DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

PERAMBALUR – 621212

REGULATIONS – 2020

CHOICE BASED CREDIT SYSTEM

CURRICULA AND SYLLABI

DEPARTMENT OF INFORMATION TECHNOLOGY

(Applicable to the students admitted from the Academic year 2020 – 2021)

Discussed in BOS meeting Dated: 06.05.21/ IT Ratified & Approved in Academic Council on 11.05.21

DHANALAKSHIMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
B.TECH., INFORMATION TECHNOLOGY
REGULATIONS – 2020
CHOICE BASED CREDIT SYSTEM
COURSE MATRIX
I-VIII CURRICULA AND SYLLABI

SEMESTER – I									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20HS101	Communicative English	3	3-0-0	20		80		50
2	U20MA101	Engineering Mathematics	4	3-1-0	20		80		50
3	U20PH101	Engineering Physics - I	3	3-0-0	20		80		50
4	U20CY101	Engineering Chemistry	3	3-0-0	20		80		50
5	U20GE101	C – Programming	3	3-0-0	20		80		50
6	U20GE102	Engineering Graphics	4	2-0-4	20		80		50
7	U20BS101	Physics and Chemistry Laboratory	2	0-0-4	20		80		50
8	U20GE103	C – Programming Laboratory	2	0-0-4	20		80		50
TOTAL			**24**						

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
3	12	9	-	-	-	-	24

SEMESTER - II									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20HS201	Functional English	3	3-0-0	20		80		50
2	U20MA201	Advanced Calculus and Ordinary Differential Equations	4	3-1-0	20		80		50
3	U20PH201	Engineering Physics - II	3	3-0-0	20		80		50
4	U20GE201	Python Programming	3	3-0-0	20		80		50
5	U20CS201	Data Structures and algorithm	3	3-0-0	20		80		50
6	U20EC201	Semiconductor Devices	3	3-0-0	20		80		50
7	U20GE203	Engineering Practices Laboratory	2	0-0-4	20		80		50
8	U20GE204	Python Programming Laboratory	2	0-0-4	20		80		50
9	U20CS202	Data Structures Laboratory	2	0-0-4	20		80		50
TOTAL			**25**						

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
3	7	10	5	-	-	-	25

SEMESTER - III									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20MA302	Mathematical Foundations of Computer Science	4	3-1-0	20		80		50
2	U20IT302	Object Oriented Programming With C++	3	3-1-0	20		80		50
3	U20IT303	Design and Analysis of Algorithm	3	3-0-0	20		80		50
4	U20IT304	Database Management System	3	3-0-0	20		80		50
5	U20IT305	Computer Organization and Architecture	3	3-0-0	20		80		50
6	U20EC301	Digital Systems	4	4-0-0	20		80		50
7	U20IT306	Object oriented Programming With C++ Laboratory	2	0-0-4	20		80		50
8	U20IT307	Data Base Management System Laboratory	2	0-0-4	20		80		50
TOTAL			**24**						

HS	BS	ES	PC	PE	OE	EEC	TOTAL CREDITS
-	4	4	16	-	-	-	24

SEMESTER - IV									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20IT401	Artificial Intelligence and Expert System.	3	3-0-0	20		80		50
2	U20IT402	Operating System	3	3-0-0	20		80		50
3	U20IT403	Computer Networks	3	3-0-0	20		80		50
4	U20IT404	Web Technology	3	3-0-0	20		80		50
5	U20EC401	Microprocessors and Micro Controllers	3	3-0-0	20		80		50
6	U20HS202	Environmental Science and Engineering	3	3-0-0	20		80		50
7	U20IT405	Operating System Laboratory	2	0-0-4	20		80		50
8	U20IT406	Computer Networks Laboratory	2	0-0-4	20		80		50
TOTAL			**22**						

HS	BS	ES	PC	PE	OE	EEC	TOTAL CREDITS
3	-	3	16	-	-	-	22

SEMESTER - V									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20MA501	Random Process and Statistics	4	3-1-0	20		80	36	50
2	U20IT501	Java Programming	3	3-0-0	20		80	36	50
3	U20IT502	Software Engineering	3	3-0-0	20		80	36	50
4	U20IT503	Theory of Computation	4	4-0-0	20		80	36	50
5		Open Elective-I	3	3-0-0	20		80	36	50
6		Professional Elective-I	3	3-0-0	20		80	36	50
7	U20IT504	Software Engineering Laboratory	2	0-0-4	20		80		50
8	U20IT505	Java Programming Laboratory	2	0-0-4	20		80		50
TOTAL			**24**						

SL. NO	**PROFESSIONAL ELECTIVE – I**	
1	U20IT511	Principles of Management
2	U20IT512	Distributed Systems
3	U20IT513	C# .Net Programming
4	U20IT514	Block Chain Techniques
5	U20IT515	Embedded Systems

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
-	4	-	14	3	3	-	24

SEMESTER – VI									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20IT601	Fundamental of Data Science	3	3-0-0	20		80		50
2	U20IT602	Machine Learning	3	3-0-0	20		80		50
3	U20IT603	Internet of Things	3	3-0-0	20		80		50
4	U20IT604	Cloud Computing	3	3-0-0	20		80		50
5		Professional Elective-II	3	3-0-0	20		80		50
6	U20IT605	Cloud Laboratory	2	0-0-4	20		80		50
7	U20IT606	Machine Learning Laboratory	2	0-0-4	20		80		50
8	U20HS601	Inter Personal Skills – I	1	0-0-2	20		80		50
TOTAL			**20**						

SL. NO	**PROFESSIONAL ELECTIVE – II**	
1	U20IT621	Linux Programming
2	U20IT622	Data Warehousing and Data Mining
3	U20IT623	Professional Ethics
4	U20IT624	Soft Computing
5	U20IT625	Cyber Security

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
-	-	-	16	3	-	1	20

SEMESTER – VII									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1	U20IT701	Big Data Analytics	3	3-0-0	20		80		50
2	U20IT702	Deep Learning	3	3-0-0	20		80		50
3	U20IT703	Cryptography and Network Security	3	3-0-0	20		80		50
4		Professional Elective-III	3	3-0-0	20		80		50
5		Open Elective-II	3	3-0-0	20		80		50
6	U20IT704	Network Security Laboratory	2	0-0-4	20		80		50
7	U20IT705	Mini Project	1	0-0-2	20		80		50
TOTAL			**18**						

SL. NO	**PROFESSIONAL ELECTIVE – III**	
1	U20IT731	Software Project Management
2	U20IT732	Wireless Adhoc and Sensor Networks
3	U20IT733	Natural Language Processing
4	U20IT734	Multicore Architecture and Programming
5	U20IT735	Data Visualization

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
-	-	-	11	3	3	1	18

SEMESTER – VIII									
SL. NO	**COURSE CODE**	**NAME OF THE COURSE**	**CREDIT**	**L-T-P**	**INTERNAL ASSESSMENT**		**END SEMESTER EXAMINATION**		**MINIMUM PASSING MARKS**
					MAX MARKS	**MIN MARKS**	**MAX MARKS**	**MIN MARKS**	
1		Professional Elective IV	3	3-0-0	20		80		50
2		Professional Elective V	3	3-0-0	20		80		50
3	U20IT801	Project Work	6	0-0-12	20		80		50
TOTAL			**12**						

SL. NO	**PROFESSIONAL ELECTIVE – IV**		**SL. NO**	**PROFESSIONAL ELECTIVE - V**	
1	U20IT841	Advanced JAVA Programming	1	U20IT851	Human Computer Interaction
2	U20IT842	Service Oriented Architecture	2	U20IT852	Software Testing
3	U20IT843	Network Programming and Management	3	U20IT853	TCP/IP Technology
4	U20IT844	Open Source Systems	4	U20IT854	Information Retrieval
5	U20IT845	Fundamentals of Nano Science	5	U20IT855	Speech Processing

HS	**BS**	**ES**	**PC**	**PE**	**OE**	**EEC**	**TOTAL CREDITS**
-	-	-	-	6	-	6	12

DEPARTMENT OF INFORMATION TECHNOLOGY OPEN ELECTIVES COMMON TO ALL BRANCHES EXCEPT INFORMATION TECHNOLOGY		
SL. NO	**OPEN ELECTIVE – I**	
1	U20OIT51	Robotics and Intelligence System
2	U20OIT52	Smart Sensing
3	U20OIT53	Software Quality Assurance
4	U20OIT54	Information Storage Management
5	U20OIT55	Social Network Analysis
SL. NO	**OPEN ELECTIVE – II**	
1	U20OIT71	Grid Computing
2	U20OIT72	Information Security
3	U20OIT73	Digital Image Processing
4	U20OIT74	Cyber Forensics
5	U20OIT75	Object Oriented Analysis and Design

TOTAL COURSES & CREDITS – SEMESTER WISE

SEMESTER	I	II	III	IV	V	VI	VII	VIII	TOTAL
No of COURSES	8	9	8	8	8	8	7	3	59
CREDITS	24	25	24	22	24	20	18	12	169

SUMMARY

B. TECH., INFORMATION TECHNOLOGY											
S. No	Subject Area	Credits Per Semester								Credits Total	Percentage %
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities Sciences	3	3	-	3	-	-	-	-	9	**5.33**
2	Basic Sciences	12	7	4	-	4	-	-	-	27	**15.98**
3	Engineering Sciences	9	10	4	-	-	-	-	-	23	**13.61**
4	Professional Cores	-	05	16	19	14	16	11	-	81	**47.93**
5	Professional Electives	-	-	-	-	3	3	3	6	15	**8.88**
6	Open Electives	-	-	-	-	3	-	3	-	6	**3.55**
7	Employability Enhancement Courses	-	-	-	-	-	1	1	6	8	**4.73**
Total		**24**	**25**	**24**	**22**	**24**	**20**	**18**	**12**	**169**	**100**

SEMESTER I

U20HS101	COMMUNICATIVE ENGLISH (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

Pre-requisite: Acquiring Basic grammar knowledge.

COURSE OBJECTIVES:

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

UNIT I GENERAL INTRODUCTION **9**

Listening - Listening to conversations, Welcome Speeches, Lectures and description of equipment. Speaking -introducing one self- family and friends. Reading- Practice in skimming- scanning and predicting - Writing - completing sentences. Grammar - WH - Questions- asking and answering - Yes or No questions and Question Tag-Parts of Speech. Prefixes- Suffixes- Tense- Present, Past and Future Tense. Word formation.

UNIT II TECHNIQUES OF READING AND WRITING **9**

Reading - Purpose of reading-comprehension - re - reading- post reading - comprehension questions (multiple choice questions or short questions/open-ended questions). Writing - Free writing on any given topic (My favorite place / Hobbies / School life, etc.) - Autobiographical writing (writing about one's leisure time activities, hometown, etc.) - Listening- Situational Conversation, Telephonic Conversation. Speaking - Sharing information of a personal kind - greeting -Taking leave - Grammar - Adjectives, Prepositions, Conjunctions, Articles, Punctuations- Error correction, editing mistakes in grammar, vocabulary, and spelling.

UNIT III GRAMMAR AND SKILL DEVELOPMENT **9**

Reading-Reading general contexts and interpreting graphical representations. Writing-understanding text structure-Use of reference words and discourse markers- Coherence-Jumbled Sentences Listening -listening to longer texts and filling up the table-Product description-narratives from different sources. Speaking- asking about routine actions and expressing opinions. Grammar-Past Tense-Kinds of noun, verb and adverb, Impersonal Passive voice.

UNIT IV READING AND LANGUAGE DEVELOPMENT **9**

Reading- Short reading passages for sentence matching exercises, Picking out specific information in a short text. Writing- Letter writing, informal or personal letters - e-mails - conventions of personal e-mail - Listening-listening to dialogues or conversations and completing exercises based on them. Speaking- Group Discussion - Grammar- Future tense, Synonyms-Antonyms-Phrasal verbs.

UNIT V WRITING SKILLS **9**

Reading-Intensive reading-Writing-Writing short essays-Dialogue Writing- Listening -listening to talks-conversations- Speaking - Presenting welcome speech and vote of thank - Grammar- Modal verbs-Collocations-Single word substitutes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Speak clearly, effortlessly, confidently and appropriately.
2. Write coherently with acceptable accuracy, organizing ideas logically.
3. Listen and comprehend different discourses and genres of texts.
4. Read and comprehend different discourses and genres of texts.
5. Read and infer, analyze, predict, interpret and draw conclusions any printed text.

TEXT BOOKS:

1. Board of Editors Using English "A Course book for Undergraduate Engineers and Technologists". Orient Black Swan Limited, Hyderabad, 2015.
2. Richards,C.Jack."Interchange Students'Book-2", New Delhi: CUP, 2015.

REFERENCES:

1. Bailey, Stephen. "Academic Writing: A practical guide for students". New York: Rutledge, 2011.
2. Raymond Murphy, Murphy's "English Grammar", Cambridge University Press 2004.
3. Meenakshi Raman, Sangeeta Sharma, "Technical Communication: English Skills for Engineers", Oxford University Press, 2009.
4. Dr.S.Sumant, "Technical English-I" Tata McGraw-Hill, New Delhi, 2001.
5. Essential English - E.Suresh Kumar, P. Sreehari, J. Savithri - Orient Blackswan 2011.

U20MA101	ENGINEERING MATHEMATICS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	1	0	4

Prerequisite: Basic ideas of Matrices, Differentiation and Integration.

COURSE OBJECTIVES:

1. To handle practical problems arising in the field of engineering.
2. To achieve conceptual understanding and to retain the best traditions of traditional calculus.
3. To provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
4. To deal with topics such as single variable and multivariable Calculus.
5. To play an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I EVALUATION AND APPLICATION OF MATRICES 12

Definition - Basic concepts of Matrices - Eigen values and Eigen vectors of a real matrix -Characteristic equation -Properties of Eigen values and Eigen vectors - Cayley - Hamilton theorem - Diagonalization of matrices - Reduction of a quadratic form to canonical form by Orthogonal transformation - Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS 12

Limit of a function - Continuity - Derivatives - Differentiation Rules - Mean Value Theorem - Interval of increasing and decreasing functions - Maxima and Minima - Interval of concavity and convexity.

UNIT III MULTIVARIABLE CALCULUS 12

Limits and Continuity - Partial derivatives - Total derivative - Differentiation of implicit functions - Jacobian and properties -Taylor's series for functions of two variables -Maxima, Minima and saddle points - Method of Lagrange multipliers.

UNIT IV INTEGRAL CALCULUS 12

Definite Integrals and its properties - Fundamental theorem of Calculus - Techniques of integration for Indefinite Integrals using basic integration formulas -Integration by parts -Trigonometric Substitutions - Integration of Rational functions by Partial Fractions.

UNIT V MULTIPLE INTEGRAL AND THEIR APPLICATIONS 12

Double integrals - Change the order of integration - Polar Coordinates - Area - Change of variables - Triple integrals -Volume -Applications -Areas and Volumes.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Express large amounts of data and functions in an organized and concise form apart from diagonalizing matrices.
2. Solve maxima and minima problems using differentiation.
3. Apply functions of several variables to solve problems in engineering and technology.
4. Evaluate integrals by using Fundamental Theorem of Calculus.
5. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change the order and change of variables.

TEXT BOOKS:

1. Grewal B.S.,"Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Ed., 2014.
2. Veerarajan T,"Engineering Mathematics", Tata McGraw-Hill, New Delhi,2011.

REFERENCES:

1. Bali N.P.and Manish Goyal, "Engineering Mathematics" (For Semester I) Third Edition, University Science Press, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons,2014
3. Fritz John and Richard Courant, "Introduction to Calculus and Analysis" Springer,1999.
4. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
5. Venkatraman M K,"Engineering Mathematics,Volume-I",Second edition,National Publishing Co,Chennai,2003.

U20PH101	**ENGINEERING PHYSICS - I (COMMON TO ALL BRANCHES)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Adequate knowledge in basic and modern physics.

COURSE OBJECTIVES:

1. To import knowledge in basic concepts of physics relevant to engineering applications.
2. Capability to understand advanced topics in engineering.
3. To acquire the knowledge of recent trends in LASER, Optical Fiber, and Ultrasonic.

UNIT I SOLID STATE PHYSICS 9

Lattice - unit cell -seven crystal systems - Bravai's lattices -lattice planes -Miller indices –derivation for inter-planar spacing in terms of Miller indices-calculation of number of atoms per unit cell , atomic radius, coordination number and packing factor for SC, BCC, FCC and HCP structures. X-ray diffraction: Bragg's law -diffraction methods: powder and Laue methods. Crystal Growth Techniques: melt growth technique (Bridgman and Czochralski techniques).

UNIT II ELASTICITY OF MATTER **9**

Introduction- Elasticity-Plasticity–Hooke's law -relationship between three modulii of elasticity (qualitative) -stress –strain diagram -Poisson's ratio - factors affecting elasticity. Beam: Internal Bending moment -Cantilever: theory and experiment-Young's modulus: theory and experiment (uniform and non-uniform bending) -I-shaped girders-advantages and applications -twisting couple of a wire or cylinder - torsion pendulum - determination of moment of inertia of disc and rigidity modulus of cylindrical wire.

UNIT III ULTRASONICS AND ITS APPLICATIONS **9**

Introduction-classification of sound- properties of infrasonics, audible and ultrasonics -production: magnetostriction and piezoelectric methods–detection of ultrasonic waves–determination of velocity of sound in liquid (Acoustic grating method). Applications: Engineering and medical field- Non-destructive testing: pulse echo system through transmission and reflection modes. Ultrasonic scanning methods-Sonogram.

