

I SEMESTER SYLLABI COMMON FOR ALL BRANCHES

Applicable to the students admitted to

R-2021: CBCS

Academic year 2021-2022
onwards



VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

#60, Avadi – Vel Tech Road, Vel Nagar,
Avadi, Tamil Nadu 600062



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LIST OF ABBREVIATIONS

S. No.	Abbreviations	Detailed Description
1	HSMC	Humanities & Social Science including Management Courses
2	BSC	Basic Science Courses
3	ESC	Engineering Science Courses
4	PCC	Professional Core Courses
5	PEC	Professional Elective Courses
6	OEC	Open Elective Courses
7	PROJ	Project Work
8	EEC	Employability Enhancement Courses
9	MC	Mandatory Courses

Curriculum (R2021)

SEMESTER I										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming	ESC	40	60	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	4	0	0	4
PRACTICAL										
7	21BS17P	Physics and Chemistry Laboratory	BSC	40	60	100	0	0	4	2
8	21ME18P	Engineering Practices Laboratory	ESC	40	60	100	0	0	4	2
TOTAL										25



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Course code	21EN11T	Semester	I						
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)					L	T	P	C
Course Title	COMMUNICATIVE ENGLISH (COMMON FOR ALL BRANCHES)					3	0	0	3

COURSE OBJECTIVES:

- To exhibit the students of Engineering and Technology to develop their listening and to recall the pattern of listening.
- To facilitate the learners to develop speaking skills to convey their ideas and views in the real context.
- To develop their reading skills and grasp the central ideas of the text.
- To expose them to acquire writing technique with basic grammar.
- To motivate the students to use appropriate vocabulary in academic and categorize the inferences in writings.

PREREQUISITE:

- Foundation of language with Basic English Grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C101. 1	<i>Listen</i> to different talks and lectures and understand them easily.	K1
C101. 2	<i>Communicate</i> their thoughts confidently using communicative strategies	K2
C101. 3	<i>Read</i> and grasp different genres of texts effortlessly	K2
C101. 4	<i>Write</i> grammatically correct academic, business and technical texts	K3
C101. 5	<i>Apply</i> the appropriate vocabulary to communicate efficiently in all forms of communication.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C101.1	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101.2	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101.3	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101.4	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101.5	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101.6	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I BASIC GRAMMAR I AND READING FOR INFORMATION 9**PRACTICAL**

LISTENING: Listening to short dialogues with good accent

SPEAKING : Introducing oneself - Exchanging personal information

TUTORIAL

READING : Reading short comprehension passages- practice skimming and scanning for specific information

WRITING: Parts of speech - Sentence patterns – Tenses – ‘wh’- questions - Yes/No questions -Countable and Uncountable nouns

VOCABULARY AND GRAMMAR: Affixation – word formation - Synonyms and Antonyms.

UNIT II BASIC GRAMMAR II AND SHARING INFORMATION 9**PRACTICAL**

LISTENING : Listening to documentaries - inspiring speeches of great leaders and practicing opinion sharing

SPEAKING : Self-introduction - peer introduction - picture description - JAM

TUTORIAL

READING: Note-making- Critical reading finding key information in a given text - shifting facts from opinions and paraphrasing

WRITING: Autobiographical writing (writing about one’s leisure time activities, hometown - favourite place and school life) - Biographical writing (place, people)

VOCABULARY AND GRAMMAR: Compound Words – Guessing meaning of words contexts - One Word substitutes – Pronouns- Adjectives – Adverbs – Imperatives - Direct and Indirect questions.

UNIT III BASIC GRAMMAR III AND FREE WRITING 9**PRACTICAL**

LISTENING : News Bulletins - Ted talks - telephonic conversations

SPEAKING : functions of Language - giving reasons - talking about future plans - comparing and contrasting - making suggestions

TUTORIAL

READING: Current Affairs - newspaper reading /magazines - loud in the classroom

WRITING: Coherence and cohesion in writing- cause and effect - compare & contrast and narrative & analytical paragraphs.

VOCABULARY AND GRAMMAR: Discourse marker - Reference words - Process description - Conjunctions – Prepositions - Articles - Degrees of comparison.

PRACTICAL

LISTENING : Listen to audio/ Conversation from BEC/IELTS /TOFEL.

SPEAKING : Interpersonal Skills: Role play/group discussion/debate/ conduct of meeting

TUTORIAL

READING: Reading different types of texts /genres/ for comprehension and pleasure – related with human values.

WRITING: Letter writing (informal letters) and formal letters – rejecting and accepting Letters - Personal emails and etiquette.

VOCABULARY AND GRAMMAR: Single Word substitutes - Use of abbreviations Acronyms - Cloze reading - interpreting visual materials - Jumbled sentences - Subject verb agreement - Modal verbs - Phrasal verbs.

UNIT V BASIC GRAMMAR V AND LANGUAGE DEVELOPMENT**PRACTICAL**

LISTENING : Listen to official meetings to know about the project proposal.

SPEAKING : Discussing the project and the proposals in the group - Creative writing and speaking - Poster making and description - project proposals.

