						
UNIT - IV	**Numerical Integration**	8 Hrs				
Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule						
UNIT - V	**Solution of Initial value problems to Ordinary differential equations**	9 Hrs				

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75201	**SMART MATERIALS AND DEVICES**	3		-	3

COURSE OBJECTIVES	
1	To provide exposure to smart materials and their engineering applications.
2	To impart knowledge on the basics and phenomenon behind the working of smart materials
3	To explain theproperties exhibited by smart materials
4	To educate various techniques used to synthesize and characterize smart materials
5	To identify the required smart material for distinct applications/devices
COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To recognize the need of smart materials
CO2	To understand the working principles of smart materials
CO3	To know different techniques used to synthesize and characterize smart materials
CO4	To exploit the properties of smart materials
CO5	To make use of smart materials for different applications

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3   **Hours of teaching: - 45 H**

UNITI : Introduction to Smart Materials: 9H
Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: 9H
 Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III: Synthesis of Smart materials: 9H
Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method,Co-precipitaiton.Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV: Characterization Techniques: 9H

X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V:Smart Materials and Devices: 9H
Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials. Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Text Books:
1.Encyclopaediaof Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and
   Hall, 1992

Texts/References:
1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.

2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.

3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, , 2nd

Edn., John Wiley & Sons, 2003.

4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1.

Emission Sensors, Materials and Amplifiers,G.Gautschi, Springer, 2002.

5. Optical Metamaterials: Fundamentals and Applications-W. Cai and V. Shalaev,

,springer,2010.

6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
        https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec_1.pdf

Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF H &SS

Course Code	Employability Skills		L	T	P	C
20A75501			3	0	0	3
Pre-requisite		Semester-VII				

Course Objectives:	
➢ To encourage all round development of the students by focusing on productive skills ➢ To make the students aware of Goal setting and writing skills ➢ To enable them to know the importance of presentation skills in achieving desired goals. ➢ To help them develop organizational skills through group activities To function effectively with heterogeneous teams	
Course Outcomes (CO):	
CO1: Define goals and try to achieve them CO2: Understand the significance of self-management CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes CO4: Analyse various forms of Presentation skills CO5: Judge the group behaviour CO6: Develop skills required for employability.	

UNIT - I	Goal Setting and Self-Management	Lecture Hrs
Definition, importance, types of Goal Setting – SMART Goal Setting – Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOT Analysis		

UNIT - II	Writing Skills	Lecture Hrs
Definition, significance, types of writing skills – Resume writing, E-Mail writing, Cover Letters, - E-Mail Etiquettes		

UNIT - III	Technical Presentation Skills	Lecture Hrs
Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics – PPT & Poster Presentation		

UNIT - IV	Group Presentation Skills	Lecture Hrs
Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion		

UNIT - V	Job Cracking Skills	Lecture Hrs
Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success - Answering Strategies – Mock Interviews		

Textbooks:
• 1. Soft Skills & Employability Skills (English, Paperback, SABINA PILLAI, AGNA FERNANDEZ)Publisher: Cambridge 2.Personality Development and Soft Skills (English, Paperback, MitraBarun K.)

Reference Books:
1. Learning How To Fly - Life Lessons for the Youth (English, Paperback, Kalam Abdul A. P. J.), Rupa& Co 2. Personality Development and Soft Skills - Preparing for Tomorrow 1 Edition (English, Paperback, Shikha Kapoor)Publisher: Dreamtech Press   3. Skills for Employability - Skills for Employability with 0 Disc (English, Paperback, Dr. M. Sen Gupta)Publisher: Innovative Publication
Online Learning Resources:
- https://youtu.be/gkLsn4ddmTs   - https://youtu.be/2bf9K2rRWwo   - https://youtu.be/FchfE3c2jzc   - https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C
20A75301	**GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT**	2	1	-	3

COURSE OBJECTIVES	
1	Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
2	Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