UNIT IV MODERN PHYSICS **9**

Black body radiation- Basic Laws -Planck's hypothesis and its radiation law: derivation -deduction of Wien's displacement law and Rayleigh Jean's law from Planck's law -Photons and its properties-Compton Effect –derivation –experimental verification. Photo Electric effect and its Laws -Einstein's Equation - Matter waves–de-Broglie hypothesis - de-Broglie wavelength-Schrodinger's time independent and time dependent wave equations -physical significance of the wave function. Application: particle in one dimensional box-normalization - degenerate and non-degenerate states.

UNIT V LASER AND OPTICAL FIBER **9**

Laser: properties–population inversion-pumping methods –Einstein's coefficients-derivation. Types: He-Ne and semiconductor lasers (Homo and Hetero junction) –uses of LASER- Hologram -Construction and Reconstruction Process. Optical fiber: Structure-advantages of optical fibre-Principle and propagation of light through optical fiber–expressions for numerical aperture and acceptance angle–fabrication of optical fiber- types of optical fibers-fiber optical communication system -endoscope -Fiber optic sensors (Qualitative Study only).

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Learners are able to

1. Assess the elastic behavior of the materials and bending behavior of beam.
2. Acquire knowledge of NDT and applications of ultrasonics.
3. Know the development of modern physics and its applications.
4. Recognize the uses of laser and fiber optics.
5. Distinguish the different crystal systems, structural determination and synthesis of crystals.

TEXT BOOKS:

1. Marikani, "Engineering Physics", PHI, New Delhi, 2013.
2. S.Vadivel & A.Pannerselvam, "Engineering Physics", Jaitech Publications, 2015.

REFERENCES:

1. Selladurai, "Engineering Physics Part-I", PHI learning private limited, New Delhi, 2010.
2. V.Rajendran, "Engineering Physics", Tata McGraw-Hill. New Delhi.2011
3. P.K.Palanisamy "Engineering Physics". Scitech Publications, 2011
4. Raymond A. Serway and John Jewett,Jr. , "Physics for Scientist and Engineer with modern Physics", Mary Finch Publication, 9th edition,2014.
5. William T. Silfvast ,"Laser Fundamentals", Second Edition, Cambridge University Press, 2008.

U20CY101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

Pre-requisite: Basics of Ionization, adsorption phenomenon kinetics, Light emission components

COURSE OBJECTIVES:

1. To make the students conversant with basics of polymer chemistry.
2. To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
3. To acquaint the student with concepts of important photo physical and photochemical processes and spectroscopy.
4. To develop an understanding of the basic concepts of phase rule and its applications to single and two Component systems and appreciate the purpose and significance of alloys.

UNIT I BASICS OF POLYMER **9**

Introduction: Classification of Polymers -Natural and Synthetic: Thermoplastic and Thermosetting Functionality -Degree of Polymerization. Types and mechanism of Polymerization: Addition, Condensation and Co-polymerization. Properties of Polymer - Techniques of Polymerization: Bulk, Emulsion, Solution and Suspension. Preparation, Properties and uses of Nylon6.6, and Epoxy resin.

UNIT II SURFACE CHEMISTRY AND CATALYSIS **9**

Adsorption: Types of Adsorption -Adsorption of gases on solids -Adsorption of solute from solutions - Adsorption isotherms -Freundlich's Adsorption Isotherm -Langmuir's Adsorption Isotherm -Applications of Adsorption on pollution abatement. Catalysis: Catalyst -Types of Catalysis -Criteria -Auto Catalysis - Catalytic Poisoning and Catalytic Promoters - Acid Base Catalysis -Enzyme Catalysis-Michaelis -Menten equation.

UNIT III CHEMICAL THERMODYNAMICS **9**

Terminology of Thermodynamics - Second Law: Entropy - Entropy change for an ideal gas, Reversible and Irreversible Processes; Entropy of Phase Transitions; Clausius inequality. Free Energy and Work function: Helmholtz and Gibbs free energy functions - Criteria of Spontaneity: Gibbs - Helmholtz equation -Clausius - Clapeyron equation: Maxwell Relations - Van't Hoff Isotherm and Isochore.

UNIT IV PHOTO CHEMISTRY AND SPECTROSCOPY **9**

Photo Chemistry: Laws of Photo Chemistry - Grotthuss-Draper law, Stark - Einstein Law and Lambert - Beer Law. Quantum Efficiency - Determination - Photo Processes - Internal Conversion, Inter - system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic Spectrum- Absorption of Radiation - Electronic, Vibrational and Rotational transitions. UV - visible and IR Spectroscopy.

UNIT V PHASE RULE AND ALLOYS **9**

Phase Rule: Introduction, Definition of terms with examples, One Component System - Water System - Reduced Phase Rule - Two Component Systems - Classification - Lead - Silver system, Zinc - Magnesium system. Alloys: Introduction - Definition- Properties of Alloys - Significance of Alloying, Functions and Effect of Alloying elements- Ferrous Alloys- Nichrome and Stainless Steel - Heat Treatment of Steel.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners able to

1. Describe the General Structure of Polymers. Identify and Explain differences between Addition and Stepwise Polymerization.
2. Explain how selected Isomers could be used for measurement of Surface Area of Materials or in Rationalization of Catalysis.
3. Derive and discuss the First and Second Laws of Thermodynamics.
4. Making possible to apply this knowledge in different areas, other than Photo Chemistry and Spectroscopy.
5. Illustrate the Phase Transition of One Component and Two Component system and Types of Alloys and their applications in industries.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi- tech Publishing Company Pvt. Ltd. Chennai, 2009.

REFERENCES:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Gowariker V. R. , Viswanathan N.V. And Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.,), Chennai, 2006.
4. Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanapat Rai & Co. (P) Ltd, Delhi, 2013.
5. Satya Prakash and Manish Agarwal, "Engineering Chemistry", Khanna Book Publishing Co.(P) Ltd, Delhi,2018.

U20GE101	C - PROGRAMMING (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Computer knowledge to access a computer

COURSE OBJECTIVES:

1. To develop C Programs using basic programming constructs
2. To develop C programs using arrays and strings
3. To develop applications in C using functions , pointers and structures
4. To do input/output and file handling in C.

UNIT I BASICS OF 'C' PROGRAMMING **9**

Introduction to programming paradigms - Structure of C program - C programming: Data Types - Storage classes - Constants - Keywords - Operators: Precedence and Associativity - Expressions - Input/output statements, Assignment statements - Decision making statements - Switch statement - Looping statements - Pre-processor directives - Compilation process

UNIT II ARRAYS AND STRINGS **9**

Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - String operations: length, compare, concatenate, copy - Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) - Recursion - Example Program: Scientific calculator using built-in functions, Binary Search using recursive functions - Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers.

UNIT IV STRUCTURES 9

Structure - Nested structures - Pointer and Structures - Array of structures - Example Program using structures and pointers - Union- Example Program using unions and pointers.

UNIT V FILE PROCESSING 9

Files - Types of file processing: Sequential access, Random access - Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files - Command line arguments.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Develop simple applications in C using basic constructs
2. Design and implement applications using arrays and strings
3. Develop and implement applications in C using functions and pointers.
4. Develop applications in C using structures.
5. Design applications using sequential and random access file processing

TEXT BOOKS:

1. Reema Thareja, ”Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.

REFERENCES:

1. Paul Deitel and Harvey Deitel, ”C How to Program”, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

U20GE102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	L	T	P	C
		2	0	4	4

Pre-requisite: Basic knowledge in practical geometry construction, imagination and mathematics.

COURSE OBJECTIVES:

1. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
2. To expose them to existing national standards related to technical drawings.

UNIT I PLANE CURVES AND ORTHOGRAPHIC PROJECTION 6+12

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimension. Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method (polygonal and circular surfaces) inclined to both the planes.

UNIT III PROJECTION OF SOLIDS 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple solids - Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC PROJECTION 6+12

Principles of Isometric Projection - Isometric scale –Isometric projections of simple solids and truncated solids - Prisms, Pyramids, Cylinders, Cones- combination of two solid objects in simple vertical positions.

TOTAL: 30+60 = 90 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Familiarize with the fundamentals and standards of Engineering graphics.
2. Perform freehand sketching of basic geometrical constructions and multiple views of objects.
3. Project orthographic projections of lines and plane surfaces.
4. Draw projections and solids and development of surfaces.
5. Visualize and to project isometric and perspective sections of simple solids.

TEXT BOOKS:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.

4. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
3. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
4. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

Special points applicable to Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

U20BS101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Pre-requisite: Basic knowledge of Physics and chemistry laboratory apparatus.

PHYSICS LABORATORY

COURSE OBJECTIVE:

1. To handle different experiments to test the physics concepts applied in optics, thermal physics, electronics, sound, elasticity and etc.

LIST OF EXPERIMENTS:

1. Find the Young’s modulus by non-uniform bending method
2. Verify of band gap energy of a PN junction semiconductor using PN junction kit
3. Determination of wavelength of Laser and particle size using Laser grating method
4. Determination of rigidity modulus of given wire using Torsion pendulum method
5. Determination of thickness of a thin specimen using Air wedge method

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

Young’s Modulus: Non-Uniform bending

a. Travelling Microscope - 6 Nos.
b. Pin -Scale Knife edge - 6 Nos.

Band gap

a. PN Junction diode setup - 6 Nos.
b. Eliminator - 6 Nos.

Particle Size

a. Laser grating - 6 Nos.

b. Circular disc with particle coated - 6 Nos.
c. Laser Source - 6 Nos.

Torsional Pendulum
a. Torsional Pendulum - 6 Nos.
b. Thin wire - 6 Nos.
c. Cloch - 6 Nos.
d. Screw gauge - 6 Nos.

Air wedge
a. Air wedge - 6 Nos.
b. Travelling Microscope - 6 Nos.
c. Mercury vapour lamp - 6 Nos.

TOTAL :30 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Apply the basic theory for the corresponding experiment
2. Know the procedure to use physics equipment

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

1. To make the student to acquire practical skills in the determination of water quality
2. Parameters through volumetric and instrumental analysis.
3. To acquaint the students with the determination of molecular weight of a polymer by Viscometer.

LIST OF EXPERIMENTS:

1. Determination of DO content of water sample by Winkler's method.
2. Determination of chloride content of water sample by argentometric method.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of HCL using conductivity meter
5. Determination of molecular weight of polyvinyl alcohol using Ostwald visco meter.

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

a. Iodine flask - 30 Nos.
b. PH meter - 5 Nos.
c. Conductivity meter - 5Nos.
d. Spectrophotometer - 5 Nos.
e. Ostwald Viscometer - 10 Nos.
f. Common Apparatus: Pipette, Burette, Conical Flask, Porcelain tile, Dropper

TOTAL :30 PERIODS

COURSE OUTCOMES :

Learners are able to

1. The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
2. Utilize the fundamental laboratory techniques for analyses such as titrations, separation, purification and spectroscopy.

U20GE103	C - PROGRAMMING LABORATORY (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	4	2

Pre-requisite: Basic computer knowledge to install software.

COURSE OBJECTIVES:

1. To develop programs in C using basic constructs.
2. To develop applications in C using strings, pointers, functions, structures.
3. To develop applications in C using file processing.

LIST OF EXPERIMENTS:

1. Programs using I/O statements and expressions.
2. Programs using decision-making constructs.
3. Program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Check whether a given number is Armstrong number or not?
6. Populate an array with height of persons and find how many persons are above the average height.
7. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
8. Given a string “a$bcd./fg “find its reverse without changing the position of special characters.(Example input:a@gh%;j and output:j@hg%;a)
9. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
10. From a given paragraph perform the following using built-in functions:
    a. Find the total number of words.
    b. Capitalize the first word of each sentence.
    c. Replace a given word with another word.
11. Solve towers of Hanoi using recursion.
12. Sort the list of numbers using pass by reference.
13. Generate salary slip of employees using structures and pointers.
14. Compute internal marks of students for five different subjects using structures and functions.
15. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

TOTAL: 60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

HARDWARE:

1. Standalone desktops 30 Nos.

SOFTWARE:

1. C / Equivalent Compiler 30 Nos.

COURSE OUTCOMES:

1. Develop C programs for simple applications making use of basic constructs, arrays and strings.
2. Develop C programs involving functions, recursion, pointers, and structures.
3. Design applications using sequential and random access file processing.

SEMESTER II

		L	T	P	C
U20HS201	**FUNCTIONAL ENGLISH (COMMON TO ALL BRANCHES)**	**3**	**0**	**0**	**3**

Pre-requisite: Basics skills development of Reading and Writing.

COURSE OBJECTIVES:

1. To develop the basic reading and writing skills of first year engineering and technology students.
2. To help learners develop their listening skills, which will enable the mlisten to lectures and comprehend them basking questions; seeking clarifications.
3. To help learners develop their speaking skills and speak fluently in real contexts.
4. To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I VOCABULARY AND GRAMMAR 9

Listening-Listening to talks mostly of a scientific/technical .Speaking- Asking for and giving directions- Reading - reading short technical texts from journals-newspapers- Writing- purpose statements– extended definitions- issue-writing instructions - recommendations- Language Development–subject verb agreement -compound words. Technical vocabulary.

UNIT II TECHNIQUES OF READING AND WRITING 9

Listening: Listening Process; Types of Listening; Intensive vs. Extensive Listening; Barriers to Listening. Speaking - describing a process-Reading - reading longer technical texts- identifying the various transitions in a text- paragraphing- Writing- interpreting charts, graphs- Language Development - vocabulary used informal letters/emails and reports .Homonyms and Homophones-Common Errors. Numerical adjectives.

UNIT III GRAMMAR AND SKILL DEVELOPMENT 9

Listening- Listening to classroom lectures/ talks on engineering/technology -Speaking –introduction to technical presentations- Reading–longer texts both general and technical, practice in speed reading; Writing- checklists- Describing a process, use of sequence words-Language Development -sequence words- Misspelled words.-use of clauses. Verb forms. Direct/Indirect Speech.

UNIT IV INTERVIEW SKILL AND LANGUAGE DEVELOPMENT 9

Listening- Listening to documentaries and making notes. Speaking - mechanics of presentations- Reading- Reading for detailed comprehension-Writing-email etiquette -job application - cover letter- Résumé preparation (via email and hard copy) - analytical essays and issue based essays - Language Development -finding suitable synonyms-paraphrasing-. -if conditionals.

UNIT V TECHNICAL WRITING 9

Listening- TED/Ink talks; Speaking–participating in a group discussion - Reading- reading and understanding technical articles Writing- Writing reports- minutes of a meeting- accident and survey- Language Development- Comparative Adjectives

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to:

1. Use academic and technical vocabulary in relevant contexts. Construct meaningful and grammatically correct sentence.
2. Effectively listen and acquire language and content, read fast and understand texts.
3. Use oral presentation skills in all professional contexts.

4. Demonstrate the understanding of the nature and importance of technical communication Draft various types of technical and business documents like, reports, proposals and business letters.
5. Compose documents like job application, book review etc.

TEXT BOOKS:

1. Board of editors. Fluency Using English" A Course book for Undergraduate Engineering Technologists". Orient Blackswan, Hyderabad, 2015.
2. Sudharshana. N.P and Saveetha.C. "English for Technical Communication". Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Barrass, Robert. "Scientists Must Write". London: Routledge.2003.
2. Faculty of English. "Technical Communication". SASTRA Publication. 2017.
3. Raman, Meenakshi & Sangeeta Sharma. "Technical Communication: Wren & Martin. High School English Grammar and Composition". (Revised edn.) New Delhi: Chand & Co. 1995.
4. Dr.S.Sumant, "Technical English" Tata McGraw-Hill, New Delhi, 2001.
5. Essential English - E.Suresh Kumar, P. Sreehari, J. Savithri - Orient Blackswan 2011.

U20MA201	ADVANCED CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	1	0	4

Prerequisite: Basic concepts of vectors and complex numbers.

COURSE OBJECTIVES:

1. To familiarize the prospective engineers with techniques in ordinary differential equations, complex variables and complex integration.
2. The Study of Laplace transforms help to solve the differential equations that occur in various branches of engineering disciplines.
3. Vector calculus can be widely used for modeling the various laws of physics.
4. The various methods of complex analysis can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS 12

Basic concepts - Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Second order linear differential equations with constant coefficients - Particular Integral using operator method and Method of variation of parameters - Homogenous equation of Euler's and Legendre's type-Physical Applications-Oscillations of a Spring.

UNIT II LAPLACE TRANSFORMS 12

Existence conditions - Transforms of elementary functions –Transform of unit step function and unit impulse function - Basic properties - Shifting theorems -Transforms of derivatives and integrals - Transform of periodic functions - Inverse transforms: Convolution theorem (Statement only) and Partial Fractions - Application to solution of linear second order ordinary differential equations with constant coefficients-Unit Step Function-Unit impulse function.

UNIT III VECTOR CALCULUS AND APPLICATIONS 12

Gradient and directional derivative - Divergence and curl - Irrotational and Solenoidal vector fields - Line integral - Surface integral - Area of a curved surface - Green's, Gauss divergence and Stokes' theorems in evaluating line, surface and volume integrals (Planar, Cylindrical and Spherical Surfaces).

UNIT IV ANALYTIC FUNCTIONS 12

Analytic functions - Necessary and sufficient conditions for analyticity in Cartesian form - Properties - Harmonic conjugates - Construction of analytic function - Conformal mapping - Mapping by function- Bilinear Transformation.