TUTORIAL

READING: Reading comparison and contrast text with the deeper level of meaning **WRITING**
: Essay writing - different types of essays - dialogue writing

VOCABULARY AND GRAMMAR: Word association (connotations) - Lexical items (fixed / semi fixed expressions) - Clause - Direct and indirect speech - Correction of errors.

Total: 45 Periods

Extensive Reading:

Kalam , Abdul. The Wings of Fire , Universities Press, Hyderabad. 19

LEARNING RESOURCES:**TEXT BOOKS:**

1. Board of Editors, Department of English, Anna University, Chennai. Using English:A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai,2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai,2011.

REFERENCES:

1. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, NewDelhi.2011.

2. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006
3. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw- Hill Publishing Company Limited, New Delhi, 2007.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. Pearson Edition (II Edition), NewDelhi, 2001.
5. Mandel, Steve. *Effective Presentation Skills*. New Delhi: Viva Books Pvt. Ltd., 2004.
6. Kilmet, Stephen. "The Resume and "The Computerized Resume." In Writing for Design Professionals.
7. Writing Cover Letters-Kilmet, Stephen. "Cover Letter, "and" Enclosures and Attachments." in Writing for Design Professionals New York.



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Course code	21MA12T	Semester	I				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	MATRICES AND DIFFERENTIAL CALCULUS (COMMON FOR ALL BRANCHES)			4	0	0	4

COURSE OBJECTIVES:

- To apply advanced matrix knowledge to solve engineering problems
- To improve their ability in solving geometrical applications of differential calculus
- To familiarize with the application of differential equations

PREREQUISITE:

- Basic Mathematics skills at 12th level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C102.1	<i>Solve</i> Engineering problems using matrices.	K3
C102.2	<i>Use</i> various test to discuss the convergence of infinite series.	K2
C102.3	<i>Apply</i> the geometrical concepts to solve differential calculus.	K4
C102.4	<i>Compute</i> partial derivatives of functions of several variables.	K2
C102.5	<i>Apply in Engineering many physical initial</i> and boundary value problems can be described by ODE.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C102.1	3	3	-	-	-	-	-	-	-	-	-	-
C102.2	3	2	-	-	-	-	-	-	-	-	-	-
C102.3	3	3	-	-	-	-	-	-	-	-	-	-
C102.4	3	2	-	-	-	-	-	-	-	-	-	-
C102.5	3	2	-	-	-	-	-	-	-	-	-	-
C102	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial



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Course code	21PH13T	Semester	I				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	ENGINEERING PHYSICS I (COMMON FOR ALL BRANCHES)			3	0	0	3

COURSE OBJECTIVES:

- To understand the importance of polarization, optical fiber and Lasers
- To familiar the knowledge of electromagnetic waves oscillations
- To understand the importance of quantum physics
- To cognize the basics of heat and thermodynamics
- To express the basics of crystal physics

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C103.1	<i>Utilize</i> the concepts of polarization, optical fiber and Lasers for engineering applications	K3
C103.2	<i>Apply</i> the knowledge of electromagnetic waves oscillations	K3
C103.3	<i>Understand</i> the importance of quantum physics.	K2
C103.4	<i>Cognize</i> the basics of heat and thermodynamics	K2
C103.5	<i>Express</i> the basics of crystal physics	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C103.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.5	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-
C103	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I PHOTONICS 9

Polarization and Fiber Optics: Electromagnetic waves - Production and analysis of linearly, elliptic and circularly polarized light-Polaroid and applications of polarization. Fiber optics - principle of operation – numerical aperture - acceptance angle and applications of fiber optics.

Optical Sources: Characteristics of Lasers - Spontaneous and Stimulated Emission of Radiation - Population Inversion - Einstein's Coefficients and Relation between them - Applications of Lasers.

UNIT II WAVES AND OSCILLATION 9

Oscillatory motion: Differential equation of SHM- Velocity and acceleration- Restoring Force-Frequency response - phase response and resonance-Analogy with LCR circuits and oscillators-Energy and energy loss- Damped oscillations- Significance in control systems - vibration and vibration isolation.

Wave motion: Definition of a plane progressive wave- Attenuation of waves- Phase Velocity- Introduction to numerical methods for solution of wave equation- Importance of spherical and plane wave fronts.

UNIT III QUANTUM MECHANICS 9

Need for Quantum Physics-Historical overviews - Matter waves - De-Broglie's concept of matter waves - Properties of matter waves - Photo electric effect - Heisenberg's uncertainty principle – Statement - Interpretation and application - Schrödinger's time dependent and time independent equations - Operators - Eigen values and Eigen functions - Expectation values -Physical significance of wave function-Quantum superposition and entanglement for Qbits (quantitatively)

UNIT IV HEAT AND THERMODYNAMICS 9

Heat and internal energy - Specific heat and calorimetry - Latent Heat coefficient of linear thermal expansion - Methods of measurement of thermal expansion - Thermal expansion -Applications - The bimetallic strip - Differential equation of one-dimensional heat flow - Lee's disc apparatus for determination of thermal conductivity - Thermal Insulation- Heat dissipation and heat sinking of electronic devices-solid state refrigerators (qualitatively)

UNIT V CRYSTAL PHYSICS 9

Introduction of Crystallography - Space Lattice - Unit Cell - Lattice Parameters – Crystal Systems - Bravais Lattices - Miller Indices and its applications - Crystal Planes and Directions- Inter Planar Spacing of Orthogonal Crystal Systems - Atomic Radius - Co-ordination Number and Packing Factor of SC, BCC, FCC – Crystal growth –Solution growth -Structure determination by x-ray diffraction method (cubic structure).