COURSE OUTCOMES	
CO1	Apply the Green chemistry Principles for day to day life as well as synthesis, Describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
CO2	Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
CO3	Demonstrate Organic solvents and importance of solvent free systems, Discuss Super critical carbondioxide, Explain Super critical water and water as a reaction solvent, Interpret Ionic Liquids as Catalyst and Solvent
CO4	Describe importance of Biomass and Solar Power, Illustrate Sonochemistry and Green Chemistry, Apply Green Chemistry for Sustainable Development , Discuss the importance of Renewable resources
CO5	Discuss green Chemistry Principles for practicing Green nano synthesis, Illustrate Microwave Assisted Synthesis, Differentiate Hydrothermal and Reflux synthesis, Demonstrate Green Chemistry applications of Inorganic nanomaterials

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT 2: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogeneous and Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples,

UNIT 3: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT 4: EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable Feedstocks, Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions)

UNIT 5: ALTERNATIVE ENERGY SOURCES

Photo redox catalysis, single electron transfer reactions (SET), Advantages and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis.

Text Books :

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition,

Oxford University Press, USA

References :

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.

2. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:

Green Nanoscience, wiley-VCH, 2013.

		L	T	P	C
20A70105	**Environmental Impact Assessment**	3	0	0	3

Course Objectives:
1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To teach procedures of risk assessment.
3. To teach the EIA methodologies and the criterion for selection of EIA methods.
4. To teach the procedures for environmental clearances and audit.
5. To know the impact quantification of various projects on the environment.

Course Outcomes (CO):
1. To prepare EMP, EIS, and EIA report.
2. To identify the risks and impacts of a project.
3. To choose an appropriate EIA methodology.
4. To evaluation the EIA report.
5. To Estimate the cost benefit ratio of a project.

 UNIT - I
Concepts and methodologies of EIA :Initial environmental Examination, Elements of EIA, - Factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT - II
Impact of Developmental Activities and Land Use :Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT - III
Assessment of Impact on Vegetation, Wildlife and Risk Assessment :Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment

UNIT - IV   Environmental audit
Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT - V   Environmental Acts and Notifications

The Environmental protection Act, The water preservation Act, The Air (Prevention &Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- Evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Textbooks:
1. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011

Reference Books:
1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
3. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi.

Online Learning Resources:
https://nptel.ac.in/courses/124107160

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Electrical & Electronic & Engineering

Course Code	IoT APPLICATIONS IN ELECTRICAL ENGINEERING (OE-IV)		L	T	P	C
20A70205			3	0	0	3
Pre-requisite						

Course Objectives: To make the students learn about:

- Basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process.
- The concept of motion less and motion detectors in IoT applications.
- Applications of IoT in smart grid.
- The concept of Internet of Energy for various applications.

Course Outcomes (CO): After completing the course, the student should be able to do the following:

CO 1 Understand the concept of IoT in Electrical Engineering.
CO 2 Analyze various types of motionless sensors and various types of motion detectors
CO 3 Apply various applications of IoT in smart grid.
CO 4 Design future working environment with Energy internet.

UNIT - I	SENSORS	Lecture Hrs: 10

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT - II	OCCUPANCY AND MOTION DETECTORS	Lecture Hrs: 10

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT - III	MEMS	Lecture Hrs: 10

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

UNIT - IV	IoT FOR SMART GRID	Lecture Hrs: 8

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT - V	INTERNET of ENERGY (IoE)	Lecture Hrs: 10

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid .

Textbooks:
1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004 2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017 3. ErsanKabalci and YasinKabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019
Reference Books:
1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016 2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019 3. RMD SundaramShriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019
Online Learning Resources:
1. https://onlinecourses.nptel.ac.in/noc22_cs96/preview 2. https://nptel.ac.in/courses/108108123 3. https://nptel.ac.in/courses/108108179

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Mechanical Engineering

Subject Code	Title of the Subject	L	T	P	C
20A70305	**MATERIAL HANDLING EQUIPMENTS**	3	0	0	3

Course Objectives:

To understand how the knowledge of materials management can be an advantage to logistics and supply chain operations.

To sensitize the students on the materials management functions – Planning, Purchase, Controlling, Storing, Handling, Packaging, Shipping and Distributing, and Standardizing.

To realize the importance of materials both in product and service.

planning/ production and plant layouts, studying about strategies of material handling and equipments, and selection of site locations.

It also aims to explore the layout planning by computer applications following different algorithms.

UNIT-I

Overview of Material Handling: Principles of Material Handling, Principal groups of Material Handling equipment – General Characteristics and application of Material Handling Equipment, Modern trends in material handling.