UNIT V CALCULUS OF COMPLEX FUNCTIONS 12

Complex integral - Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series - Singularities - Residues - Residue theorem - Application of residue theorem for evaluation of real integrals - Use of circular contour and semicircular contour (No poles on the real axis).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Evaluate the effective mathematical tools to obtain the solutions of first and second order differential equations that model physical processes.
2. Express Gradient, divergence and curl of a vector point function and related identities. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
3. Apply the tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.
4. Express Analytic functions, conformal mapping and complex integration.
5. Solve Laplace transform and inverse transform of simple functions, properties, various related theorems and application to solve the differential equations with constant coefficients.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi.

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2014.
2. N. P. Bali and Manish Goyal "Engineering Mathematics" (For Semester II) Third Edition, University Science Press.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
5. Venkatraman M K, "Engineering Mathematics", Volume-1, Second edition, National Publishing Co, Chennai, 2003.

U20PH201	ENGINEERING PHYSICS - II (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

Prerequisite: Basic knowledge in material property and its uses.

COURSE OBJECTIVES:

1. To understand the basics of electric, thermal, magnetic, super conducting and di electric properties of materials
2. To aware about recent trends in physics

UNIT I ELECTRON THEORY OF SOLIDS 9

Introduction: types of materials- classical free electron theory: postulates- derivation of electrical conductivity and thermal conductivity- derivation. Wiedemann-Franz law and its verification-merits and demerits of classical free electron theory. Quantum free electron theory: Fermi energy level and its importance -Fermi-Dirac distribution function and its variation with temperature - density of energy states – carrier concentration in metals -average energy of electrons at 0 K.

UNIT II FUNDAMENTALS OF SEMICONDUCTORS 9

Introduction: properties- Types semiconductors- concept of effective mass of an electron and hole. Intrinsic semiconductor: carrier concentration in an intrinsic semiconductor-derivation –variation of Fermi energy level with temperature - Extrinsic semiconductor: carrier concentration derivation (P and N type semiconductor) - Hall effect–theory and experimental determination of Hall coefficient - Applications.

UNIT III DIELECTRICS AND FERRO ELECTRICS 9

Introduction: fundamental definitions in dielectrics–expressions for electronic and ionic polarization mechanisms- orientation polarization - space charge polarization - Langevin - Debye equation - frequency and temperature effects on polarization. Capacitor-energy stored in capacitor- Internal field - Clausius Mossotti relation-dielectric loss –dielectric breakdown - various breakdown mechanisms with characteristics - applications of dielectric materials - Ferro electrics -properties and applications.

UNIT IV MAGNETISM AND SUPER CONDUCTORS 9

Magnetic Materials: Introduction-basic definitions - origin of magnetic moment –Bohr magneton - magnetic materials: classification of dia, para, ferro magnetic materials. Ferro magnetic domains-energies involved in the growth of magnetic domains-hysteresis-explanation of hysteresis curve based on domain theory-soft and hard magnetic materials. Superconducting Materials: properties - types - BCS theory of super conductivity-Applications: cryotron and Mag-lev.

UNIT V NANOMATERIALS 9

Definition of nano system- Quantum confinement - 0D to 3D Quantum confined nanostructures - density of energy states from 3D to 0D- Preparation: top down and bottom up approaches- PLD - PVD - CVD - Electro deposition- Carbon nanotubes-types - SWCNT and MWCNT, Armchair, Zig-zag and Chiral structures-properties-applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Learners are able to

1. Select the metals required for specific applications in the area of engineering and technology.
2. Distinguish between different types of semiconductor and determination of Hall co-efficient.
3. Understand the property of dielectric and ferro electric property of materials.
4. Identify different magnetic materials and super conducting materials.
5. Understand the idea used in new technologies

TEXT BOOKS:

1. V.Rajendran, “Materials Science”, Tata McGraw- Hill, New Delhi, 2011.
2. S. Vadivel, A. Pannerselvam, “Solid State Physics”, Jaitech Publications, 2015 (Revised edition).

REFERENCES:

1. Charles Kittel,"Introduction to Solid State Physics",John Wiley & sons, 7th edition,Singapore (2007).
2. M. Arumugam, "Materials Science". Anuradha publishers, 2010.
3. Dr. W. R. Fahrner, "Nanotechnology and Nano electronics Materials", Devices, Measurement Techniques", Springer, 2005
4. J M D. Coey, "Magnetism and Magnetic Materials", Combridge University Press, 1st edition, 2009.
5. V. Pokropivny, R. Lohmus, I. Hussainova, A. Pokropivny, S. Vlassov. Introduction in nano materials and nanotechnology. - University of Tartu. - 2007.

U20GE201	PYTHON PROGRAMMING (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Knowledge of concepts like variables, loops and control statement

COURSE OBJECTIVES:

1. To acquire programming skills in core Python.
2. To develop Python programs with conditionals and loops.
3. To develop the skill of designing Graphical user Interfaces in Python
4. To use Python data structures – lists, tuples, dictionaries.
5. To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS AND STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW AND FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES AND DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES AND PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Develop algorithmic solutions to simple computational problems
2. Decompose a Python program into functions.
3. Implement database and GUI applications
4. Represent compound data using Python lists, tuples and dictionaries.
5. Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey,"Think Python: How to Think Like a Computer Scientist‟", 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python “, Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, “Introduction to Computation and Programming Using Python‟”, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
4. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers, LLC, 2013.

U20CS201	DATA STRUCTURES AND ALGORITHM	L	T	P	C
		3	0	0	3

Prerequisite: To Know the basic concepts of learning algorithms

COURSE OBJECTIVES:

1. Apply various non-linear tree data structures in real time applications and projects
2. Solve the collision problem using hashing techniques
3. Implement and solve problems using heaps
4. Design algorithms to solve common graph problems
5. Identify the algorithms that are used to solve various problems.

UNIT I TREE STRUCTURE 9

Tree: Types of Trees - Binary Tree – Representation – Tree Traversals – Expression Trees - Threaded Binary Tree - Application of Trees- Set Representation – Union and Find operations

UNIT II SEARCH STRUCTURESAND INDEXING 9

Binary Search Tree- AVL Tree - Red-Black Tree- Splay Tree - B-tree - B+ tree - Hashing - Hash functions – Collision resolution techniques: Separate chaining and open addressing

UNIT III STACKS ANDQUEUES 9

Stacks and Queues: Stacks: ADT Stack and its operations: Applications of Stacks: Expression Conversion and evaluation. Queues: ADT Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues

UNIT IV GRAPHS 9

Graphs: Representation – Graph traversals – Minimum spanning trees: Prim's algorithm, Kruskal's algorithm – Shortest path algorithms: Dijkstra's algorithm, Floyd Warshall algorithm – Applications of Graphs: Topological sort

UNIT V INTRODUCTION TO ALGORITHMDESIGNTECHNIQUES 9

Overview: Greedy Method - Divide and conquer - Dynamic Programming - Backtracking - Branch and bound.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Derive the time and space complexities and justify the correctness of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Create the ADTs and demonstrate the applications of Stacks and Queues.
4. Demonstrate the advantages of dynamic memory allocation via linked lists.
5. Illustrate about different types of Trees & Graph structures and implement search and
6. Traversal algorithms.

TEXT BOOKS:

1. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Silicon Press, New Jersey, Second Edition, 2005.
2. Data Structures and Algorithm Analysis In C 2nd Edition by Mark Allen Weiss, Pearson Education.

REFERENCES:

1. Jean Paul Tremblay and Sorenson, “An Introduction to Data Structures with Applications” McGraw Hill Publishing Company, New Delhi, Second Edition, 2007.
2. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, “Data Structures using C and C++”, Prentice Hall of India/ Pearson Education, New Delhi,2006.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, New Delhi, Second Edition, 2012.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press, 2010.

		L	T	P	C
U20EC201	**SEMICONDUCTOR DEVICES**	**3**	**0**	**0**	**3**

Pre-requisite: Basic knowledge of Engineering Physics

COURSE OBJECTIVES:

1. Accustom with the basics of semiconductor physics
2. Understand the operation, characteristics, parameters and specifications of semiconductor diodes and special diodes
3. Discuss the operation and performance of important applications of diodes
4. Explain the bipolar, field-effect and metal oxide semiconductor transistor construction, operation, characteristics and parameters
5. Acquaint with the construction, theory and operation of Special semiconductor and display devices

UNIT I SEMICONDUCTORS 9

History of semiconductor device development - Intrinsic semiconductor - Energy band diagram - Direct and indirect semiconductors - Carrier concentration in intrinsic semiconductor - Extrinsic semiconductors - Carrier concentration in N-type and P-type semiconductors - Semiconductor device materials - Semiconductor devices - Advantages, disadvantages and applications.

UNIT II SEMICONDUCTOR DIODE 9

Equilibrium PN junction - Forward biased PN junction - Reverse biased PN junction - Current-voltage relationship - Calculation of depletion width - Potential barrier - Diode current - Capacitive effects in PN junction - Energy band structure - Ideal diode and its current-voltage characteristics - Terminal characteristics and parameters.

UNIT III DIODE CIRCUITS 9

Diode Characteristics and Parameters - Diode Equivalent Circuit - Half Wave Rectifier - Precision Half Wave Rectifier - Full Wave Rectifier - Bridge Rectifier - Rectifiers with filter capacitors- Diode Switching Time and Frequency Response - Clippers and Clampers - Voltage multipliers Circuits.

UNIT IV JUNCTION TRANSISTORS 9

BJT: NPN and PNP - Operations - Early effect - Current equations - Input and Output characteristics of CE, CB, CC. JFETs - Drain and Transfer characteristics - Current equations - Pinch off voltage and its significance - MOSFET - Characteristics - Threshold voltage - Channel length modulation - D - MOSFET - E - MOSFET - Characteristics - Comparison of MOSFET with JFET.

UNIT V SPECIAL SEMICONDUCTOR, POWER DEVICES AND DISPLAY DEVICES 9

Schottky barrier diode - Zener diode - Varactor diode - Tunnel diode - LASER diode - LDR - UJT - SCR - DIAC - TRIAC - LED - LCD - Photo transistor - Solar cell.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Confidence in handling and usage of electronic devices, tools and instruments in engineering applications.
2. Know broadly the concepts and functionalities of the electronic devices, tools and instruments.
3. Understand use, general specifications and deploy abilities of the electronic devices and assemblies.
4. Operate the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors,
5. Understand the concepts on Power control devices, LED, LCD and other Opto-electronic devices.

TEXT BOOKS:

1. David A. Bell, “Electronic Devices & Circuits”, Oxford University Press, 4th edition, 2006.
2. Donald A Neaman, “Semiconductor Physics and Devices”, 2nd Edition, Tata Mc GrawHill Inc, 2002.

REFERENCES:

1. Adel S. Sedra, Kenneth C. Smith, “Microelectronic Circuits: Theory and Applications”, Oxford University Press, 7th Edition, 2017.
2. Jacob Millman, Christos C Halkias, Satyabrata Jit, Millman's,“Electronic Devices and Circuits”, McGraw Hill Education, 4th Edition, 2015.
3. Salivahanan.S, Suresh Kumar.N, Vallavaraj.A, “Electronic Devices and circuits”, Tata McGraw-Hill, 3rd Edition, 2012.
4. Thomas L. Floyd, “Electronic Devices”, Pearson Education, 7th edition, 2008.
5. Sanjeev Gupta,Santosh Gupta, “Electinic Devicew and Circuits” Rai Publication, 4 edition 2007

U20GE203	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	4	2

Prerequisite: Basic knowledge of Civil, Mechanical, Electrical and Electronics Engineering Equipments

COURSE OBJECTIVE:

1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

CIVIL ENGINEERING PRACTICES

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

b) Study of pipe connections requirements for pumps and turbines.

c) Preparation of plumbing line sketches for water supply and sewage works.

d) Hands-on-exercise:

Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.

e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting

MECHANICAL ENGINEERING PRACTICES

Welding:

a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

b) Gas welding practice

Basic Machining:

a) Simple Turning and Taper turning

b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:

b) Model making - Trays and funnels.

c) Different type of joints.

Machine assembly practice:

a) Study of centrifugal pump

b) Study of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.

Example –Exercise - Production of hexagonal headed bolt.

b) Foundry operations like mould preparation for gear and step cone pulley.

c) Fitting - Exercises - Preparation of square fitting and V - fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICES:

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICES:

1. Study of Electronic components and equipments - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.

4. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.

1. Carpentry vice (fitted to work bench	15 sets
2. Standard woodworking tools	15 Nos.
3. Models of industrial trusses, door joints, furniture joints	15 sets
Power Tools:	5 each
(a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

Arc welding transformer with cables and holders	5 Nos.
1. Welding booth with exhaust facility	5 Nos.
2. Welding accessories like welding shield, chipping hammer, wire brush, etc..	5 Sets
3. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
4. Centre lathe	2 Nos.
5. Hearth furnace, anvil and smithy tools	2 Sets
6. Moldings table, foundry tools	2 Sets.
7. Power Tool: Angle Grinder	2 Nos.
8. Study-purpose items: centrifugal pump, air-conditioner	One each

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each 1 No.
4. Megger (250V/500V)	2 Nos.
5. Power Tools:	2 Nos.
a) Range Finder	2 Nos.
b) Digital Live-wire detector	2 Nos.

ELECTRONICS

1.	Soldering guns	10 Nos.
2.	Assorted electronic components for making circuits Small PCBs	50 Nos.
3.	Multimeters	10 Nos.
4.	Study purpose items:	10 Nos. (Telephone, FM radio, low-voltage power supply)

COURSE OUTCOMES:

Learners are able to

1. Fabricate carpentry components and pipe connections including plumbing works.
2. Use welding equipments to join the structures.
3. Carry out the basic machining operations
4. Make the models using sheet metal works
5. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
6. Carry out basic home electrical works and appliances
7. Measure the electrical quantities
8. Elaborate on the components, gates, soldering practices.

U20GE204	PYTHON PROGRAMMING LABORATORY (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	4	2

Pre-requisite:. Basic knowledge of install programming software

COURSE OBJECTIVES:

1. To read, write and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. To implement functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. To get input data from/to files in Python.

LIST OF EXPERIMENTS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method).
3. Exponentiation (power of a number).
4. Find the maximum of a list of numbers.
5. Linear search and Binary search.
6. Selection sort, Insertion sort.
7. Merge sort
8. Find the First n prime numbers.
9. Multiply matrices.
10. Implement python programs that take command line arguments (word count).
11. Implement python program to find the most frequent words in a text read from a file.
12. Simulate elliptical orbits in Pygame.
13. Simulate bouncing ball using Pygame.

TOTAL :60 PERIODS

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

HARDWARE:

1. Standalone Desktops 30 Nos

SOFTWARE:

Python 3 Interpreter for Windows/Linux

COURSE OUTCOMES:

Learners are able to

1. Compile and execute simple Python programs.
2. Implement mathematical calculation in programs
3. Develop Python programs step-wise by defining functions and calling them.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Execute simulation of pygame programs

		L	T	P	C
U20CS202	**DATA STRUCTURES LABORATORY**	**0**	**0**	**4**	**2**

Pre-requisite: To gain knowledge about different algorithm techniques

COURSE OBJECTIVES:

1. To implement Linear and Non - Linear Data Structures
2. To understand the different Operations of Search Trees
3. To implement Graph Traversal Algorithms
4. To get familiarized to Sorting and Searching Algorithms.

LIST OF EXPERIMENTS:

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms
12. Hashing – any two collision techniques.

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

HARDWARE:

Standalone Desktops 30 Nos

SOFTWARE:

C / Equivalent Compiler 30 Nos

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Write functions to implement Linear and Non - Linear Data structure Operations.
2. Suggest appropriate Linear / Non - Linear Data Structure Operations for solving a given problem.
3. Appropriately use the linear / non-linear data structure operations for a given problem.
4. Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval

SEMESTER III

U20MA302	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
		3	1	0	4

Pre-requisite: Basic ideas of set theory and formal languages

COURSE OBJECTIVES:

1. To provide mathematical background and sufficient experience on various topics of discrete mathematics like matrix algebra, logic and proofs, combinatory, graphs, algebraic structures, formal languages and finite state automata.
2. This course will extend students Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

UNIT I MATRIX ALGEBRA **12**

Matrices, Rank of Matrix, Solving System of Equations-Eigen Values and Eigen Vectors-Inverse of a Matrix - Cayley Hamilton Theorem.

UNIT II BASIC SET THEORY **12**

Basic Definitions - Venn Diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion - partitions- Permutation and Combination - Relations-Properties of relations - Matrices of relations - Closure operations on relations - Functions - injective, subjective and objective functions.

UNIT III MATHEMATICAL LOGIC **12**

Propositions and logical operators - Truth table - Propositions generated by a set, Equivalence and implication - Basic laws- Some more connectives - Functionally complete set of connectives- Normal forms - Proofs in Propositional calculus - Predicate calculus

UNIT IV ALGEBRAIC STRUCTURES **12**

Algebraic systems-Examples and general properties, Semi groups and monads, Groups- Sub groups-homomorphism, Isomorphism.

UNIT V GRAPH THEORY **12**

Basic Concepts, Isomorphism and Sub graphs-Planar Graphs, Euler's Formula; Multigraphs and Euler's Circuits- Hamiltonian Graphs- Trees and Connectivity- Chromatic Numbers.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Demonstrate skills in solving mathematical Problems
2. Comprehend mathematical principals and logic
3. Develop the understanding of the mathematical and logical basis to much modern technology.
4. Solve Problems using basic Graph Theory.
5. Design discrete problems to solve by computers

TEXT BOOKS:

1. "Mathematical Foundation of Computer Science" ,kindle edition, 2016, by J. Rajendra Prasad, T.Rama Rao,A. Madana Mohana Rao**.**
2. "Discrete Mathematical Structures with Applications to Computer Science", J.P.Tremblay and P.Manohar,Tata McGraw Hill.