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Richard Wolfson, "Essential University Physics", Vols. 1 and 2. Pearson Education, Singapore, 2011.
2. Gaur R K, Gupta S L, "Engineering Physics", DhanpatRai Publications, 2013.

REFERENCES:

1. Halliday D., Resnick R. and Walker J., “Fundamentals of Physics”, Wiley Publications, 2008.
2. Avadhanulu M. N., “Engineering Physics”, S. Chand & Co., 2007.
3. Purcell E. M., “Electricity and Magnetism – Berkeley Physics Course”, Vol. 2, Tata McGraw-Hill, 2008.
4. Paul A. Tipler and Gene Mosca, “Physics for Scientists and Engineers”, W.H. Freeman and Company, New York, 2004.



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Course code	21CY14T	Semester	I				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	ENGINEERING CHEMISTRY (COMMON FOR ALL BRANCHES)			3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with water quality parameters and treatment techniques.
- To get the basic idea about the polymers, electrochemistry and corrosion.
- To deal with the information about various types of fuels and energy sources.

PREREQUISITE:

- Basic Chemistry Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C104.1	<i>Understand</i> the water related problems and their treatment techniques.	K2
C104.2	<i>Explain</i> the applications of polymers and reinforced plastics.	K2
C104.3	<i>Acquire</i> knowledge on electrochemistry and corrosion.	K2
C104.4	<i>Summarize</i> the types of fuels and its production process and calculate the CV values.	K2
C104.5	<i>Classify</i> the non-conventional energy sources and its applications.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C104.1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.2	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.4	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.5	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I WATER AND ITS TREATMENT 9

Introduction - characteristics - alkalinity - types and determination - hardness - types expression of hardness - units - estimation of hardness of water by EDTA - numerical problems -boiler feed water-requirements-boiler troubles – scale & sludge -disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (carbonate, phosphate, Calgon, sodium aluminate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT II POLYMERS AND REINFORCED PLASTICS 9

Introduction - classification of polymers - Natural and synthetic - Thermoplastic and Thermosetting, Functionality - Degree of polymerization, Properties of polymers: T_g, Tacticity, Molecular weight - weight average, number average and polydispersity index. Types – addition, condensation and Copolymerization – free radical, cationic and anionic polymerization mechanism - Preparation, properties and uses of PVC, Nylon- 6,6, Teflon and Epoxy resin. Plastics - Compounding of plastics – moulding methods – injection, extrusion and compression – Engineering plastics-applications-fibre-reinforced plastics (FRP) – carbon and glass– applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential-oxidation potential-reduction potential - measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types: chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function Electroplating of Copper and electroless plating of nickel-Chemical conversion coatings-phosphate, chromate, chemical oxide, and anodized coatings.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum – refining- manufacture of synthetic petrol (Bergius process) – knocking - octane number- cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) – synthesis, advantages and commercial application of power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value –problems- ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Energy-Types- Non-renewable energy- Nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries - primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells - H₂-O₂ fuel cell.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai, Publishing Company (P) Ltd., New Delhi, 2015.
2. S.S Dara&S.S Umare, A Text book of Engineering Chemistry, S.Chand & Company Ltd., New Delhi, 2015.

REFERENCES:

1. S. Vairam,P. Kalyani and Suba Ramesh., Engineering Chemistry, Wiley India Pvt. Ltd, New Delhi, 2013.
2. B.K.Sharma, Engineering Chemistry, Krishna Prakasan Media (P) Ltd., Meerut, 2014.
3. Prasanta Rath, Engineering Chemistry, Cengage Learning India Pvt. Ltd, Delhi, 2015.
4. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.
5. V.R.Gowariker, N.V.Viswanathan, J.Sreedhar, Polymer Science, New Age International (P) Ltd., Publishers, New Delhi, 2011.



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Course code	21CS15IT	Semester		I			
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	PROBLEM SOLVING AND PYTHON PROGRAMMING (COMMON FOR ALL BRANCHES)			2	0	4	4

COURSE OBJECTIVES:

- To be familiar with the basics of algorithmic problem solving.
- To construct python programs with conditionals, loops and functions.
- To use python data structures-Lists, Tuples and Dictionaries.