UNIT-II

Lifting Equipments: Hoist- Components of Hoist – Load Handling attachments hooks, grabs and clamps – Grabbing attachments for bulk material – Wire ropes and chains.

UNIT-II

Lifting tackle pulleys for gain of force and speed: Tension in drop parts – Drums, Shears and sprockets – Arresting gear and brakes – Block brakes, Band brakes, thrust brakes – Safety and hand cranks. Principle operation of EOT, Gantry and jib cranes Hoisting Mechanisms, Travelling mechanisms, lifting mechanisms – Slewing Mechanisms – Elevators and lifts.

UNIT-IV

CONVEYORS: Types - description -applications of Belt conveyors, apron conveyors and escalators Pneumatic conveyors, Screw conveyors and vibratory conveyors

UNIT-V

ELEVATORS: Bucket elevators: Loading and bucket arrangements - Cage elevators - shaft way, guides, counter weights, hoisting machine, safety devices - Design of fork lift trucks.

Course Outcomes :

The students will be able to select appropriate location for establishing industrial plants by applying the concepts of location selection.

The students will be able to plan and design plant and production layouts through basic strategies and with computer applications.

The students will be able to identify and analyse the problems in the existing layout/ material handling system and shall be able to the optimize the layout/ material handling system

The students will be able to develop algorithms for new planning layouts for typical applications in the industries and Suggesting appropriate material handling strategies in the industries.

The students will be able to design of fork lift trucks.

REFERENCES

Rudenko, N., Materials handling equipment, ELnvee Publishers, 1970.

Spivakovsy, A.O. and Dyachkov, V.K., Conveying Machines, Volumes I and II, MIR Publishers, 1985.

Alexandrov, M., Materials Handling Equipments, MIR Publishers, 1981.

Boltzharol, A., Materials Handling Handbook, The Ronald Press Company, 1958.

P.S.G. Tech., "Design Data Book", KalaikathirAchchagam, Coimbatore, 2003.

Lingaiah. K. and Narayana Iyengar, "Machine Design Data Hand Book", Vol. 1 & 2, Suma Publishers, Bangalore, 1983

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Electronics & Communication Engineering

Course Code	PRINCIPLES OF DIGITAL SIGNAL	L	T	P	C
20A70405	PROCESSING	3	0	0	3

Pre-requisite
Basics of Electronics and Communication Engineering

Course Objectives:
- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete Fourier series and Fourier transforms.
- To design &analyzeIIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

Course Outcomes (CO): At the end of this course, the students will be able to
- Articulate the frequency domain analysis of discrete time signals.
- Understand the properties of discrete Fourier series and Fourier transforms.
- Design &analyzeIIR digital filters from analog filters.
- Design various structures used in implementation of FIR digital filters.
- Summarize the importance and applications of Multirate Digital signal processing.

UNIT - I
Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

UNIT - II
Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT - III
Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT - IV
Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling techniques, comparison of IIR & FIR filters, basic structures of FIR systems.
UNIT - V

DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Textbooks:
1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI.

Reference Books:
1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using MATLAB", Thomson, 2007.
4. B. Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

Online Learning Resources:

Course Code:20A70505   **L T P C : 3 0 0 3**

Course Objectives:
- To introduce the concept of Internet of Things.
- To Practice programs and build real time applications.
- Students will be explored to the interconnection and integration of the physical world.
- Students will gain practical experience in the development of Cloud-based IoT systems.
- To get knowledge on cloud platforms

Course Outcomes (CO):

CO4:   Design reliable real time applications using microcontrollers and microprocessors .
CO5:   Extend the programming functionality and design new modules.
CO6:   Able to design & develop IOT Devices.

UNIT-I: Introduction

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMS
system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMS
system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence, DBMS
system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database
system, approaches to building a database, data models, database management system, Data Independence,DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems, Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

UNIT-II: E/R Model

Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship
types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples
Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship
types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples
Conceptual Data Modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples.

UNIT-III: Relational Data Model

Concepts of relations, schema-instance distinction, keys, referential integrity & foreign keys, converting the database specification in ER notation to the relational schema, Relational algebra operators: selection, projection, cross product, various types of joins, division, set operations, example queries, tuple relational calculus, domain relational calculus, Fundamentals of SQL.