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill,Fourth Edition, 2002 (Unit 1,2 & 3).

2. Hopcroft and Ullman, “Introduction to Automata Theory, Languages andComputation”, Narosa Publishing House, Delhi, 2002. (Unit 4,5)
3. A.Tamilarasi&A.M.Natarajan, “Discrete Mathematics and its Application”, Khanna Publishers, 2nd Edition 2005.
4. M.K.Venkataraman “Engineering Mathematics”, Volume II, National PublishingCompany, 2nd Edition,1989.
5. Graph Theory, by J.A.Bondy and U.S.R.Murthy, springer Verlag (2008).

WEB LINK:

1. https://lecturenotes.in/notes/19024-note-for-mathematical-foundations-of-computer-science-mfcs-by-shashank-mouli

U20IT302	OBJECT ORIENTED PROGRAMMING WITH C++	L	T	P	C
		3	0	0	3

Pre-requisite: Basic programming knowledge for reusability concepts

COURSE OBJECTIVES:

1. To get a clear understanding of object-oriented concepts.
2. To understand object oriented programming through C++.

UNIT I OVERVIEW **9**

Object-Oriented Programming in C++ - Data Types, Variables, Constants, Operators and Expressions –Functions and Pointers- Control Flow, Implementing ADTs in the Base Language

UNIT II CHARACTERISTICS OF OOP **9**

Data Hiding and Member Functions- Object Creation and Destruction- Constructors and Destructors in C++, Polymorphism data abstraction: Function overloading and Operator overloading. Iterators and Containers.

UNIT III INHERITANCE **9**

Inheritance-Types of Inheritance-Single, Multilevel, Hierarchical, Multiple and Hybrid Inheritance.

UNIT IV EXCEPTION HANDLING **9**

Exception handling in C++- try, catch and throw statements and various types of exceptions, Templates-function templates and class templates, Generic Programming and STL.

UNIT V STREAMS AND FILES **9**

Input Output With Files- Methods of Input and Output Classes- Text mode files- State flags- get and put stream pointers- Binary files- I/O Manipulators.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Gain the basic knowledge on Object Oriented concepts.
2. Ability to develop applications using Object Oriented Programming Concepts.
3. Ability to implement features of object oriented programming to solve real world problems.

TEXT BOOKS:

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003.
2. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.

REFERENCES:

1. Ira Pohl, “Object-Oriented Programming Using C++”, Pearson Education Asia, 2003.
2. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, 2004.
3. H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited,2003.

4. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

WEB LINKS:

1. https://www.geeksforgeeks.org/object-oriented-programming-in-cpp
2. https://www.digimat.in/nptel/courses/video/106105151/L01.html

U20IT303	DESIGN AND ANALYSIS OF ALGORITHM	L	T	P	C
		3	0	0	3

Pre-requisite: To know the basic concepts of algorithm to solve various problems

COURSE OBJECTIVES:

1. To understand and apply the algorithm analysis techniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3. To understand different algorithm design techniques.
4. To understand the limitations of Algorithmic power.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force – Computing an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design algorithms for various computing problems.
2. Analyze the time and space complexity of algorithms.
3. Critically analyze the different algorithm design techniques for a given problem.
4. Modify existing algorithms to improve efficiency.

TEXT BOOKS:

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms/ C++”, Second Edition, Universities Press, 2007.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford university press, 2015.

WEB LINKS:

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
2. https://www.digimat.in/nptel/courses/video/106101060/L01.html

U20IT304	DATABASE MANAGEMENT SYSTEM	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of database and query concepts

COURSE OBJECTIVES:

1. To learn the fundamentals of data models and to represent a database system using ER diagrams.
2. To study SQL and relational database design.
3. To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
4. To understand the fundamental concepts of transaction processing concurrency control techniques and recovery procedures.
5. To have an introductory knowledge about the Storage and Query processing

UNIT I RELATIONAL DATABASES **9**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL.

UNIT II DATABASE DESIGN **9**

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTIONS **9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery

UNIT IV IMPLEMENTATION TECHNIQUES **9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V ADVANCED DATABASES **9**

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL – XML

Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Classify the modern and futuristic database applications based on size and complexity.
2. Map ER model to Relational model to perform database design effectively.
3. Write queries using normalization criteria and optimize queries.
4. Compare and contrast various indexing strategies in different database systems.
5. Appraise how advanced databases differ from traditional databases

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011.
2. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan,"Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,”Database Management Systems", Tata McGraw Hill, 2011.

WEB LINKS:

1. https://beginnersbook.com/2015/04/dbms-tutorial
2. https://www.digimat.in/nptel/courses/video/106104135/L01.html
3. https://www.digimat.in/nptel/courses/video/106105175/L01.html

U20IT305	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

Pre-requisite: Basic idea of arithmetic and memory operations

COURSE OBJECTIVES:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To familiarize the students with hierarchical memory system including cache memories and Virtual memory.

UNIT I OVERVIEW & INSTRUCTIONS **9**

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions– Logical operations – control operations – Addressing and addressing modes

UNIT II ARITHMETIC OPERATIONS **9**

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub word Parallelism.

UNIT III PROCESSOR AND CONTROL UNIT **9**

Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions

UNIT IV PARALLELISM, MEMORY AND I/O SYSTEMS **9**

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors, Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory

UNIT V PARALLEL COMPUTER ARCHITECTURES **9**

On chip parallelism - co processors- Shared memory multiprocessors – Message passing multi computers-Massively parallel processors

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design arithmetic and logic unit.
2. Design and analyze pipelined control units
3. Evaluate performance of memory systems.
4. Understand parallel processing architectures.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessey, “Computer organization and design, Morgan Kauffman Elsevier, Fifth edition, 2014.
2. Structured Computer Organization, Andrew S.Tanenbaum “Structured Computer Organization” sixth Edition 2021.

REFERENCES:

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organization“, VIth edition, Mc Graw-Hill Inc, 2012.
2. William Stallings “Computer Organization and Architecture”, Eleventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.
4. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.

WEB LINKS:

1. https://www.tutorialspoint.com/computer_organization/index.asp
2. https://www.digimat.in/nptel/courses/video/106105031/L01.html
3. https://www.digimat.in/nptel/courses/video/106106092/L01.html

U20EC301 DIGITAL SYSTEMS **L T P C**
4 0 0 4

Pre-requisite: To know knowledge about logic gates and memory

COURSE OBJECTIVES:

1. To design digital circuits using simplified Boolean functions
2. To analyze and design combinational circuits
3. To analyze and design synchronous and asynchronous sequential circuits
4. To understand Programmable Logic Devices.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES **12**

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC **12**

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC **12**

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC **12**

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment.

UNIT V MEMORY AND PROGRAMMABLE LOGIC **12**

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Simplify Boolean functions using KMap.
2. Design and Analyze Combinational and Sequential Circuits.
3. Implement designs using Programmable Logic Devices.
4. Write HDL code for combinational and Sequential Circuits.

TEXT BOOK:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilo", 6th Edition, Pearson Education, 2017.

REFERENCES:

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design”, Sixth Edition, CENGAGE Learning", 2013.
4. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2003.

WEB LINK:

1. https://www.tutorialspoint.com/computer_logical_organization/digital_number_system.html

U20IT306	**OBJECT ORIENTED PROGRAMMING WITH C++ LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Pre-requisite: Basic knowledge about inheritance and file access

COURSE OBJECTIVES:

1. To get a clear understanding of object-oriented concepts.
2. To understand object oriented programming through C++.

LIST OF EXPERIMENTS:

1. Program Using Functions
    - Functions with default arguments
    - Implementation of call by value, address, reference
2. Simple Classes for Understanding Objects, Member Functions & Constructors
    - Classes with primitive data members,
    - Classes with arrays as data members
    - Classes with pointers as data members
    - Classes with constant data members
    - Classes with static member functions
3. Compile Time Polymorphism
    - Operator overloading
    - Function overloading

4. Run Time Polymorphism
    - Inheritance
    - Virtual functions
    - Virtual base classes
    - Templates
5. File Handling
    - Sequential access
    - Random access

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Gain the basic knowledge on Object Oriented concepts.
2. Develop applications using Object Oriented Programming Concepts.
3. Implement features of object oriented programming to solve real world problems.

U20IT307	DATABASE MANAGEMENT SYSTEM LABORATORY	L	T	P	C
		0	0	4	2

Pre-requisite: To learn about SQL query and DDL,DML commands

COURSE OBJECTIVES:

1. Learn to create and use a database
2. Be familiarized with a query language
3. Have hands on experience on DDL Commands
4. Have a good understanding of DML Commands and DCL commands
5. Familiarize advanced SQL queries.
6. Be exposed to different applications.

LIST OF EXPERIMENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. PL/SQL block to satisfy some conditions by accepting input from the user.
8. PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions
11. Mini project (Application Development using Oracle/ Mysql)
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design and implement a database schema for a given problem-domain
2. Populate and query a database
3. Create and maintain tables using PL/SQL.
4. Prepare reports

SEMESTER IV

U20IT401	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM	L	T	P	C
		3	0	0	3

Pre-requisite: Basic idea about AI techniques and fuzzy system

COURSE OBJECTIVES:

1. To understand the various characteristics of intelligent agents.
2. To learn about the different search strategies in AI.
3. To learn to represent knowledge in solving AI problems.
4. To understand the different ways of designing software agents.
5. To know about the various applications of AI.

UNIT I INTRODUCTION TO AI **9**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS **9**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT III KNOWLEDGE REPRESENTATION **9**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV FUZZY SYSTEMS **9**

Fuzzy Information, Fuzzy Neural Networks, Fuzzy Approaches for Supervised Learning Networks, Fuzzy Generalizations of Unsupervised Learning Methods, Reasoning with Uncertain Information, Preprocessing and Post-Processing Using Fuzzy Techniques, Applications in Biomedical Engineering

UNIT V EXPERT SYSTEMS **9**

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Use appropriate search algorithms for any AI problem
2. Represent a problem using first order and predicate logic
3. Provide the apt agent strategy to solve a given problem
4. Design software agents to solve a problem
5. Design applications for NLP that uses Artificial Intelligence.

TEXT BOOKS:

1. S. Russell and P. Norvig ,"Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. C S Krishanamoorthy and S.Rajeev, "Artificial Intelligence and Expert system for Engineers", CRC Press 1st Edition.

REFERENCES:

1. M. Tim Jones, “Artificial Intelligence: A Systems Approach (Computer Science)”, Jones and Bartlett Publishers, Inc.First Edition, 2008
2. Nils J. Nilsson, “The Quest for Artificial Intelligence”, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, ”Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003.

WEB LINK:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.html

U20IT402	OPERATING SYSTEM	L	T	P	C
		3	0	0	3

Pre-requisite: Basic concepts of scheduling algorithms and android OS

COURSE OBJECTIVES:

1. To understand the basic concepts and functions of operating systems.
2. To understand Processes and Threads.
3. To analyze Scheduling algorithms.
4. To understand the concept of Deadlocks.
5. To analyze various memory management schemes.
6. To understand I/O management and File systems.
7. To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM OVERVIEW **9**

Computer System Overview- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Processes - Process Concept, Process Scheduling, Operations on Processes, CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues.

UNIT II PROCESS MANAGEMENT **9**

Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock. Kernel Modules, Process Management

UNIT III STORAGE MANAGEMENT **9**

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, Mobile OS - iOS and Android - Architecture and SDK Framework.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS **9**

Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Media Layer, Services Layer, Core OS Layer, File System.

UNIT V DISTRIBUTED OS **9**

Characterization of Distributed Systems- PC Message Passing, RPC, RMI, Group Communication - Synchronization: Lamport's logical clocks, mutual exclusion - Election algorithms - Replication: consistency control algorithms - Distributed Transactions, Serialization

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Analyze various scheduling algorithms.
2. Understand deadlock, prevention and avoidance algorithms.
3. Compare and contrast various memory management schemes.
4. Understand the functionality of file systems.
5. Perform administrative tasks on Linux Servers.
6. Compare iOS and Android Operating Systems

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc.,
2. Operating System Concepts, 10th Edition Abraham Silberschatz, Greg Gagne, Peter B. Galvin. April 2018
3. Andrew S. Tenenmaum, Albert S.Woodhull, "Operating Systems-Design and Implementation",3nd Edition, Pearson publication 2006.
4. Andrew.S.Tanenbaum, "Distributed Operating systems", Pearson Education India, 2001

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition,2010.
2. Achyut S.Godbole, Atul Kahate, "Operating Systems", Mc Graw Hill Education,2016.
3. Andrew S.Tanenbaum,"Modern Operating Systems",Second Edition,Pearson Education,2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education,2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education,2004.
6. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
7. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106106144/L01.html
2. https://www.tutorialspoint.com/operating_system/os_overview.html

U20IT403	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about different network layers

COURSE OBJECTIVES:

1. To understand the protocol layering and physical level communication.
2. To analyze the performance of a network.
3. To understand the various components required to build different networks.
4. To learn the functions of network layer and the various routing protocols.
5. To familiarize the functions and protocols of the Transport layer.

UNIT I NETWORK INTRODUCTION AND PHYSICAL LAYER 9

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA-LINK LAYER AND MEDIA ACCESS 9

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLCPPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER 9

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP

Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol –SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand the basic layers and its functions in computer networks.
2. Evaluate the performance of a network.
3. Understand the basics of how data flows from one node to another.
4. Analyze and design routing algorithms.
5. Design protocols for various functions in the network.
6. Understand the working of various application layer protocols.

TEXT BOOKS:

1. Behrouz A. Forouzan,"Data Communications and Networking", Fifth Edition TMH, 2013.
2. "Computer Networks" , By Pearson (5th Edition) by Tanenbaum, January 2013

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc.,2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education,2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall,2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher,2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education,2013.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106105081/L01.html
2. https://www.digimat.in/nptel/courses/video/106105183/L01.html
3. https://www.javatpoint.com/computer-network-tutorial

U20IT404	WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Idea about HTML and XML language

COURSE OBJECTIVES:

1. To understand about client-server communication and protocols used during communication.
2. To design interactive web pages using Scripting languages.
3. To learn server side programming using Servlets and JSP.
4. To develop web pages using XML/XSLT.

UNIT I WEB SITE BASICS AND HTML **9**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms

UNIT II CSS AND CLIENT SIDE SCRIPTING 9

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-CSS3.0. Client-Side Programming: The JavaScript Language-History and Versions.

UNIT III SERVER SIDE SCRIPTING 9

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window. Server-Side Programming: Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Databases and JavaServlets

UNIT IV JSP AND XML 9

Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm- Databases and JSP. Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces- DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers

UNIT V AJAX AND WEB SERVICES 9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods. Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design simple web pages using markup languages like HTML and XHTML.
2. Create dynamic web pages using DHTML and java script that is easy to navigate and use.
3. Program server side web pages that have to process request from client side web pages.
4. Represent web data using XML and develop web pages using JSP.
5. Understand various web services and how these web services interact.

TEXT BOOK:

1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2006.

REFERENCES:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown," Core Web Programming", Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006.

WEB LINK:

1. https://www.javatpoint.com/computer-network-tutorial

U20EC401	MICROPROCESSORS AND MICRO CONTROLLERS	L	T	P	C
		3	0	0	3

Pre-requisite: To know about basic microprocessor and its architecture

COURSE OBJECTIVES:

1. To understand the Architecture of 8086 microprocessor.
2. To study the Architecture of 8051 microcontroller.
3. To interface microcontrollers with supporting chips.
4. To understand the architecture and programming of advanced processor.
5. To study the application development of ARM processor.

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – 8086 signals – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II MICROCONTROLLER 9

Architecture of 8051–Special Function Registers (SFRs)-I/O Pins Ports and Circuits-Instruction set Addressing modes - Assembly language programming

UNIT III INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller and PIC.

UNIT IV ARM PROCESSOR ARCHITECTURE AND PROGRAMMING 9

Arcon RISC Machine – Architectural Inheritance – Core & Architectures - The ARM Programmer's model -Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors. Instruction set – Thumb instruction set – Instruction cycle timings

UNIT V ARM APPLICATION DEVELOPMENT 9

Introduction to RT implementation with ARM – Exception Handling – Interrupts – Interrupt handling schemes- Firmware and boot loader – Free RTOS Embedded Operating Systems concepts –example on ARM core like ARM9 processor

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand and execute programs based on 8086 microprocessor.
2. Design and implement 8051 microcontroller-based systems.
3. Design and interface I/O circuits.
4. Understand and execute programs based on ARM microprocessor.
5. Explain concepts relevant to ARM application development

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family-Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007. (UNIT I- III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011. (UNIT IV-V)
3. Steve Furber, ''ARM system on chip architecture'', Addision Wesley.