PREREQUISITE:

- Basic Mathematics Skills and Computer Knowledge

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students will be able to		
C105. 1	<i>Develop</i> algorithmic solutions to simple computational problems	K3
C105. 2	<i>Construct</i> simple Python programs for solving problems.	K3
C105. 3	<i>Build</i> Python programs with conditionals and loops.	K3
C105. 4	<i>Demonstrate</i> a Python program into functions.	K2
C105. 5	<i>Show</i> compound data using Python lists, tuples, and dictionaries.	K2
C105. 6	<i>Read</i> and write data from/to files in Python Programs.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C105. 1	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 2	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 3	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 4	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 5	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 6	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT- I ALGORITHMIC PROBLEM SOLVING AND BASICS OF PYTHON 8

Algorithms-building blocks of algorithms (statements, state, control flow, functions), simple Strategies for developing algorithms (iteration, recursion)-pseudo code- flow chart-programming language. Introduction to Python-Features of Python-Python Interpreter: Interactive and script mode- Values and types, variables, Keywords, Identifiers, operators, precedence of operators, expression, Comments.

UNIT-II CONTROL FLOW, FUNCTIONS 8

Conditional statements-Iterative statements, Functions: Built-in functions, user defined function-Function Arguments-Fruitful functions and void functions- local and global variable - function composition- recursion-Lambda Functions.

UNIT-III MODULES, PACKAGES, STRINGS 4

Modules-Packages-Strings-string operations, string functions and methods.

UNIT-IV LISTS, TUPLES, DICTIONARIES 5

Lists- list operations, list methods, list loop, mutability, aliasing, cloning lists-Tuples-Tuple assignment, Operations on Tuples, Tuple as return value- Dictionaries- operations and methods-Sets-Operations on sets.

UNIT-V FILES AND EXCEPTIONS 5

Files –Types of files, file operations, file methods, format operator-command line arguments-Errors and Exceptions, handling exceptions.

List of Experiments: 30 Periods

1. Write a python program to demonstrate basic data types in python.
2. Write a python program using conditional statements.
3. Write a python program using Iterative statements.
4. Write a python program using built-in and user defined functions.
5. Write a python program using lambda functions and recursions.
6. Write a python program to demonstrate Strings and its Operations.
7. Write a python program to demonstrate lists, tuples and its operations.
8. Write a python program to demonstrate Sets and its operations.
9. Write a python program to demonstrate Dictionaries and its operations.
10. Write a python program to demonstrate Files and its Operations.

30 Periods**Total: 60 Periods**

LEARNING RESOURCES:

TEXT BOOKS:

1. Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist“, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.

REFERENCES:

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Mc-Graw Hill Education, 2018.
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.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1	Standalone desktops with Python [Open Source]	30 Nos



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Course code	21ME16T	Semester	I				
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	ENGINEERING GRAPHICS (COMMON FOR ALL BRANCHES)			1	3	0	4

COURSE OBJECTIVES:

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

PREREQUISITE:

- Engineering Drawing Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C106.1	<i>Familiarize</i> with the fundamentals and standards of Engineering graphics.	K2
C106.2	<i>Develop</i> freehand sketching of basic geometrical constructions and multiple views of objects.	K3
C106.3	<i>Draw</i> orthographic projection of lines and plane surfaces.	K3
C106.4	<i>Construct</i> projection of solids, Section and development of surfaces.	K3
C106.5	<i>Visualize</i> isometric and perspective projections	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C106. 1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C106. 2	3	3	-	-	-	-	-	-	-	-	-	1	1	-	-	-
C106. 3	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 4	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 5	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

CONCEPTS AND CONVENTIONS (Not for Examination)**1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING**7+12**

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, Triangle 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 and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Applications – Drawing interpretation and process planning, circuit design.

UNIT III PROJECTION OF SOLIDS**5+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, auxiliary plane method. Applications – Engineering design, automotive modelling, X-rays.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**5+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 and sectioned solids – Prisms, pyramids cylinders and cones. Applications – Design of piping, Fabrication, body building, defect analysis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS**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 – Perspective projection of simple solids–Prisms, pyramids and cylinders by visual ray method and vanishing point method. Applications–constructions, photography, animation and image processing.

Total: 90 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2010.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 51th Edition, 2019.

REFERENCES:

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2015.
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. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 3rd Edition, 2013.

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 Semester End Examination on 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. 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



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Course code	21BS17P	Semester	I				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	PHYSICS AND CHEMISTRY LABORATORY (COMMON FOR ALL BRANCHES)			0	0	4	2

COURSE OBJECTIVES:

- To test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To encourage the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

PREREQUISITE:

- Basic measurement skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C107.1	<i>Estimate</i> the various water quality parameters like alkalinity, hardness (total, temporary, & permanent), dissolved oxygen content, and chloride content.	K2
C107.2	<i>Investigate</i> the metals and ions present in any given sample using various analytical techniques.	K2
C107.3	<i>Analyze</i> the properties such as conductance of solutions, and redox potentials.	K2
C107.4	<i>Determine</i> various moduli of elasticity and also various thermal and optical properties of materials.	K2
C107.5	<i>Determine</i> the velocity of ultrasonic waves, band gap determination and viscosity of liquids.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C107.1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.5	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

PHYSICS LABORATORY
LIST OF EXPERIMENTS
 (Any SIX Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Lee's disc Determination of thermal conductivity of a bad conductor
4. Laser- Determination of the wave length of the laser using grating, Estimation of laser parameters
5. Optical fibre -Determination of Numerical Aperture and acceptance angle
6. Ultrasonic interferometer - determination of the velocity of sound and compressibility of Liquids
7. Determination of Band gap of a semiconductor
8. Spectrometer- Determination of wavelength using gating