UNIT-VI: Relational Database Design

Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, Normalization, Normal Forms - INF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, multi valued dependencies and 4NF, join dependencies and 5NF, Concept of Denormalization.

UNIT-V: Transaction Processing,Data Storage & Indexing

Transaction processing and Error recovery-Concepts of transaction processing, ACID properties, concurrency control, Serializability, locking based protocols, Timestamp based protocols, recovery and logging methods.
Data Storage and Indexes - File organizations, primary, secondary index structures, various index structures - hasb based, dynamic hashing techniques, multi-level indexes, B and B-trees.

References:

9. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424

10. Cyril Prasanna Raj P., "CMOS digital circuit design manual", Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Chemical Engineering

Course Code	SOLID WASTE MANAGEMENT	L	T	P	C
20A70805		3	0	0	3

Pre-requisite

Course Objectives:

- Material flow in society and generation of solid waste source
- Clarification of solid waste on characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation
- Understand processing technologies with mechanical volume reduction and thermal volume reduction corporate land filling, deep well injections.
- Learn to estimate material recovery energy recovery from a given waste data using case standing

Course Outcomes (CO):

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

CO1 Identify sources and relationship between various functional elements of solid waste management and methods of storage and collection and transport of solid wastes.

CO2 Know the importance of transfer station and suggest suitable methods of solid waste disposal based on the composition of solid waste.

CO3 Suggest suitable methods for the management of plastic and E-wastes

CO4 Identify hazardous wastes and suggest suitable management techniques for radioactive wastes and Bio-medical wastes.

CO5 Adopt the suitable management method for a given industry

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and

environment. Legislations

UNIT - II

Engineered systems: Typical generation rates. Estimation and factors effecting generation rates. On site handling. Storage and processing. Collection systems and devices. Transfer and transport.

UNIT - III

Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

UNIT - IV

Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.

Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

UNIT - V

Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Textbooks:
1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:
1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF MATHEMATICS

Course Code	Number theory and its Applications		L	T	P	C
20A75102			0	3	0	3
Pre-requisite	-----	Semester	I			

Course Objectives:	
This course enables the students to learn the concepts of number theory and its applications to information security.	
Course Outcomes (CO): Student will be able to	

- understand number theory and its properties.
- understand principles on congruences
- develop the knowledge to apply various applications
- develop various encryption methods and its applications.

UNIT - I	Integers, Greatest common divisors and prime Factorization	8 Hrs

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT - II	Congruences	8 Hrs

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT - III	Applications of Congruences	9 Hrs

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem-Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT - IV	Finite fields & Primality, factoring	8 Hrs

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT - V	**Cryptology**	9 Hrs

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers- Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:

1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.

Reference Books:

1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press

Online Learning Resources:

https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75202	**SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS**	3		-	3

	COURSE OBJECTIVES
1	To provide exposure to various kinds of sensors and actuators and their engineering applications.
2	To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
3	To explain the operating principles of various sensors and actuators
4	To educate the fabrication of sensors
5	To explain the required sensor and actuator for interdisciplinary application

	COURSE OUTCOMES
	At the end of the course the student will be able
CO1	To recognize the need of sensors and actuators
CO2	To understand working principles of various sensors and actuators
CO3	To identify different type of sensors and actuators used in real life applications
CO4	To exploit basics in common methods for converting a physical parameter into an electrical quantity
CO5	To make use of sensors and actuators for different applications

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credits: 3   **Hours of teaching:- 45 H**

UNIT – I: Introduction to Sensors and Actuators   **9H**
Sensors: Types of sensors:temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition:ChemicalVapor Deposition, Pattern: photolithography and Etching: Dry and WetEtching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT –II: Temperature and Mechanical Sensors   **9H**
Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors
Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Semiconductor, Piezoresistive, capacitive, Variable Reluctance Sensor (VRP).