REFERENCES:

1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012.
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", 3rd edition, Tata McGraw Hill,2012

3. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and Optimizing System Software', Elsevier 2007

WEB LINK:

1. https://www.tutorialspoint.com /microprocessor/index.htm

U20HS202	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic idea about environmental impact and its uses

COURSE OBJECTIVES:

1. To study of nature and the facts about environment.
2. To find and implement scientific, technological, economic and political solutions to environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth's interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, Scope and Importance of Environment – Need for Public Awareness - 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 (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity 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-Spots 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 Bio diversity. Field Study of Common Plants, Insects, Birds Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – Causes, Effects and Control Measures of: (A) Air Pollution (B) Water Pollution (C)Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Soil Waste Management: Causes, Effects and Control Measures of Municipal Solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management: Floods, Earthquake, Cyclone and Landslides. Field Study of Local Polluted Site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURALRE SOURCES 9

Forest Resources: Use and Over-Exploitation, Deforestation, Case Studies - Timber Extraction, Mining, Dams and Their Effects on Forests 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: Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources. Case Studies – Land Resources: Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources – Equitable Use of Resources for Sustainable Life styles. Field Study of Local Area to Document Environmental Assets – River / Forest / Grassland / Hill / Mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **9**

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 – Role of Non-Governmental Organization- Environmental Ethics: Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies. – Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act– Air (Prevention And Control Of Pollution) Act – Water (Prevention And Control Of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Enforcement Machinery Involved in Environmental Legislation- Central and State Pollution Control Boards- Public Awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **9**

Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – 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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Public awareness of environment at infant stage.
2. Ignorance and incomplete knowledge has lead to misconceptions.
3. Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Second Edition, Pearson Education2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, 2006.

REFERENCES:

1. R.K. Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, EnviroMedia.
2. Cunningham, W.P. Cooper, T.H.Gorhani, ‘Environmental Encyclopedia, Jaico Publishing, 2001.
3. DharmendraS.Sengar,“Environmentallaw”,PrenticeHall,2007.
4. Raja gopalan.R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2005.

WEB LINK:

1. https://www.seas.harvard.edu/environmental-science-engineering

U20IT405 OPERATING SYSTEM LABORATORY **L T P C**
0 0 4 2

Pre-requisite: Basic idea about Unix commands and system calls

COURSE OBJECTIVES:

1. To learn Unix commands and shell programming
2. To implement various CPU Scheduling Algorithms
3. To implement Process Creation and Inter Process Communication.
4. To implement Deadlock Avoidance and Deadlock Detection Algorithms
5. To implement Page Replacement Algorithms
6. To implement File Organization and File Allocation Strategies

LIST OF EXPERIMENTS:

1. Basics of UNIX commands
2. programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Programs to simulate UNIX commands like cp, ls, grep,etc.

4. Shell Programming
5. Programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers Algorithm for Deadlock Avoidance
9. Implementation of Deadlock Detection Algorithm
10. Program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition
    a) FirstFit b)WorstFit c) BestFit
12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms
    a) FIFO b)LRU c)LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies
    a) Sequential b)Indexed c)Linked

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Compare the performance of various CPU Scheduling Algorithms
2. Implement Deadlock avoidance and Detection Algorithms
3. Implement Semaphores
4. Create processes and implement IPC
5. Analyze the performance of the various Page Replacement Algorithms
6. Implement File Organization and File Allocation Strategies

U20IT406	**COMPUTER NETWORKS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Pre-requisite: Basic idea about protocols and their uses

COURSE OBJECTIVES:

1. To learn and use network commands.
2. To learn socket programming.
3. To implement and analyze various network protocols.
4. To learn and use simulation tools.
5. To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS:

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and trace route.
2. Capture ping and trace route PDUs using a network protocol analyzer and examine.
3. HTTP web client program to download a web page using TCPsockets.
4. Applications using TCP sockets: like
   - Echo client and echo server
   - Chat
   - File Transfer
5. Simulation of DNS using UDP sockets.
6. code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Performance evaluation of Routing protocols using Simulation tool.
11. Simulation of error correction code (likeCRC).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Implement various protocols using TCP and UDP.
2. Compare the performance of different transport layer protocols.
3. Use simulation tools to analyze the performance of various network protocols.
4. Analyze various routing algorithms.
5. Implement error correction codes.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 TUDENTS:

HARDWARE:

1. Standalone desktops

SOFTWARE:

1. C / C++ / Java / Python /Equivalent Compiler
2. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer /Equivalent

SEMESTER V

		L	T	P	C
U20MA501	**RANDOM PROCESS AND STATISTICS**	**3**	**1**	**0**	**4**

Pre-requisite: Basic Knowledge of Multi Variable Calculus and Partial Differential Equation

COURSE OBJECTIVES:

1. To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
2. To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
3. To understand the basic concepts of random processes and its applications.
4. To understand the concept of correlation and spectral densities.
5. To understand the significance of linear systems with random inputs.

UNIT I PROBABILITY AND RANDOM VARIABLE 12

Axioms of probability - Conditional probability - Total probability – Baye's theorem - Random variable - Probability mass function - Probability density functions- Properties –Moments - Moment generating functions and their properties.

UNIT II CLASSIFICATION OF RANDOM PROCESSES 12

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT III CORRELATION AND SPECTRAL DENSITIES 12

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS 12

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - factorial design.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
2. Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
3. Apply the concept random processes in engineering disciplines.
4. Understand and apply the concept of correlation and spectral densities.
5. The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Veerarajan, T., 'Engineering mathematics', Tata McGraw-Hill(Education) India Pvt.Ltd, 2006.
2. Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.
3. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis" ,Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4. Stark. H. and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.
5. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics" Volume III, S. Chand & Company Ltd., 2011.

WEB LINK:

1. https://www.tutorialspoint.com/statistics/probability.htm

U20IT501	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about classes and thread concepts

COURSE OBJECTIVES:

1. To learn about basics concepts of java.
2. To study about Inheritance and it types.
3. To implement interfacing and threading mechanism.

UNIT I CLASS, METHODS AND STRINGS 9

History and Evolution of Java - An Overview of Java – Data types, variables, and Arrays- Operators – Control Statement – Introducing Class - Methods – String, String Buffer, String Builder

UNIT II INHERITANCE, PACKAGE, INTERFACE AND EXCEPTION HANDLING 9

Inheritance, Packages and Interfaces - Exception Handling Fundamentals – Exception Types – Uncaught Exception – Using try and catch – Multiple catch Clauses – Nested try statement – throw – throws – finally – Built-in Exception- Creating our own Exception class – Chained Exception

UNIT III GUI AND DATABASE CONNECTIVITY **9**

Introducing Swing – Exploring Swing: JLabel, Image Icon, JTextField, JButton, JList, JComboBox and JTable - Event Handling –- JDBC Programming concept – Executing Queries – Scrollable and Updatable Resultset.

UNIT IV I/O AND THE COLLECTIONS FRAMEWORK **9**

I/O Basics – Exploring java.io: Stream Class, Character Streams – Serialization - The Collections Framework – The Array List class – The HashSet class – Working with maps – The Vector class - Accessing a Collection via an Iterator.

UNIT V THREADS, GENERICS AND FUNCTIONAL PROGRAMMING **9**

Threads - Interrupting Threads - Thread States - Thread Properties – Synchronization - Auto Boxing – Generics – Lambda Expressions - Functions as First Class Objects -Pure Functions -Higher Order Functions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Apply basic features of Java to write programs.
2. Apply inheritance, package, interface and exceptions to write efficient programs.
3. Apply collection framework for writing efficient programs for real time applications.
4. Write GUI based data driven application using JDBC

TEXT BOOKS:

1. Herbert Schildt, “JavaTM : The Complete Reference”, 9th edition, Oracle Press, 2014.
2. Anita Seth, B. L. Juneja, “JAVA: One Step Ahead”, Oxford University Press, 2017.

REFERENCES:

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I Fundamentals”, 9th edition, Prentice Hall, 2013.
2. K. Arnold, D. Holmes and J. Gosling, “The JAVA programming language”, 4th edition, Addison Wesley Professional, 2005.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, 3rd edition, Addison Wesley, 2000.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106105191/L01.html
2. https://www.javatpoint.com/java-tutorial

U20IT502	**SOFTWARE ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: To Learn about basic software life cycle model

COURSE OBJECTIVES:

1. Understand the phases in a software project
2. Understand fundamental concepts of requirements engineering and Analysis Modeling.
3. Understand the major considerations for enterprise.

UNIT I SOFTWARE PROCESS **9**

Introduction –Software Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWI spiral, evolutionary, prototyping, object oriented and Agile software project management model) – system engineering – computer based system – verification – validation.

UNIT II SOFTWARE REQUIREMENTS **9**

Functional and non-functional - user – system –requirement engineering process – feasibility studies –

requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping -Software document. Analysis and modeling- data, functional and behavioral models – structured analysis and data dictionary.

UNIT III DESIGN CONCEPTS AND PRINCIPLES 9

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design– user interface design – user interface design principles. Real time systems - Real time software design. Software Configuration Management (SCM) – Need for SCM – Version control – Introduction to SCM process – Software configuration items - software design with extreme programming – Risk Management.

UNIT IV TESTING 9

Taxonomy of software testing – levels – test activities – types of software test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large - software testing strategies - testing using extreme programming.

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Measures and measurements – S/W complexity and science measure – size measure – data and logic Structure measure – information flow measure. Software cost estimation – function point models COCOMO model- Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis Error Tracking – Software changes – program evolution dynamics – software maintenance Architectural evolution.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Compare and analyze the various lifecycle models of software process
2. Design an appropriate analysis model that suits the requirement
3. Design software architecture models for various applications
4. Implement the strategies for software testing
5. Estimate the cost of the project using appropriate methods.

TEXT BOOK:

1. Roger S.Pressman, “Software engineering - A practitioner’s Approach”, McGraw-Hill International Edition, 8th edition,2015.

REFERENCES:

1. Ian Sommerville, “Software engineering”, Pearson education Asia, 9th edition, 2011.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Springer Verlag, 1997.
3. James F Peters and WitoldPedryez, “Software Engineering – An Engineering Approach”, John Wiley and Sons, New Delhi, 2000
4. Ali Behforooz and Frederick J Hudson, “Software Engineering Fundamentals”, Oxford University Press.

WEB LINKS:

1. https://www.javatpoint.com/software-engineering-tutorial
2. https:/www.digimat.in/nptel/courses/video/106101061/L01.html
3. https://www.digimat.in/nptel/courses/video/106105182/L01.html

U20IT503	THEORY OF COMPUTATION	L	T	P	C
		4	0	0	4

Pre-requisite: Learn about regular expression and grammar

COURSE OBJECTIVES:

1. To understand the language hierarchy.
2. To construct automata for any given pattern and find its equivalent regular expressions
3. To design a context free grammar for any given language.
4. To understand Turing machines and their capability.
5. To understand undecidable problems and NP class problems.

UNIT I AUTOMATA FUNDAMENTALS **12**

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES **12**

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES **12**

CFG – Parse Trees – Ambiguity in Grammars and Languages – Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines– Programming Techniques for TM.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES **12**

Definition of the Pushdown Automata – Languages of Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT V UNDECIDABILITY **12**

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Construct automata, regular expression for any pattern.
2. Write Context free grammar for any construct.
3. Design Turing machines for any language.
4. Propose computation solutions using Turing machines.

TEXT BOOK:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2003.
2. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2003.
3. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

WEB LINKS:

1. https://www.geeksforgeeks.org/introduction-of-theory-of-computation
2. https://www.digimat.in/nptel/courses/video/106104028/L01.html
3. https://www.digimat.in/nptel/courses/video/106105153/L01.html

U20IT504	SOFTWARE ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

Pre-requisite: Basic knowledge about to implement design and coding

COURSE OBJECTIVES:

1. To understand the software engineering methodologies for project development.
2. To gain knowledge about open source tools for Computer Aided Software Engineering.
3. To develop an efficient software using case tools

SOFTWARE REQUIRED:

Open source Tools: StarUML / UMLGraph / Topcased Prepare the following documents for each experiment and develop the software using software engineering methodology.

1. Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.

2. Software Requirement Analysis - Describe the individual Phases/modules of the project and Identify deliverables.

3. Data Modeling - Use work products – data dictionary, use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.

4. Software Development and Debugging – implement the design by coding

5. Software Testing - Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor.

LIST OF EXPERIMENTS:

Academic domain

1. Course Registration System
2. Student marks analyzing system

Railway domain

3. Online ticket reservation system
4. Platform assignment system for the trains in a railway station

Medicine domain

5. Expert system to prescribe the medicines for the given symptoms
6. Remote computer monitoring

Finance domain

7. ATM system
8. Stock maintenance

Human Resource management

9. Quiz System
10. E-mail Client system.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Use open source case tools to develop software.
2. Analyze and design software requirements in efficient manner.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Argo UML / StarUML / UMLGraph / Topcased or Equivalent.
HARDWARE: Standalone desktops 30 Nos.

U20IT505	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Pre-requisite: To learn about basic java programs and net beans.

COURSE OBJECTIVES:

1. To teach fundamentals of object oriented programming in Java.
2. Understand various concepts of Java.
3. To familiarize Java environment to create, debug and run simple Java programs.
4. To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application

LIST OF EXPERIMENTS

1. Prints all real solutions to the quadratic equation ax2 +bx + c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.
3. Prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)
4. Multiply two given matrices.
5. Reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)
6. Checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
7. Sorting list of names. Read input from command line.
8. Make frequency count of words in a given text.
9. Program to create a Student class with following fields
    i. Hall ticket number
    ii. Student Name
    iii. Department Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.
10. Demonstrate String comparison using == and equals method

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to:

1. Implement Object oriented features using Java
2. Apply the concept of polymorphism and inheritance.
3. Implement exception handling
4. Develop network and window application using AWT and Swings.

SEMESTER VI

U20IT601	FUNDAMENTALS OF DATA SCIENCE	L	T	P	C
		3	0	0	3

Pre-requisite: Basic idea about data science and data visualization

COURSE OBJECTIVES:

1. To understand about data science.
2. To learn about data preprocessing.
3. To design machine learning applications and its techniques
4. To understand clustering and their capabilities.

UNIT I INTRODUCTION TO DATA SCIENCE **9**

Data Science - Big Data and Data Science – Datafication - Current landscape of perspectives - Skill sets needed; Matrices - Matrices to represent relations between data, and necessary linear algebraic operations on matrices -Approximately representing matrices by decompositions (SVD and PCA); Statistics: Descriptive Statistics: distributions and probability - Statistical Inference: Populations and samples - Statistical modeling - probability distributions - fitting a model - Hypothesis Testing - Intro to R/ Python

UNIT II DATA PREPROCESSING **9**

Data preprocessing: Data cleaning - data integration - Data Reduction Data Transformation and Data Discretization. Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves-Exploratory Data Analysis - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA - The Data Science Process.

UNIT III MACHINE LEARNING ALGORITHMS **9**

Basic Machine Learning Algorithms: Association Rule mining - Linear Regression- Logistic Regression - Classifiers - k-Nearest Neighbors (k-NN), k-means -Decision tree - Naive Bayes- Ensemble Methods - Random Forest. Feature Generation and Feature Selection - Feature Selection algorithms - Filters; Wrappers; Decision Trees; Random Forests.

UNIT IV CLUSTERING **9**

Choosing distance metrics - Different clustering approaches - hierarchical agglomerative clustering, k-means (Lloyd's algorithm), - DBSCAN - Relative merits of each method - clustering tendency and quality.

UNIT V DATA VISUALIZATION **9**

Basic principles, ideas and tools for data visualization.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Compare and analyze the various data science concepts
2. Design data preprocessing techniques.
3. Design clustering approaches and metrics.
4. Implement the strategies for data visualization.

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, O'Reilly, 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei, “ Data Mining: Concepts and Techniques”, Third Edition. ISBN 0123814790, 2011.
3. Mohammed J. Zaki and Wagner Miera Jr, “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge University Press, 2014.
4. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016.

REFERENCES:

1. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
2. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python”, O'Reilly Media, 2012.

WEB LINKS:

1. https://www.tutorialsduniya.com/notes/data-science-notes
2. https://www.digimat.in/nptel/courses/video/106106212/L01.html

U20IT602	MACHINE LEARNING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about Big Data

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Machine Learning - Machine Learning Foundations –Overview – applications - Types of machine learning - basic concepts in machine learning Examples of Machine Learning -Applications - Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition -Bayesian Linear Regression - Bayesian Model Comparison.

UNIT II SUPERVISED LEARNING 9

Linear Models for Classification - Discriminate Functions -Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees – Classification Trees- Regression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Error Back propagation- Regularization - Mixture Density and Bayesian Neural Networks - Kernel Methods -Dual Representations - Radial Basis Function Networks. Ensemble methods- Bagging- Boosting.

UNIT III UNSUPERVISED LEARNING 9

Clustering- K-means - EM - Mixtures of Gaussians - The EM Algorithm in General -Model election for latent variable models - high-dimensional spaces -- The Curse of Dimensionality –dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA- Independent components analysis.

UNIT IV PROBABILISTIC GRAPHICAL MODELS 9

Introduction to time serious analysis in Machine learning. Directed Graphical Models - Bayesian Networks - Exploiting Independence Properties – From Distributions to Graphs -Examples -Markov Random Fields - Inference in Graphical Models – Learning –Naive Bayes classifiers-Markov Models – Hidden Markov Models – Inference – Learning- Generalization – Undirected graphical models- Markov random fields- Conditional independence properties - Parameterization of MRFs - Examples - Learning - Conditional random fields (CRFs) - Structural SVMs.

UNIT V ADVANCED LEARNING 9

Sampling – Basic sampling methods – Monte Carlo. Reinforcement Learning- K-Armed Bandit- Elements - Model-Based Learning- Value Iteration- Policy Iteration. Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions- Eligibility Traces- Generalization- Partially Observable States- The Setting- Example. Semi - Supervised Learning. Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. To implement a neural network for an application of your choice using an available tool.
2. To implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results.
3. To use a tool to implement typical clustering algorithms for different types of applications.
4. To design and implement an HMM for a sequence model type of application.
5. To identify applications suitable for different types of machine learning with suitable justification.