Total: 30 Periods

REFERENCES:

1. Physics Practicals, Department of Physics, Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College 2021
2. Wilson J.D. and Hernandez C.A., "Physics Laboratory Experiments", Houghton Mifflin Company, New York 2005

Lab Requirements

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Torsional Pendulum, stop clock, suspension metallic wire: two different thickness, two identical cylindrical mass, screw gauge, wooden scale	5
2.	Uniform bending: 1-meter wooden scale, two-knife edges, travelling microscope, two weight hanger with slotted weights, screw gauge, Vernier calliper, pin	5
3.	Non-uniform bending: 1 meter wooden scale, two-knife edges, travelling microscope, weight hanger with slotted weights, screw gauge, Vernier calliper, pin	5
4.	Diode laser (green or red), fiber optic cable, movable arrangement with a screen for measuring spot size (zig), meter scale, stand	5
5.	He-Ne/Diode laser (red), Green diode laser, Grating, Screen, Iron stand (3 Nos), 1m wooden scale, thread.	5
6.	Ultrasonic interferometer apparatus with high frequency wave generator, cell, micrometer, PZ crystal, water or other liquids	5
7.	450 inclined glass plate set-up, two optically plane glass plates, sodium vapour lamp, travelling microscope, thin wire/thin strip of paper	5
8.	Post office box, 5V power supply, thermometer, galvanometer, semiconductor (thermistor), variable temperature bath set-up (oil, temperature controller, vessel, hot plate.	5

CHEMISTRY LABORATORY
LIST OF EXPERIMENTS
(Any SIX Experiments)

1. Determination of permanent, total and temporary hardness of water sample.
2. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
3. Determination of DO Content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given HCl using pH meter.
6. Estimation of Fe^{2+} by Potentiometric titration.
7. Determination of molecular weight of PVA using Ostwald viscometer.
8. Estimation of Iron content in water sample using spectrophotometer (1,10 – Phenanthroline/thiocyanate method).
9. Conductometric titrations of strong acid Vs strong base.
10. Determination of strength of acid in a mixture using conductivity meter.
11. Corrosion experiment-weight loss method.
12. Estimation of sodium and potassium present in water using flame photometer.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Jeffery G.H., Bassett J., Mendham J. and Denny vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
2. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.
3. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore (1994).

Lab Requirements

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	PH meter	10 nos
2.	Conductivity meter	10 nos
3.	Potentiometer	10 nos
4.	Flame photometer	2 nos
5.	Electronic Balance (Four digit)	1 no
6.	Hot Air Oven	1 no
7.	Spectrophotometer	2 nos
8.	Magnetic stirrer	2 nos



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Course code	21ME18P	Semester	I				
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	ENGINEERING PRACTICES LABORATORY (COMMON FOR ALL BRANCHES)			0	0	4	2

COURSE OBJECTIVES:

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

PREREQUISITE:

- Basic knowledge of engineering skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students will be able to		
C108. 1	Demonstrate on Smithy operations, Foundry operations models and machine assembly practice of centrifugal pump and air-conditioner	K2
C108. 2	Experiment with pipe connections and plumbing works	K3
C108. 3	Make use of welding equipment to join the structures.	K3
C108. 4	Explain carpentry components, for the joint used in roofs, doors, windows and furniture.	K5
C108. 5	Develop sheet metal models, fitting models and do basic machining operations	K6

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C108. 1	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 2	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 3	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 4	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 5	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

I CIVIL ENGINEERING PRACTICE**12****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 and 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.

II MECHANICAL ENGINEERING PRACTICE**18****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.

Total: 30 Periods

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

14

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 an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
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: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Chapman, W.A.J. Workshop Technology, Edward Arnold, 2001.

REFERENCES:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, DhanpathRai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2 Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapooanT. and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Required Numbers (for batch of 30 students)
Part I: Civil Engineering Practices		
(a)	Plumbing Work:	
1)	Pipe Vice	15 Nos.
2)	Die Holder with Die set	15 Nos.
(b)	Wood Work	
1)	Tri Square	15 Nos.
2)	Hand Saw	15 Nos.
3)	Carpentry bench wise	15 Nos.
4)	Firmer Chisel	15 Nos.
5)	Motrin Chisel	15 Nos.
6)	Iron Jack	15 Nos.
7)	Mallet	15 Nos.
8)	Bench hold fastens	15 Nos.
9)	Wooden Bench Hook	15 Nos.
10)	Wood Cutting Machine	2 Nos.
Part II: Mechanical Engineering Practices		
(a)	Welding Work:	
1)	Arc welding unit	5 Nos.
2)	Gas welding unit	2 Nos.
(b)	Basic Machining Work:	
1)	Lathe Machines	5 Nos.
2)	Drilling Machines	5 Nos.
(c)	Assembly Work:	
1)	Centrifugal pump	2 Nos.
2)	Air-conditioner unit	2 Nos.
3)	Household mixer	2 Nos.
(d)	Sheet Metal Work:	
1)	Steel rule	2 Nos.
2)	Bend snips	5 Nos.
3)	Straight snips	5 Nos.
4)	Scriber	5 Nos.
5)	Divider	5 Nos.
6)	Trammel	5 Nos.
7)	Prick Punches	5 Nos.
8)	Centre punches	5 Nos.
9)	Pliers	5 Nos.
10)	Ball pean hammer	5 Nos.
11)	Raising hammer	5 Nos.
12)	Riverting hammer	5 Nos.
13)	Square free hammer	5 Nos.
14)	Anvil	3 Nos.
15)	Swage block	3 Nos.
16)	Wige gauges	2 Nos.
(e)	Foundry Work	
1)	Cope and Drag Box	5 Nos.
2)	Pattern	5 Nos.
3)	Solid pattern	5 Nos.
4)	Split pattern	5 Nos.
5)	Runner	5 Nos.