UNIT –III: Optical and Acoustic Sensors   **9H**
Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors:thermal, Passive Infra Red, Fiber based sensors and Thermopiles
Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT –IV: Magnetic, Electromagnetic Sensors and Actuators   **9H**
Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT –V: Chemical and Radiation Sensors   **9H**
Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.
Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Muller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Text Books:
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:
1.Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links
https://onlinecourses.nptel.ac.in/noc21_ee32/preview

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF H & SS

Subject Code	Title of the Subject	L	T	P	C
20A79102	English Literary Spectrum	3		0	3

COURSE OBJECTIVES	
1	To develop aesthetic sense to appreciate the beauty of life
2	To introduce to Elizabethan drama and be able to appreciate the nuances of humour
3	To familiarize with Victorian novel and industrialization
4	To expose to the historical significance of ideas of different periods
5	To give exposure to the vicissitudes of life through short stories

COURSE OUTCOMES	
CO1	Awareness to lead a life of quality than quantity
CO2	Able to understand humour and Elizabethan culture
CO3	Enable to appreciate human relations in this mechanized world
CO4	Tolerant and receptive to different ideas
CO5	Be imaginative and understanding of human aspirations

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT I: Poetry
1. Ode to a Grecian Urn- John Keats
2. To a Skylark- P.B.Shelley
3. Satan's Speech from Paradise Lost Book I- 140-170 lines- John Milton
4. My Last Duchess- Robert Browning

UNIT II: Drama
1. Twelfth Night- William Shakespeare

a) Elizabethan theatre
b) Shakespearean tragedy
c) Shakespearean Comedy
d) Themes of Shakespearean Dramas

UNIT III: Novel
1. Hard Times- Charles Dickens
a) Rise of the English Novel
b) Victorian Novel
c) Utilitarianism
d) Humanism

UNIT IV: Prose
1. Of Studies – Francis Bacon
2. On Seeing People Off- A.G.Gardiner
3. Sweetness and Light- Mathew Arnold
4. I too have a Dream- Martin Luther King Junior

UNIT V: Short Stories
1. The Last Leaf- O.Henry
2. Useless Beauty- Guy de Maupassant
3. After the Dance – Leo Tolstoy
4. The Selfish Giant- Oscar Wilde

Text Books:
The Oxford Book of English Verse by Christopher Ricks (Editor)
Twelfth Night (2010 edition): Oxford School Shakespeare (Oxford School Shakespeare Series)
Dickens Charles, Hard Times (Penguin Classics)
The Art of the Personal Essay: An Anthology from the Classical Era to the Present, Anchor Books Publication
References:
Legois and Cazamian, *A History of English Literature*

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C
20A75302	**CHEMISTRY OF NANOMATERIALS AND APPLICATIONS**	2	1	-	3

COURSE OBJECTIVES	
1	To understand synthetic principles of Nanomaterials by various methods
2	And also characterisae the synthetic nanomaterials by various instrumental methods
3	To enumerate the applications of nanomaterials in engineering

COURSE OUTCOMES	
CO1	Classify the nanostructure materials, Describe scope of nano science and technology, Explain different synthetic methods of nano materials, Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material
CO2	Describe the top down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapour deposition method and electrodeposition method, Discuss about high energy ball milling.
CO3	Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis, Apply different spectroscopic techniques for characterization
CO4	Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, Describe liquid crystals
CO5	Illustrate applications of nanaomaterials, Discuss the magnetic applications of nanomaterials, list the applications of non-linear optical materials, Describe the applications fullerenes, carbon nanotubes

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												

CO4											
CO5											

SYLLABUS

Unit – I

Basics and Characterization of Nanomaterials : Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Unit – II

Synthesis of nanomaterials : Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method.
Synthetic Methods**:** Bottom-Up approach**:-** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterilas, BET method for surface area analysis, dynamic light scattering for particle size determination-

UNIT-IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials and liquid crystals.

UNIT-V

Engineering Applications of Nanomaterials : Applications of Nano Particle, nano rods of nano wires, Fullerenes, carbon nano tubes, Graphines nanoparticles and other applications of nonmaterials and uses.

TEXT BOOKS:
1. **NANO: The Essentials:** T Pradeep, MaGraw-Hill, 2007.
2. **Textbook of Nanoscience and nanotechnology:** B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:
1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. **Nanostructures & Nanomaterials; Synthesis, Properties & Applications:** Guozhong Cao, Imperial College Press, 2007.
3. **Nanomaterials Chemistry**, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.