TEXT BOOKS:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Ethem Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005.

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3. Hastie, Tibshirani, Friedman, “The Elements of Statistical Learning” (2nd edition), Springer, 2008.
4. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, CRC Press, 2009.

WEB LINKS:

1. https://www.expert.ai/blog/machine-learning-definition
2. https://www.digimat.in/nptel/courses/video/106105152/L01.html

U20IT603	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about internet and its methodologies.

COURSE OBJECTIVES:

1. Identify the various IoT elements appropriate to the applications
2. Design a portable IoT using Arduino/Raspberry Pi incorporating cloud and analytics.
3. Implement IoT applications for real-time environment
4. To learn about the basics of IOT protocols

UNIT I FUNDAMENTALS OF IoT **9**

Introduction - Definition and Characteristics of IoT - Physical design - Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view

UNIT II ELEMENTS OF IoT **9**

IoT and M2M- difference between IoT and M2M - Software Defined Networks - Network Function Virtualization - IoT systems management – Needs - NETCONF, YANG - IoT design methodology Sensors and actuators - Communication modules – LoRa - RFID - Wi-Fi - Power sources

UNIT III IOT PROTOCOLS **9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

UNIT IV BUILDING IoT WITH CLOUD AND DATA ANALYTICS **9**

IoT platforms – Arduino – Raspberry Pi - Cloud Computing in IoT - Cloud Connectivity - Big Data Analytics - Data Visualization.

UNIT V CHALLENGES IN IOT AND CASE STUDIES **9**

Security Concerns and Challenges - Real time applications of IoT – Home automation – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Describe the characteristics, physical and logical designs, domains and architecture.
2. Differentiate M2M and IoT, SDN and NFV design methodologies.

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key applications and Protocols”, Wiley Publications 2nd edition, 2013.

REFERENCES:

1. Raj Kamal, “Internet of Things – Architecture and Design Principles”, Mc Graw Hill Education Pvt. Ltd., 2017.
2. “Internet of Things and Data Analytics”, HwaiyuGeng, P.E, Wiley Publications, 2017.
3. Manoel Carlos Ramon, Intel Galileo and Intel Galileo Gen 2: API Features and Arduino Projects for Linux Programmers, Apress, 2014.
4. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.
5. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications, 2012.

WEB LINKS:

1. https://www.expert.ai/blog/machine-learning-definition
2. https://www.digimat.in/nptel/courses/video/106105166/L01.html

U20IT604	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Pre-requisite: To learn about cloud environment and its storage

COURSE OBJECTIVES:

1. To understand the concept of cloud computing.
2. To appreciate the evolution of cloud from the existing technologies.
3. To have knowledge on the various issues in cloud computing.
4. To be familiar with the lead players in cloud.
5. To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I FUNDAMENTALS OF CLOUD COMPUTING 9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS 9

Hadoop – Map Reduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
2. Learn the key and enabling technologies that help in the development of cloud.
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
4. Explain the core issues of cloud computing such as resource management and security.
5. Install and use current cloud technologies.
6. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Ritting house, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)”, O'Reilly, 2009.

WEB LINKS:

1. https://azure.microsoft.com/en-in/overview/what-is-cloud-computing
2. https://www.digimat.in/nptel/courses/video/106105223/L01.html
3. https://www.digimat.in/nptel/courses/video/106105167/L01.html

U20IT605	**CLOUD LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Pre-requisite: Learn to run virtual machine of different configuration

COURSE OBJECTIVES:

1. To develop web applications in cloud
2. Be exposed to tool kits for grid and cloud environment.
3. To learn the design and development process involved in creating a cloud based application
4. To learn to implement and use parallel programming using Hadoop.

LIST OF EXPERIMENTS:

1. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs 3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
3. Use GAE launcher to launch the web applications.
4. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
5. Find a procedure to transfer the files from one virtual machine to another virtual machine.
6. Find a procedure to launch virtual machine using trystack (Online Open stack Demo Version)
7. Install Hadoop single node cluster and run simple applications like word count

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

U20IT606	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

Pre-requisite: Basic knowledge of AI problems and its uses

COURSE OBJECTIVES:

1. To solve problems using various machine learning techniques with python language.
2. To design applications using machine learning techniques with R tool.
3. To identify machine learning techniques suitable for given problem.

LIST OF EXPERIMENTS:

1. Study and usage of python and R tool.
2. Implement a classifier for the sales data.
3. Develop a predictive model for predicting house prices
4. Implement the FIND-S algorithm. Verify that it successfully produces the trace in for the Enjoy sport - Example. (Tom Mitchell Reference)
5. Implement a decision tree algorithm for sales prediction/classification in retail sector
6. Implement back propagation algorithm for stock prices prediction
7. Implement clustering algorithm for Insurance fraud detection
8. Implement clustering algorithm for identifying cancerous data
9. Apply reinforcement learning and develop a game of your own.
10. Develop a traffic signal control system using reinforcement learning technique.

TOTAL: 60 PERIODS

COURSE OUTCOMES

Learners are able to

1. Apply various classification and clustering techniques for problems using tools like R and Python.
2. Implement solutions for various prediction problems using tools.
3. Design and development of game and traffic control system using reinforcement learning.

U20HS601	INTER PERSONALSKILLS - I	L	T	P	C
		0	0	2	1

Pre-requisite: Basic knowledge to acquire academic reading and listening skills

COURSE OBJECTIVES:

1. Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
2. Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
3. Improve general and academic listening skills
4. Make effective presentations.

UNIT I **6**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II **6**

Listen to process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III **6**

lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV **6**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V **6**

Conversational skills (formal and informal)-group discussion- making effective presentations using computers,listening/watchinginterviewsconversations,documentaries.Listening to lectures, discussions from TV/ Radio/Podcast.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Listen and respond appropriately.
2. Participate in group discussions
3. Make effective presentations
4. Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Pease, Allan. 1998. Body Language: How to Read Others Thoughts by their Gestures. Suda Publications. New Delhi.
2. Hughes, Glyn and Josephine Moate.Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Robert M.Sherfield and et al. “Developing Soft Skills” 4th edition, New Delhi: Pearson Education,2009.
4. Robbins, S. P. and Hunsaker, Phillip, L. (2009). Training in Interpersonal skills. Tips for managing people at work. 5th ed. New Delhi: PHI Learning.
5. Ladousse, GillianPorter. Role Play.Oxford University Press: Oxford,2014.

WEB LINK:

1. https://www.digimat.in/nptel/courses/video/106104220/L01.html

SEMESTER VII

U20IT701	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

Pre-requisite: To learn about big data tools and its analytics

COURSE OBJECTIVES:

1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with big data
3. To learn about stream computing.
4. To know about the research that requires the integration of large amounts of data.

UNIT I INTRODUCTION TO BIG DATA 9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT II CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions - Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches

UNIT IV STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 9

NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding - Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Work with big data tools and its analysis techniques.
2. Analyze data by utilizing clustering and classification algorithms.
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data.
4. Perform analytics on data streams.
5. Learn NoSQL databases and management.

TEXT BOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.

REFERENCES:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

WEB LINK:

1. https://www.javatpoint.com/what-is-big-data

U20IT702	DEEP LEARNING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of deep learning techniques.

COURSE OBJECTIVES:

1. To present the mathematical, statistical and computational challenges of building neural networks
2. To study the concepts of deep learning
3. To introduce dimensionality reduction techniques
4. To enable the students to know deep learning techniques to support real-time applications
5. To examine the case studies of deep learning techniques.

UNIT I INTRODUCTON TO DEEP LEARNING 9

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT II DEEP NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT III DIMENTIONALITY REDUCTION 9

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization

UNIT IV OPTIMIZATION AND GENERALIZATION 9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT V CASE STUDY AND APPLICATIONS 9

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection- Bio Informatics- Face Recognition- Scene Understanding- Gathering Image Captions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand basics of deep learning
2. Implement various deep learning models
3. Realign high dimensional data using reduction techniques
4. Analyze optimization and generalization in deep learning
5. Explore the deep learning applications

TEXT BOOK:

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.

REFERENCES:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

WEB LINKS:

1. https://www.javatpoint.com/deep-learning
2. https://www.digimat.in/nptel/courses/video/106105215/L01.html
3. https://www.digimat.in/nptel/courses/video/106106201/L01.html

U20IT703	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

Pre-requisite: Basic idea about protocols and network security

COURSE OBJECTIVES

1. To understand Cryptography Theories, Algorithms and Systems.
2. To understand necessary Approaches and Techniques to build protection
3. Mechanisms in order to secure computer networks.

UNIT I INTRODUCTION TO CNS **9**

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY **9**

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclids algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution

UNIT III PUBLIC KEY CRYPTOGRAPHY **9**

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY **9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometri m,mcs, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY **9**

Electronic Mail security – PGP, S/MIME – IP security – Web Security - System Security: Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand the fundamentals of networks security, security architecture, threats and vulnerabilities.
2. Apply the different cryptographic operations of symmetric cryptographic algorithms
3. Apply the different cryptographic operations of public key cryptography
4. Apply the various Authentication schemes to simulate different applications
5. Understand various Security practices and System security standards

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.
2. Cryptography and network security principles and practice, william-stallings-7th edition, 2006.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India Pvt.Ltd
2. Behrouz A.Foruzan, "Cryptography and Network Security", Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: private Communication in a public World", Prentice Hall.

WEB LINK:

1. https://www.geeksforgeeks.org/cryptography-introduction

U20IT704	**NETWORK SECURITY LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Pre-requisite: Basic Knowledge about security system and various algorithm

COURSE OBJECTIVES

1. To learn different cipher techniques.
2. To implement the algorithms DES, RSA, MD5, SHA-1.
3. To use network security tools and vulnerability assessment tools.

LIST OF EXPERIMENTS

1. Perform encryption, decryption using the following substitution techniques
   (i) Ceaser cipher,
   (ii) Play air cipher
   (iii) Hill Cipher
   (iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques
   i) Rail fence ii) row & Column Transformation
3. Implement RSA Algorithm using HTML and JavaScript
4. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
5. Calculate the message digest of a text using the SHA-1 algorithm.
6. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
7. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
8. Defeating Malware
   i) Building Trojans ii) Root kit Hunter

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Develop code for classical Encryption Techniques to solve the problems.
2. Build cryptosystems by applying symmetric and public key encryption algorithms.
3. Construct code for authentication algorithms.
4. Develop a signature scheme using Digital signature standard.
5. Demonstrate the network security system using open source tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent
HARDWARE: Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

PROFESSIONAL ELECTIVES (PE)

SEMESTER V
ELECTIVE I

U20IT511	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about organizations and principles

COURSE OBJECTIVES:

1. To enable the students to study the evolution of Management.
2. To study the functions and Principles of management
3. To learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS **9**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and Contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING **9**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques– Decision making steps and process.

UNIT III ORGANISING **9**

Nature and purpose – Formal and informal organization – organization chart – organization structure– types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management

UNIT IV DIRECTING **9**

Foundations of individual and group behavior – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – Communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING **9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and Performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Have clear understanding of managerial Functions like planning, organizing, staffing, leading and controlling
2. Have same basic knowledge on international aspect of management

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

WEB LINK:

1. https://www.tutorialspoint.com/principal-of-management

U20IT512	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

Pre-requisite: To learn about memory and distributed systems

COURSE OBJECTIVES:

1. To understand the foundations of distributed systems.
2. To learn issues related to clock Synchronization and the need for global state in distributed systems.
3. To learn distributed mutual exclusion and deadlock detection algorithms.
4. To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
5. To learn the characteristics of peer-to-peer and distributed shared memory systems

UNIT I INTRODUCTION TO DISTRIBUTED SYSTEMS 9

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems – Message-passing systems versus shared memory systems –Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. A model of distributed computations: A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications. Logical Time: A framework for a system of logical locks –Scalar time –Vector time – Physical clock synchronization: NTP.

UNIT II MESSAGE ORDERING & SNAPSHOTS 9

Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. Global state and snap shot recording algorithms: Introduction –System model and definitions –Snapshot algorithms for FIFO channels

UNIT III DISTRIBUTED MUTEX & DEADLOCK 9

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport’s algorithm –Ricart-Agrawala algorithm – Maekawa’s algorithm – Suzuki–Kasami’s broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries –Models of deadlocks – Knapp’s classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT IV RECOVERY & CONSENSUS 9

Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure –free system – Agreement in synchronous systems with failures.

UNIT V P2P & DISTRIBUTED SHARED MEMORY 9

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord– Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Elucidate the foundations and issues of distributed systems
2. Understand the various synchronization issues and global state for distributed systems.
3. Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems
4. Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
5. Describe the features of peer-to-peer and distributed shared memory systems

TEXT BOOKS:

1. Kshemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

REFERENCES:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Mukesh Singhal and Niranjan G. Shivaratri. Advanced concepts in operating systems. McGraw-Hill, Inc., 1994.
3. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
4. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

WEB LINK:

1. https://www.tutorialspoint.com/Distributed-Systems

U20IT513	C#. NET PROGRAMMING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of .net framework and its uses

COURSE OBJECTIVES:

1. To learn basic programming in C# and the object oriented programming concepts.
2. To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.
3. To study the advanced concepts in data connectivity, WPF,WCF and WWF with C# and .NET 4.5.
4. To implement mobile applications using .Net compact framework
5. To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT I C# LANGUAGE BASICS **9**

Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples – Operators and Casts – Indexers

UNIT II C# ADVANCED FEATURES **9**

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher – Event Listener - Strings and Regular Expressions - Generics - Collections – Memory Management and pointers - Errors and Exceptions – Reflection

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION **9**

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization -Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions -ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications – Windows Presentation Foundation (WPF).

UNIT IV WINDOW BASED APPLICATIONS, WCF AND WWF **9**

Window based applications - Core ASP.NET- ASP.NET Web forms –Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting -Windows Service - Windows

Workflow Foundation (WWF) - Activities – Workflows

UNIT V .NET FRAMEWORK AND COMPACT FRAMEWORK **9**

Assemblies - Shared assemblies - Custom Hosting with CLR Objects – App domains -Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging –Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Write various applications using C# Language in the .NET Framework.
2. Develop distributed applications using .NET Framework.
3. Create mobile applications using .NET compact Framework.

TEXT BOOKS:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner . “Professional C# 2012 and .NET 4.5”, Wiley, 2012
2. Harsh Bhasin, “Programming in C#”, Oxford University Press, 2014.

REFERENCES:

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”, O‘Reilly, Fourth Edition, 2010.
2. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, A press publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, “Mobile Development Handbook”, Microsoft Press, 2011.

WEB LINK:

1. https://www.tutorialspoint.com/csharp/index.htm

U20IT514	**BLOCK CHAIN TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Basic knowledge of bitcoin and blockchain technologies

COURSE OBJECTIVES:

1. Impart strong technical understanding of blockchain technologies.
2. To develop familiarity of current technologies, tools and implementation strategies.
3. To introduce application areas, current practices and future directions

UNIT I INTRODUCTION TO BLOCKCHAIN **9**

Blockchain- Public Ledgers, Blockchain as Public Ledgers -Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Blockchain, Transactions-Distributed Consensus, The Chain and the Longest Chain – Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT II BITCOIN AND CRYPTOCURRENCY **9**

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay, Consensus introduction, Distributed consensus in open environments-Consensus in a Bitcoin network

UNIT III BITCOIN CONSENSUS **9**

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases, Design issues for Permissioned Blockchains, Execute contracts- Consensus models for permissioned blockchain-Distributed consensus in closed environment Paxos

UNIT IV DISTRIBUTED CONSENSUS **9**

RAFT Consensus-Byzantine general problem, Byzantine fault tolerant system-Agreement Protocol, Lamport-Shostak-Pease BFT Algorithm-BFT over Asynchronous systems, Practical Byzantine Fault Tolerance.

UNIT V HYPER LEDGER FABRIC , ETHERUM & BLOCKCHAIN APPLICATIONS **9**

Architecture of Hyperledger fabric v1.1-Introduction to hyperledger fabric v1.1, chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, Smart contracts, Truffle Design and issue Crypto currency, Mining, DApps, DAO Internet of Things-Medical Record Management System-Blockchain in Government and Blockchain Security-Blockchain Use Cases – Finance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

1. Understand emerging abstract models for Blockchain Technology.
2. Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
3. It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
4. Apply hyperledger Fabric and Etherum platform to implement the Block chain Application.

REFERENCES:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran,2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106104220/L01.html
2. https://www.tutorialspoint.com/blockchain/index.htm

U20IT515	**EMBEDDED SYSTEMS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Basic knowledge of c programming and data structures

COURSE OBJECTIVES:

1. To learn the architecture and programming of ARM processor.
2. To become familiar with the embedded computing platform design and analysis.
3. To get thorough knowledge in interfacing concepts
4. To design an embedded system and to develop programs

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS **9**

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output-supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN **9**

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs-Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III EMBEDDED FIRMWARE **9**

Reset Circuit, Brown-out Protection Circuit-Oscillator Unit - Real Time Clock-Watchdog Timer - Embedded Firmware Design Approaches and Development Languages.

UNIT IV SENSOR INTERFACING WITH ARDUINO **9**

Basics of hardware design and functions of basic passive components-sensors and actuators-Arduino code - library file for sensor interfacing-construction of basic applications.