6)	Riser	5 Nos.
7)	Sprue	5 Nos.
8)	Sand reamer	5 Nos.
9)	Trowel	5 Nos.
PART-III Electrical Practices		
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	One each
4)	Megger (250V/500V)	1 No.
5)	Power Tools: (a) Range Finder (b) Digital Live-wire detector	2 Nos 2 Nos
PART-IV Electronics Practices		
1)	Soldering guns	10 No.
2)	Assorted electronic components for making circuits	50 No.
3)	Small PCBs	10 No.
4)	Multi Meters	10 No.
5)	Study purpose items: Telephone, FM radio, low-voltage power supply	2 each

CURRICULUM AND II SEMESTER SYLLABI

Applicable to the students admitted to

**B.E- COMPUTER SCIENCE AND ENGINEERING
R-2021: CBCS**

**Academic year 2021-2022
onwards**



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R-2021: CBCS CURRICULA

II SEMESTER SYLLABI

LIST OF ABBREVIATIONS

S. No.	Abbreviations	Detailed Description
1	HSMC	Humanities & Social Science including Management Courses
2	BSC	Basic Science Courses
3	ESC	Engineering Science Courses
4	PCC	Professional Core Courses
5	PEC	Professional Elective Courses
6	OEC	Open Elective Courses
7	PROJ	Project Work
8	EEC	Employability Enhancement Courses
9	MC	Mandatory Courses

Category Based Credit Split-Up – Semester Wise

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	Project /EEC	MC	Total Credit
1	3	12	10	-	-	-	-	-	25
2	3	7	3	10	-	-	-	-	23
3	-	4	5	10	-	-	-	0	19
4	-	4	-	18	-	-	1	-	23
5	-	4	4	8	3	3	1	-	23
6	-	-	-	15	3	-	2	0	20
7	-	-	-	13	3	3	2	-	21
8	-	-	-	-	6	-	6	-	12
Total Credits	6 (3.61%)	31 (18.67%)	22 (13.25%)	74 (44.57%)	15 (9.03%)	6 (3.61%)	12 (7.22%)	0 (0 %)	166

B.E. – Computer Science and Engineering Curriculum (R2021)

SEMESTER I										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming*	ESC	40	60	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	4	0	0	4
PRACTICAL										
7	21BS17P	Physics and Chemistry Laboratory	BSC	40	60	100	0	0	4	2
8	21ME18P	Engineering Practices Laboratory	ESC	40	60	100	0	0	4	2
TOTAL										25

SEMESTER II										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN21T	Technical English	HSMC	40	60	100	3	0	0	3
2	21MA22T	Vector Calculus and Complex Integration	BSC	40	60	100	3	1	0	4
3	21PH23T	Engineering Physics II	BSC	40	60	100	3	0	0	3
4	21EE24T	Basic Electrical, Electronics and Instrumentation Engineering	ESC	40	60	100	3	0	0	3
5	21CS25T	Data Structures	PCC	40	60	100	3	0	0	3
6	21IT26T	Programming in C	PCC	40	60	100	3	0	0	3
PRACTICAL										
7	21CS27P	Data Structures Laboratory	PCC	40	60	100	0	0	4	2
8	21IT28P	Programming in C Laboratory	PCC	40	60	100	0	0	4	2
TOTAL										23

SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA31T	Discrete Mathematics and Applications	BSC	40	60	100	3	1	0	4
2	21HE32T	Digital Logic Circuits	ESC	40	60	100	3	0	0	3
3	21HC33T	Object Oriented Programming using Java	PCC	40	60	100	3	0	0	3
4	21HC34T	Database Management Systems	PCC	40	60	100	3	0	0	3
5	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
6	21HC37P	Object Oriented Programming using Java Laboratory	PCC	40	60	100	0	0	4	2
7	21HE38P	Digital Logic Circuits Laboratory	ESC	40	60	100	0	0	4	2
8	21HC39P	Database Management Systems Laboratory	PCC	40	60	100	0	0	4	2
TOTAL										19