UNIT V EMBEDDED C PROGRAMMING **9**

Introduction-Creating 'hardware delays' using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay-Timeout mechanisms-Creating loop timeouts-Testing loop timeouts- hardware timeouts-Testing a hardware timeout.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Describe the architecture and programming of ARM processor.
2. Explain the concepts of embedded systems.
3. Understand the Concepts of peripherals and interfacing of sensors.
4. Capable of using the system design techniques to develop firmware
5. Illustrate the code for constructing a system

TEXT BOOKS:

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (unit I & II)
2. Michael J. Pont, "Embedded C", 2nd Edition, Pearson Education, 2008.(Unit IV & V)

REFERENCES:

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill.2014
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
3. Raj Kamal, "Embedded Systems-Architecture, programming and design", Third edition,TMH.2015.
4. David E. Simon, "An Embedded Software Primer", Pearson Education, 2000.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106104220/L01.html
2. https://www.digimat.in/nptel/courses/video/109103020/L01.html
3. https://www.tutorialspoint.com/embedded_systems/index.htm

SEMESTER-VI

ELECTIVE-II

		L	T	P	C
U20IT621	**LINUX PROGRAMMING**	**3**	**0**	**0**	**3**

Pre-requisite: Basic knowledge about Linux OS.

COURSE OBJECTIVES:

1. To teach principles of operating system including File handling utilities, Security by file Permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
2. To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, Debugging shell scripts.
3. To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).

4. To facilitate students in understanding Inter process communication.
5. To facilitate students in understanding semaphore and shared memory.
6. To facilitate students in understanding process.

UNIT I INTRODUCTION TO LINUX AND LINUX UTILITIES 9

A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT II INTRODUCTION TO SHELLS 9

Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT III GREP 9

Operation, grep Family, Searching for File Content. Sed :Scripts, Operation, Addresses, commands, Applications, grep and sed. UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers. File Management :File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT IV PROCESS AND SIGNALS 9

Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT V INTER PROCESS COMMUNICATION 9

Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands. INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
2. Write Shell Programming using Linux commands.
3. Design and write application to manipulate internal kernel level Linux File System.
4. Develop IPC-API's that can be used to control various processes for synchronization.
5. Develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

TEXT BOOKS:

1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India.
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson.

REFERENCES:

1. Linux System Programming, Robert Love, O'Reilly, SPD.

2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education.

WEB LINK:

1. https://www.tutorialspoint.com/unix/index.htm

U20IT622	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Knowledge about Data mining techniques.

COURSE OBJECTIVES:

1. This course deals with evolving multidimensional intelligent model from a typical system,
2. Representation of multidimensional data for a data warehouse,
3. Ds covering the knowledge imbibed in the high dimensional system,
4. Finding the hidden interesting patterns in data,
5. Gives the idea to evaluate various mining techniques on complex data objects.

UNIT I INTRODUCTION TO DATA WAREHOUSING 9

Evolution of Decision Support Systems- Data warehousing Components –Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations..

UNIT II DATA WAREHOUSE PROCESS AND ARCHITECTURE 9

Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS

UNIT III INTRODUCTION TO DATA MINING 9

Data mining-KDD versus data mining, Stages of the Data Mining Process-task premitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing –Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation

UNIT IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification –Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods - Clustering techniques – , Partitioning methods- k-means Hierarchical Methods - distance-based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis

UNIT V DATA WAREHOUSING AND DATA MINING SOFTWARE'S & APPLICATIONS 9

Mining complex data objects, Spatial databases, temporal databases, Multimedia databases, Time series and Sequence data; Text Mining –Graph mining-web mining-Application and trends in data mining.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Learners are able to

1. Be familiar with mathematical foundations of data mining tools..
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition2011, ISBN: 1558604898.
2. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

REFERENCES:

1. Mehmed kantardzic,"Data mining concepts,models,methods, and algorithms", Wiley Inter science, 2003.
2. Ian Witten, Eibe Frank, Data Mining; Practical Machine Learning Tools and Techniques, third edition, Morgan Kaufmann, 2011.
3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Prentice Hall, 2003.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106105174/L01.html
2. https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

U20IT623	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

Pre-requisite: Ethical thinking of professional context with requirements.

COURSE OBJECTIVES:

1. To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES **9**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas –Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR)– Discrimination.

UNIT V GLOBAL ISSUES **9**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi,2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India,New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics–Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.

WEB LINK:

1. https://www.tutorialspoint.com/professional_ethics/index.htm

U20IT624	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of fuzzy sets and membership functions

COURSE OBJECTIVES:

1. To learn the basic concepts of Soft Computing
2. To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
3. To apply soft computing techniques to solve problems.

UNIT I INTRODUCTION TO SOFT COMPUTING **9**

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS **9**

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional-Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS **9**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making

UNIT IV GENETIC ALGORITHMS **9**

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction -Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm

UNIT V HYBRID SYSTEMS **9**

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture -Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Apply suitable soft computing techniques for various applications.
2. Integrate various soft computing techniques for complex problems.

TEXT BOOKS:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd.,2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2002.
2. Kwang H.Lee, “First course on Fuzzy Theory and Applications”, Springer, 2005.
3. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Practice Hall, 1996.
4. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

WEB LINK:

1. https://www.javatpoint.com/what-is-soft-computing

U20IT625	CYBER SECURITY	L	T	P	C
		3	0	0	3

Pre-requisite: Basics skills to assess security and privacy technologies.

COURSE OBJECTIVES:

1. To learn the concepts of number theory, cryptographic techniques.
2. To understand integrity and authentication process.
3. To familiarize various cyber threats, attacks, vulnerabilities, defensive mechanisms, security policies and practices.

UNIT I INTRODUCTION TO NUMBER THEORY **9**

Finite Fields and Number Theory: Modular arithmetic, Euclidian Algorithm, Primality Testing: Fermats and Eulers theorem, Chinese Reminder theorem, Discrete Logarithms

UNIT II CRYPTOGRAPHIC TECHNIQUES **9**

Symmetric key cryptographic techniques: Introduction to Stream cipher, Block cipher: DES,AES,IDEA Asymmetric key cryptographic techniques: principles, RSA, ElGamal, Elliptic Curve cryptography, Key distribution and Key exchange protocols.

UNIT III INTEGRITY AND AUTHENTICATION **9**

Hash functions, Secure Hash Algorithm (SHA)Message Authentication, Message Authentication Code (MAC), Digital Signature Algorithm : RSA ElGamal based

UNIT IV CYBERCRIMES AND CYBER OFFENSES **9**

Classification of cybercrimes, planning of attacks, social engineering: Human based, Computer based: Cyber stalking, Cyber cafe and Cybercrimes.

UNIT V CYBER THREATS, ATTACKS AND PREVENTION **9**

Phishing, Password cracking, Key loggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID): Types of identity theft, Techniques of ID theft-SECURITY writing security policies, Internet and email security policies, Compliance and Enforcement of policies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Know the fundamental mathematical concepts related to security.
2. Implement the cryptographic techniques to real time applications.
3. Comprehend the authenticated process and integrity, and its implementation
4. Know fundamentals of cybercrimes and the cyber offenses.
5. Realize the cyber threats, attacks, vulnerabilities and its defensive mechanism.
6. Design suitable security policies for the given requirements.
7. Exploring the industry practices and tools to be on par with the recent trends

TEXT BOOKS:

1. Cryptography and Network security, William Stallings, Pearson Education, 7th Edition,2016
2. Cyber Security, Understanding cyber crimes, computer forensics and legal perspectives, Nina Godbole,Sunit Belapure, Wiley Publications, Reprint 2016
3. Writing Information Security Policies, Scott Barman, New Riders Publications, 2002

REFERENCES:

1. Cyber security for Dummies, Brian Underdahl, Wiley, 2011
2. Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011.

WEB LINK:

1. https://www.tutorialspoint.com/cyber security

SEMESTER VII

ELECTIVE III

		L	T	P	C
U20IT731	**SOFTWARE PROJECT MANAGEMENT**	**3**	**0**	**0**	**3**

Pre-requisite: To learn about software organization to deliver quality product

COURSE OBJECTIVES:

1. Deliver successful software projects that support organization's strategic goals
2. Match organizational needs to the most effective software development model
3. Plan and manage projects at each stage of the software development life cycle (SDLC)
4. Create project plans that address real-world management challenges
5. Develop the skills for tracking and controlling software deliverables.

UNIT I BASIC CONCEPTS **9**

Product, Process and Project – Definition – Product Life Cycle – Project Life Cycle Models.

UNIT II FORMAT PROCESS MODELS AND THEIR USE **9**

Definition and Format model for a process – The ISO 9001 and CMM Models and their relevance to Project Management – Other Emerging Models like People CMM.

UNIT III UMBRELLA ACTIVITIES IN PROJECTS **9**

Metrics – Configuration Management – Software Quality Assurance – Risk Analysis.

UNIT IV STREAM ACTIVITIES IN PROJECTS **9**

Project Initiation **–** Project Planning **–** Execution and Tracking **–** Project Wind up **–** Concept of Process/Project Database.

UNIT V ENGINEERING AND PEOPLE ISSUES IN PROJECT MANAGEMENT **9**

Phases (Requirements, Design, Development, Testing, Maintenance, Deployment) – Engineering Activities and Management Issues in Each Phase – Special Considerations in Project Management for India and Geographical Distribution Issues.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Provide how different project contexts will impact upon all aspects of a software development project
2. Identify and describe the key phases of project management.
3. Determine an appropriate project management approach through an evaluation of the business context and project scope and knowledge of agile and traditional project management approaches
4. Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management.

TEXT BOOKS:

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Humphrey,Watts,"Managing the Software Process ",Addison Wesley,1986.

REFERENCES:

1. Pressman, Roger, "Software Engineering", A Practitioners approach". McGraw Hill, 1997.
2. Bob Hughes and Mike Cotterell, "Software Project Management".
3. Wheelwright and Clark, "Revolutionizing product development", The Free Press, 1993.

WEB LINK:

1. https://www.tutorialspoint.com/software_engineering/software_project_management.htm

U20IT732	WIRELESS ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about protocols and routing networks

COURSE OBJECTIVES:

1. Explain fundamental principles of Ad-hoc Networks
2. Discuss a comprehensive understanding of Ad-hoc network protocols.
3. Outline current and emerging trends in Ad-hoc Wireless Networks.
4. Analyze energy management in ad-hoc wireless networks.

UNIT I INTRODUCTION TO ADHOC NETWORKS 9

Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas

UNIT II ROUTING PROTOCOLS 9

Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols.

UNIT III MULTICAST ROUTING 9

Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other

Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.

UNIT V QUALITY OF SERVICE AND ENERGY MANAGEMENT 9

Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design their own wireless network
2. Evaluate the existing network and improve its quality of service
3. Choose appropriate protocol for various applications
4. Examine security measures present at different level
5. Analyze energy consumption and management.

TEXT BOOK:

1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education,2011

REFERENCES:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.
3. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson Education, 2002.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/106105160/L01.html
2. https://www.tutorialspoint.com/what-is-ad-hoc-network

U20IT733	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about linear algebra and AI techniques

COURSE OBJECTIVES:

1. To learn the fundamentals of natural language processing
2. To understand the use of CFG and PCFG in NLP
3. To understand the role of semantics of sentences and pragmatics
4. To apply the NLP techniques to IR applications

UNIT I INTRODUCTION 9

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM -Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow

parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS **9**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES **9**

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus,British National Corpus BNC.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design an innovative application using NLP components
2. Implement a rule based system to tackle morphology/syntax of a language
3. Design a tag set to be used for statistical processing for real-time applications
4. Compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin,"Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, O'Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, "Language Processing with Java and Ling Pipe Cookbook", Atlantic Publisher, 2015.
2. Richard M Reese, "Natural Language Processing with Java", O'Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

WEB LINKS:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm
2. https://www.digimat.in/nptel/courses/video/106105158/L01.html

U20IT734	**MULTICORE ARCHITECTURE AND PROGRAMMING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Basic knowledge of memory programming and core processor

COURSE OBJECTIVES:

1. To understand the recent trends in the field of Computer Architecture and identify performance related parameters.
2. To appreciate the need for parallel processing.
3. To expose the students to the problems related to multiprocessing.
4. To understand the different types of multicore architectures.
5. To understand the design of the memory hierarchy.
6. To expose the students to multicore programming.

UNIT I NEED FOR MULTICORE ARCHITECTURES 9

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and its Exploitation - Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT II MULTIPROCESSOR ISSUES 9

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT III MULTICORE ARCHITECTURES 9

Homogeneous and Heterogeneous Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture – GPGPU Architectures.

UNIT IV MEMORY HIERARCHY DESIGN 9

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

UNIT V MULTICORE PROGRAMMING 9

Parallel Programming models – Shared Memory Programming – Message Passing Interface – Open MP Program Development and Performance Tuning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Identify the limitations of ILP and the need for multicore architectures
2. Discuss the issues related to multiprocessing and suggest solutions
3. Point out the salient features of different multicore architectures and how they exploit parallelism
4. Critically analyze the different types of inter connection networks
5. Design a memory hierarchy and optimize it
6. Explain the different parallel programming models
7. Develop programs using Open MP and optimize them.

TEXT BOOKS:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan Kaufmann / Elsevier, 2011.

REFERENCES:

1. Michael J Quinn, “Parallel Programming in C with MPI and OpenMP”, Tata McGraw Hill, 2003.
2. Darryl Gove, “Multicore Application Programming: For Windows, Linux, and Oracle Solaris”, Pearson, 2011.
3. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture: A Hardware/ Software Approach”, Morgan Kaufmann / Elsevier, 1997.

WEB LINK:

1. https://www.tutorialspoint.com/ multicore architectures.htm

U20IT735	**DATA VISUALIZATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Basic knowledge of python and R programming

COURSE OBJECTIVES:

1. To develop skills to both design and critique visualizations.
2. To introduce visual perception and core skills for visual analysis.
3. To understand visualization for time-series analysis.

4. To understand visualization for ranking analysis.
5. To understand visualization for deviation analysis.
6. To understand visualization for distribution analysis.
7. To understand visualization for correlation analysis.

UNIT I CORE SKILLS FOR VISUAL ANALYSIS 9

Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples.

UNIT II TIME-SERIES,RANKING AND DEVIATION ANALYSIS 9

Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays–deviation analysis best practices.

UNIT III DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS 9

Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques & practices.

UNIT IV INFORMATION DASHBOARD DESIGN I 9

Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception–Achieving eloquence.

UNIT V INFORMATION DASHBOARD DESIGN II 9

Advantages of Graphics Library of Graphs – Designing Bullet Graphs – Designing Spark lines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Learners are able to

1. Explain principles of visual perception
2. Apply core skills for visual analysis
3. Apply visualization techniques for various data analysis tasks
4. Design information dashboard.

REFERENCES:

1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001.
3. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.
4. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
5. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
6. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.
7. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009.
8. Tamara Munzner, “Visualization Analysis and Design”, AK Peters Visualization Series, CRC Press, Nov. 2014

WEB LINK:

1. https://www.tutorialspoint.com/business_writing_skills/data_visualization.htm

SEMESTER VIII

ELECTIVE IV

		L	T	P	C
U20IT841	**ADVANCED JAVA PROGRAMMING**	**3**	**0**	**0**	**3**

Pre-requisite: Basic understanding of java language.

COURSE OBJECTIVES:

1. To be familiarize with RMI and JSP
2. To understand the Java Servlets and Database connectivity.
3. To know more about the Enterprise Java Bean (EJB) Programming

UNIT I APPLET, AWT AND EVENT HANDLING **9**

Applet Basics – Applet architecture – HTML APPLET tag – Passing parameter to Applet get Document Base() and get Codebase() – AWT classes and Graphics – AWT Controls Event Handling – Event Classes – Event Listener Interfaces – Layout Managers – Menus

UNIT II INTRODUCING SWING & JAVA BEANS **9**

Exploring Swing – JLabel and ImageIcon, JTextField – The Swing Buttons – JTabbedPane - JScrollPane, JList & JcomboBox – Trees & JTables –Java Bean – Advantages of Java Beans – Introspection, Bound and Constrained Properties – Persistence & Customizers

UNIT III RMI & NETWORKING **9**

Remote Method Invocation – Setting up Remote Method Invocation – RMI with Applets -Networking Basics – The Networking Classes and Interfaces – Inet Address – Inet4Address and Inet6Address - TCP/IP Client sockets – URL – URL Connection – Http URL Connection.

UNIT IV JDBC **9**

Presentation to JDBC CONNECTION settings – The Concept of JDBC – JDBC Driver Types – JDBC Packages – A Brief Overview of the JDBC Process – Database Connection – Associating the JDBC/ODBC Bridge with the Database – Statement Objects – Result Set.

UNIT V SERVLETS **9**

Background, The Life Cycle of a Servlet & The JSDK-A Simple Servlet – The Servlet API -RolePlay-Servlet Concept – The javax.servlet Package – Reading Servlet Parameters, The javax.servlet.http Package – Handling HTTP Request and Responses – Using Cookies – Session Tracking.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Implement Java programs.
2. Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API
3. Use the frameworks JSP, Hibernate, Spring
4. Design and implement server side programs using Servlets and JSP.

TEXT BOOK:

1. Naughton and H.Schildt, (2007), “Java 2-The complete reference”, Fifth Edition McGraw Hill.

REFERENCES:

1. Jim Keogh, (2002), “The Complete Reference J2EE”, Tata McGraw Hill Edition, New Delhi.
2. Marty Hall, Larry Brown, (2004), “Core Servlets and Java Server Pages”, 2nd Edition, Pearson Education.

WEB LINK:

1. https://www.tutorialspoint.com/java/index.htm

U20IT842	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

Pre-requisite: To learn key principle of software design and other components

COURSE OBJECTIVES:

1. To gain understanding of the basic principles of service orientation.
2. Service oriented analysis techniques, technology underlying the service design.
3. To gain advanced concepts such as service composition.
4. Orchestration and Choreography, and various WS-* specification standards

UNIT I FUNDAMENTALS OF SOA 9

Introduction-Defining SOA-Evolution of SOA-Service Oriented Enterprise-Comparing SOA to client-server and distributed internet architectures-Basic SOA Architecture-concepts-Key Service characteristics-Technical Benefits-Business Benefits.

UNIT II COMBINING SOA AND WEB SERVICES 9

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns Web Service Platform-Service Contract-Service Level Data Model-Service Discovery-Service Level Security-Service Level Interaction Patterns-Atomic and Composite Services-Service Enabling Legacy System-Enterprise Service Bus Pattern.

UNIT III MULTI CHANNEL ACCESS AND WEB SERVICES COMPOSITION 9

SOA for Multi-Channel Access-Business Benefits-Tiers-Business Process Management-Web Service Composition-BPEL-RESTFUL Services-comparison of BPEL and RESTFUL Services

UNIT IV JAVA WEB SERVICES 9

SOA support in J2EE – Java API for XML-based web services(JAX-WS)-Java Architecture for XML binding (JAXB) – Java API for XML Registries(JAXR)-Java API for XML based RPC (JAX-RPC)- Web Services Interoperability-SOA support in .NET – ASP.NET web services – Case Studies- Web Services Enhancements (WSE)

UNIT V WEB SERVICES SECURITY AND TRANSACTION 9

Meta Data Management-Advanced Messaging- Addressing – Reliable Messaging – PoliciesWS-Policy– Security- WS-Security–Notification and Eventing-Transaction Management

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand XML technologies.
2. Understand service orientation, benefits of SOA.
3. Understand web services and WS standards.
4. Use web services extensions to develop solutions.

TEXT BOOKS:

1. Eric Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005.
2. James McGovern,Sameer Tyagi,Michael E Stevens,Sunil Mathew,”Java Web Services Architecture”,Elsevier,2003.

REFERENCES:

1. Thomas Erl, “Service Oriented Architecture”,Pearson Education,2005
2. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services, An Architect’s Guide”, Pearson Education, 2005.
3. Dan Woods and Thomas Mattern, “Enterprise SOA Designing IT for Business Innovation” O’REILLY, First Edition, 2006.
4. Frank Cohen, “FastSOA”, Elsevier, 2007.
5. Jeff Davies, “The Definitive Guide to SOA”,Apress,2007

WEB LINK:

1. https://www.tutorialspoint.com/soa/index.htm

U20IT843	NETWORK PROGRAMMING AND MANAGEMENT	L	T	P	C
		3	0	0	3

Pre-requisite: Learn about TCP/IP and network protocols

COURSE OBJECTIVES:

1. Learn the basics of socket programming using TCP Sockets.
2. Learn about Socket Options.
3. Learn to develop Macros for including Objects in MIB Structure.
4. Understand SNMPv1, v2 and v3 protocols & practical issues.

UNIT I ELEMENTARY TCP SOCKETS 9

Introduction to Socket Programming – Overview of TCP/IP Protocols –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write, close functions – Iterative Server – Concurrent Server.

UNIT II APPLICATION DEVELOPMENT 9

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function – shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing).

UNIT III SOCKET OPTIONS, ELEMENTARY UDP SOCKETS 9

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

UNIT IV ADVANCED SOCKETS 9

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination – TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

UNIT V SIMPLE NETWORK MANAGEMENT 9

SNMP network management concepts – SNMP management information – standard MIB's – SNMPv1 protocol and Practical issues – introduction to RMON, SNMPv2 and SNMPvIII

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Develop Macros for including Objects in MIB Structure.
2. Use Socket Options.
3. Develop programs using TCP Sockets.
4. Use SNMPv1, v2 and v3 protocols.

TEXT BOOKS:

1. W. Richard Stevens, "UNIX Network Programming Vol-I", Third Edition, PHI Pearson Education, 2003.
2. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Third Edition, Pearson Edition, 2009

REFERENCE:

1. D.E. Comer, "Internetworking with TCP/IP Vol- III: Client-Server Programming and Application BSD Sockets Version", Second Edition, Pearson Edition, 2003.

WEB LINK:

1. https://www.digimat.in/nptel/courses/video/106105158/L01.htm

U20IT844	OPEN SOURCE SYSTEMS	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of python and mysql

COURSE OBJECTIVES:

1. Demonstrate different open source technology like linux, PHP & MySQL with different packages.
2. Illustrate Linux commands for programmers.
3. Explore programs of PHP with MySQL connections.
4. Explore programs of PYTHON

UNIT I FOSS PHILOSOPHY AND LINUX PACKAGE 9

Introduction to Software Terminologies - Overview of Free/Open Source Software - Definition of FOSS & GNU - History of GNU/Linux and the Free Software Movement , Advantages of Free Software and GNU/Linux, FOSS usage , trends and potential - global and Indian-Free Software Licenses(GPL, LGPL, AGPL). Installing software - from source code as well as using binary packages - Understanding build systems - constructing make files and using make, using autoconf and autogen to automatically generate make files tailored for different development environments.

UNIT II OPEN SOURCE NON RELATIONAL DATABASES 9

NoSQL definition - relational Vs non-relational database - working with NoSQL - Running MongoDB - Getting A Database Connection - Inserting Data into A Collection - Accessing Data From a Query - CouchDB-Developing with CouchDB - Example application - Deploying CouchDB.

UNIT III OPEN SOURCE PROGRAMMING LANGUAGES 9

PHP: Introduction - Programming in web environment - variables - constants - data types -operators - Statements - Functions - Arrays - OOP - String Manipulation and regular expression - File handling and data storage - PHP and SQL database - PHP and LDAP - PHP Connectivity - Sending and receiving E-mails - Debugging and error handling - Security - Templates.

UNIT IV PYTHON 9

Syntax and Style - Python Objects - Numbers - Sequences - Strings - Lists and Tuples -Dictionaries - Conditionals and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OOP - Execution Environment.

UNIT V OPEN SOURCE TOOLS AND TECHNOLOGIES 9

Web Server: Apache Web server –Google Web server- Working with Web Server - Configuring and Using apache web services MDA: Introduction to MDA - Genesis of MDA - Meta Object Facility - UML - UML Profiles - MDA Applications- case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Understand the importance of FOSS.
2. Create and manipulate non-relational data bases.
3. Write programs using PHP, Python and manipulate SQL data base.
4. Configure and use Apache web services, acquire knowledge to develop software models using MDA.

REFERENCES:

1. Mike McGrath, “Linux in easy steps, Fifth Edition”, Tata McGraw-Hill, Fifth Edition 2010.
2. N. B. Venkateshwarlu, “Introduction to Linux: Installation and Programming”, First Edition, BS Publishers, 2006.
3. Steve Suchring, “MySQL Bible”, John Wiley, 2007.
4. Steven Holzner, “PHP: The Complete Reference”, TMH Edition; 2007
5. J.Chris Anderson, “CouchDB : Definitive Guide”, First Edition, O’Reilly series, 2010.
6. Wesley J.Chun, “Core Python Programming”, Prentice Hall, 2007
7. Stephen J. Mellor, Marc Balces, “Executable UMS: A foundation for MDA”, Addison Wesley, 2002.

WEB LINK:

1. https://www.tutorialspoint.com/listtutorial/What-is-Open-Source/7155

U20IT845	FUNDAMENTALS OF NANO SCIENCE	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge about nano science and its methods

COURSE OBJECTIVE:

1. To learn about basis of nanomaterial science, preparation method, types and applications.
2. To learn about basic nano particles and its uses.

UNIT I INTRODUCTION ABOUT NANOSCIENCE 9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nano structured materials- nano particles- quantum dots, nano wires ultra-thin films-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only)

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 9

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arcgrowth,laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications-Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nano indentation.

UNIT V APPLICATIONS 9

Nano InfoTech: Information storage- nano computer, molecular switch, super chip, nanocrystal,Nano biotechlogy: nano probes in medical diagnostics and biotechnology, Nano medicines,Targetted drug delivery, Bio imaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, nano crystalline silver for bacterial inhibition,Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Familiarize about the science of nanomaterial.
2. Demonstrate the preparation of nanomaterial.
3. Develop knowledge in characteristic nanomaterial.

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterial: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscale Characterization of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure,
3. Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

WEB LINK:

1. https://www.tutorialspoint.com/fundamentals_of_science_and_technology/fundamentals_of_science_and_technology_quick_guide.htm

SEMESTER VIII

ELECTIVE V

U20IT851	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

Pre-requisite: Learn about basic computer devices with human interaction

COURSE OBJECTIVES:

1. To learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI.
4. To learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI **9**

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices– Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN & SOFTWARE PROCESS **9**

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES **9**

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI **9**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V WEB INTERFACE DESIGN **9**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

TOTAL: 45 PERIODS

COURSE OUTCOMES

Learners are able to

1. Design effective dialog for HCI
2. Design effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.
4. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
5. Develop meaningful user interface.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)

2. Brian Fling, “Mobile Design and Development”, 1st Edition, O’Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009 (UNIT-V)

WEB LINK:

1. https://www.tutorialspoint.com/human_computer_interface/index.htm

U20IT852	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of test techniques and software programs

COURSE OBJECTIVES:

1. To learn the criteria for test cases.
2. To learn the design of test cases.
3. To understand test management and test automation techniques.
4. To apply test metrics and measurements.

UNIT I INTRODUCTION **9**

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester‘s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository

UNIT II TEST CASE DESIGN STRATEGIES **9**

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White box testing approaches- Evaluating Test Adequacy Criteria. Risks analysis and management.

UNIT III LEVELS OF TESTING **9**

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT **9**

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program.

UNIT V TEST AUTOMATION **9**

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Design test cases suitable for a software development for different domains.
2. Identify suitable tests to be carried out.

3. Prepare test planning based on the document.
4. Document test plans and test cases designed.
5. Use automatic testing tools.
6. Develop and validate a test plan.

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, “Practical Software Testing”, Springer International Edition, 2003.
2. Edward Kit, “Software Testing in the Real World – Improving the Process”, Pearson Education, 1995.
3. Boris Beizer,”Software Testing Techniques” – 2nd Edition, Van Nostr and Reinhold, New York, 1990.
4. Aditya P. Mathur, “Foundations of Software Testing-Fundamental Algorithms and Techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

WEB LINK:

1. https://www.tutorialspoint.com/software_testing/index.htttml

U20IT853	TCP/IP TECHNOLOGY	L	T	P	C
		3	0	0	3

Pre-requisite: To learn socket programming and TCP/IP application

COURSE OBJECTIVE:

1. Gives a complete understanding of TCP / IP Technology
2. To learn the concept of protocols and its uses.

UNIT I INTRODUCTION **9**

Protocols and standards – OSI model – TCP / IP protocol suite – addressing – versions – underlying technologies.

UNIT II IP ADDRESSES, ROUTING, ARP AND RARP **9**

Classful addressing – other issues – subnetting – super netting – classless addressing – routing methods – delivery – table and modules – CIDR – ARP package – RARP

UNIT III IP, ICMP, TGMP AND UDP **9**

Datagram – fragmentation – options – checksum – IP package – ICMP – messages, formats – error reporting – query – checksum – ICMP package – IGMP – messages, operation – encapsulation – IGMP package – UDP – datagram – checksum – operation – uses – UDP package.

UNIT IV TCP, UNICAST AND MULTICAST ROUTING PROTOCOLS **9**

Services – flow, congestion and error control – TCP package and operation – state transition diagram – unicast routing protocols – RIP – OSPF – BGP – multicast routing – trees – protocols – MOSPF – CBT – PIM .

UNIT V APPLICATION LAYER, SOCKETS **9**

Client server model – concurrency – processes – sockets – byte ordering – socket system calls – TCP and UDP client-server programs – BOOTP -DHCP – DNS – name space, resolution – types of records – concept – mode of operation – Rlogin.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Study the standards of TCP / IP protocol and addressing.
2. Study of various protocols like ARP, RARP, UDP, ICMP, TGMP.

3. Multicasting protocols, sockets.

TEXT BOOK:

1. Behrouz Forouzan, “TCP/IP protocol suite “, 2nd ed., Tata McGraw-Hill.

REFERENCE:

1. Douglas Comer, “Internetworking with TCP / IP”, Vol – 1, PHI, 2000.

WEB LINKS:

1. https://www.tutorialspoint.com/wireless_communication/wireless_communication_tcp_ip.htm
2. https://www.tutorialspoint.com/The-TCP-IP-Reference-Model

U20IT854	INFORMATION RETRIEVAL	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of data structures and search engine

COURSE OBJECTIVES:

1. To use an open source search engine framework and explore its capabilities, represent documents in different ways and discuss its effect on similarity calculations and on search.
2. To modify Page Rank and HITS algorithms or Personalization, Semantic or any other aspect.
3. Design and implement an innovative feature in a search engine and explain the search components affected by the innovation.
4. Design a smart information management system with Information Retrieval components.

UNIT I INTRODUCTION TO IR **9**

Introduction -History of IR- Components of IR - Issues –Open source Search engine Frameworks, The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a Search engine- Characterizing the web.

UNIT II INFORMATION RETRIEVAL **9**

Boolean and vector-space retrieval models- Term weighting - TF-IDF weighting- cosine similarity – Preprocessing - Inverted indices - efficient processing with sparse vectors – Language Model based IR - Probabilistic IR –Latent Semantic Indexing - Relevance feedback and query expansion

UNIT III WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING **9**

Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement - search engine optimization/spam – Web Search Architectures - crawling - meta-crawlers- Focused Crawling - web indexes –- Near-duplicate detection - Index Compression - XML retrieval.

UNIT IV WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH **9**

Link Analysis –hubs and authorities - PageRank and HITS algorithms -Searching and Ranking – Relevance Scoring and ranking for Web – Similarity - Hadoop & MapReduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products – handling “invisible” Web - Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

UNIT V DOCUMENT TEXT MINING **9**

Information filtering; organization and relevance feedback – Text Mining -Text classification and clustering - Categorization algorithms: naive Bayes; decision trees; and nearest neighbor - Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Use an open source search engine framework and explore its capabilities
2. Apply appropriate method of classification or clustering and web crawling.

3. Design and implement innovative features in a search engine.

TEXT BOOKS:

1. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", (2nd Edition) (ACM Press Books) 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, "Search Engines: Information Retrieval in Practice", Addison Wesley; 1st edition 2009
4. Mark Levene,"An Introduction to Search Engines and Web Navigation",Wiley;2nd ed, 2010.

REFERENCES:

1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.
2. Ophir Frieder, "Information Retrieval: Algorithms and Heuristics" (The Information Retrieval Series)(2nd Edition), Springer; 2nd edition, 2004
3. Manu Konchady, "Building Search Applications", Lucene, LingPipe, and Gate Mustru Publishing; First edition,2008

WEB LINK:

1. https://www.tutorialspoint.com/information-retrival

U20IT855	SPEECH PROCESSING	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of phonetic and speech recognition

COURSE OBJECTIVES:

1. To understand the fundamentals of the speech processing
2. Explore the various speech models
3. Gather knowledge about the phonetics and pronunciation processing
4. Perform wavelet analysis of speech
5. To understand the concepts of speech recognition

UNIT I INTRODUCTION **9**

Introduction - knowledge in speech and language processing - ambiguity - models and algorithms - language - thought - understanding - regular expression and automata - words& transducers – N grams

UNIT II SPEECH MODELLING **9**

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model –transformation-based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling.

UNIT III SPEECH PRONUNCIATION AND SIGNAL PROCESSING **9**

Phonetics - speech sounds and phonetic transcription - articulatory phonetics -phonological categories and pronunciation variation - acoustic phonetics and signals -phonetic resources - articulatory and gestural phonology

UNIT IV SPEECH IDENTIFICATION **9**

Speech synthesis - text normalization - phonetic analysis - prosodic analysis – diphone waveform synthesis - unit selection waveform synthesis – evaluation

UNIT V SPEECH RECOGNITION **9**

Automatic speech recognition - architecture - applying hidden markov model – feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding -embedded training - multipass decoding: n-best lists and lattices- a* ('stack') decoding -context-dependent acoustic models: triphones - discriminative training – speech recognition by humans

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Learners are able to

1. Create new algorithms with speech processing
2. Derive new speech models
3. Perform various language phonetic analysis
4. Create a new speech identification system
5. Generate a new speech recognition system

TEXT BOOK:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Person education,2013.

REFERENCES:

1. Kai-Fu Lee, “Automatic Speech Recognition”, The Springer International Series in Engineering and Computer Science, 1999.
2. Himanshu Chaurasiya, “Soft Computing Implementation of Automatic Speech Recognition”, LAP Lambert Academic Publishing, 2010.
3. Claudio Becchetti, Klucio Prina Ricotti, “Speech Recognition: Theory and C++ Implementation”,Wiley publications 2008.
4. Ikrami Eldirawy , Wesam Ashour, “Visual Speech Recognition”, Wiley publications , 2011

WEB LINKS:

1. https://www.tutorialspoint.com/ Speech Recognition
2. https://www.tutorialspoint.com/biometrics/voice_recognition.htm