SEMESTER IV										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA41T	Probability and Queuing Theory	BSC	40	60	100	3	1	0	4
2	21HC42T	Design and Analysis of Algorithms	PCC	40	60	100	3	0	0	3
3	21CS43IT	Object Oriented Analysis and Design	PCC	40	60	100	2	0	4	4
4	21HC44T	Operating Systems	PCC	40	60	100	3	0	0	3
5	21HC45T	Software Engineering	PCC	40	60	100	3	0	0	3
6	21CS46T	Computer Architecture and Organization	PCC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE01P	Mini Project- I	PCC	40	60	100	0	0	2	1
8	21HC47P	Operating Systems Laboratory	EEC	40	60	100	0	0	4	2
TOTAL										23

SEMESTER V										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA44T	Numerical Methods	BSC	40	60	100	3	1	0	4
2	21HC52T	Theory of Computation	PCC	40	60	100	3	0	0	3
3	21HC53T	Computer Networks	PCC	40	60	100	3	0	0	3
4	21HE54IT	Microprocessor and Microcontroller	ESC	40	60	100	2	0	4	4
5	-	Professional Elective I	PEC	40	60	100	3	0	0	3
6	-	Open Elective I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21HC57P	Networks Laboratory	PCC	40	60	100	0	0	4	2
8	21EE03P	Technical Seminar	EEC	100	-	100	1	0	0	1
TOTAL										23

SEMESTER VI										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CS61T	Internet Programming	PCC	40	60	100	3	0	0	3
2	21CS62T	Artificial Intelligence	PCC	40	60	100	3	0	0	3
3	21CS63T	Compiler Design	PCC	40	60	100	3	0	0	3
4	-	Professional Elective II	PEC	40	60	100	3	0	0	3
5	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
6	21CS66IT	Mobile Computing	PCC	40	60	100	2	0	4	4
PRACTICAL										
7	21CS67P	Internet Programming Laboratory	PCC	40	60	100	0	0	4	2
8	21CS68P	Mini Project II	EEC	40	60	100	0	0	2	1
9	21CS69P	Internship	EEC	100	-	100	0	0	2	1
TOTAL										20

SEMESTER VII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CS71T	Cryptography and Network Security	PCC	40	60	100	3	0	0	3
2	21CS72T	Cloud Computing	PCC	40	60	100	3	0	0	3
3	21CS73T	Data Science and Analytics	PCC	40	60	100	3	0	0	3
4	-	Open Elective II	OEC	40	60	100	3	0	0	3
5	-	Professional Elective III	PEC	40	60	100	3	0	0	3
PRACTICAL										
6	21CS76P	Cloud Computing Laboratory	PCC	40	60	100	0	0	4	2
7	21CS77P	Security Laboratory	PCC	40	60	100	0	0	4	2
8	21CS78P	Project Work - Phase-I	PROJ	40	60	100	0	0	4	2
TOTAL										21

SEMESTER VIII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	-	Professional Elective IV	PEC	40	60	100	3	0	0	3
2	-	Professional Elective V	PEC	40	60	100	3	0	0	3
PRACTICAL										
3	21CS83P	Project Work – Phase - II	PROJ	40	60	100	0	0	12	6
TOTAL										12

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Engineering Stream Courses
PROFESSIONAL ELECTIVE I		
1	21CS551PT	Data Warehousing and Data Mining
2	21EC743PT	Digital Image Processing
3	21HC563PT	Software Testing
4	21CS554PT	Wireless Adhoc and Sensor Networks
5	21CS555PT	Total Quality Management
PROFESSIONAL ELECTIVE II		
6	21CS641PT	Social Network Analysis
7	21CS642PT	Microcontroller and Embedded Systems
8	21CS643PT	Machine Learning Techniques
9	21CS644PT	Gaming Technology
10	21CS645PT	Speech Processing
PROFESSIONAL ELECTIVE III		
11	21CS751PT	Soft Computing
12	21CS752PT	Database and Web Application
13	21CS753PT	Internet of Things
14	21CS754PT	Information Security
15	21CS755PT	Human Computer Interaction
PROFESSIONAL ELECTIVE IV		
16	21HC54T	Block Chain Technology
17	21CS812PT	Information Retrieval
18	21CS813PT	Edge Computing
19	21CS814PT	Natural Language Processing
20	21CS815PT	Agile Methodologies
PROFESSIONAL ELECTIVE V		
21	21CS821PT	Software Project Management
22	21CS822PT	Sensor Networks Applications of AI in Healthcare
23	21CS823PT	Multi Core Architecture
24	21CS824PT	Cyber Security and Forensics
25	21CS825PT	Computer Vision



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LIST OF OPEN ELECTIVE COURSES

S. No	COURSE CODE	NAME OF THE COURSE
1	21CS01OT	Bio Python
2	21CS02OT	Cyber Security
3	21CS03OT	Java Programming
4	21CS04OT	Data Base System Design



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Course code	21EN21T	Semester		II			
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)			L	T	P	C
Course Title	TECHNICAL ENGLISH (Common for all Branches)			3	0	0	3

COURSE OBJECTIVES:

- To make the students of engineering and technology to enhance their ability on reading and comprehending the different texts
- To improve their creative and critical thinking so as to use in demanding contexts
- To equip the learners with the skills of writing convincing job Applications and effective reports
- To develop their speaking skills to make technical presentations and participate in group discussions
- To facilitate them to hone their soft skills

PREREQUISITE:

- Technical writing and basic English grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C201. 1	<i>Read</i> and understand general and technical texts	K2
C201. 2	<i>Apply</i> creative and critical thinking and communicate their ideas efficiently	K2
C201. 3	<i>Participate</i> in group discussions and deliver short speeches effectively	K3
C201. 4	<i>Write</i> effectively and persuasively in academic and workplace contexts	K3
C201. 5	<i>Experiment with</i> the future challenges confidently and successfully	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C201. 1	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 2	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 3	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 4	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 5	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

- UNIT-I TECHNICAL WRITING AND VISUAL CONVERSION 9**
- PRACTICAL**
- LISTENING** :Listening to pronunciation of longer words.
- SPEAKING** :Making out meaning of pictorial and graphical representations.
- TUTORIAL**
- READING** :Understanding logic and sequencing in reading inferring the exact meaning of text
- WRITING** :Extended Definition- Writing Instructions, Checklists & Recommendations- Reading short technical text from Journal.
- VOCABULARY:** Technical vocabulary- Regular and Irregular verbs.
-
- UNIT- II TECHNICAL WRITING AND GUIDELINES PREPARATION 9**
- PRACTICAL**
- LISTENING** : Comprehensive listening - Listening to telephonic conversations – short and long conversations from different domains, listening to various pre-recorded conversations and speeches.
- SPEAKING** : Delivering short speeches in the class.
- TUTORIAL**
- READING** : Technical reading on innovations and innovators.
- WRITING** : Conditional clauses, Numerical adjectives, Process Description
- VOCABULARY:** Collocation, Verbal Analogies.
-
- UNIT-III TECHNICAL PROCESS WRITING 9**
- PRACTICAL**
- LISTENING** : Listening to documentaries and making notes.
- SPEAKING** : Basic speaking practice based on BEC, IELTS, and TOFEL.
- TUTORIAL**
- READING** : longer text both general and technical –practice in speed reading
- WRITING** : Purpose statements, words are used as nouns and verbs- describing a process – use of sequence word - Interpretation of Graphs and Charts.
- VOCABULARY:** Sequence words –Misspelled words -Embedded sentences.
-
- UNIT- IV TECHNICAL WRITING AND BUSINESS LETTERS 9**
- PRACTICAL**
- LISTENING** : listening to native accents.
- SPEAKING** : Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation - Planning, Preparing, Organizing and Presenting.
- TUTORIAL**
- READING** : Reading for detailed comprehension.
- WRITING** : Cause and effect, impersonal passive voice, idioms and phrases, - Letter writing, job application, business correspondence (letters) – calling for quotations, placing order, complaint letters, preparing a memo, notice and e-mail itinerary.
- VOCABULARY:** clauses and If conditionals.

PRACTICAL**LISTENING** : TED /ink talks**SPEAKING** : Starting a Career — vision statement, preparing logo and tagline, making short term and long-term goals, setting plans.**TUTORIAL****READING** : Reading and understanding technical articles.**WRITING** : Degrees of comparison, editing, Email etiquette, Mispronounced words – Report writing survey, feasibility, industrial visit, reporting various incidents and accidents, Minutes of meeting.**VOCABULARY:** Reported speech.**Total: 45 Periods****LEARNING RESOURCES:****TEXT BOOKS:**

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.

REFERENCE BOOKS:

1. Rizvi, M. Ashraf, “Effective Technical Communication”, Tata McGraw— Hill, 2006.
2. Ibbotson, Mark, “Cambridge English for Engineering”, Cambridge University Reference Press, 2008
3. Richard Johnson-Sheehan, “Technical Communication Today” 4th Edition Books Longman Publishing Group, 2011.
4. Richard Johnson-Sheehan, “Technical Communication Today” 4th Edition Books Longman Publishing Group, 2011
5. Porter, Patricia A., and Margaret Grant, “Communicating Effectively in English: Oral Communication for Non-Native Speakers”, 2nd Edition, Wadsworth, 1992.
6. Gopaldaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

Extensive Reading:

Wells, H G. The Time Machine, Peacock, India, 2008.



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Course code	21MA22T	Semester	II				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	VECTOR CALCULUS AND COMPLEX INTEGRATION (Common for all Branches)			3	1	0	4

COURSE OBJECTIVES:

- To improve their ability in vector calculus
- To expose to the ideas of analytic functions
- To solve differential equation using the concept of Laplace Transform.

PREREQUISITE:

- Mathematics skills at Sem-I level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C202.1	<i>Apply</i> the vector calculus concepts to solve engineering problems.	K3
C202.2	<i>Apply</i> the concept of mapping to solve Linear equation.	K3
C202.3	<i>Apply</i> the complex integration problem ideas to solve engineering problems.	K3
C202.4	<i>Understand</i> the concepts of multiple integrals.	K2
C202.5	<i>Apply</i> the concepts of Laplace transformation to solve Differential Equations.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C202.1	3	2	-	-	-	-	-	-	-	-	-	-
C202.2	3	2	-	-	-	-	-	-	-	-	-	-
C202.3	3	2	-	-	-	-	-	-	-	-	-	-
C202.4	2	2	-	-	-	-	-	-	-	-	-	-
C202.5	3	2	-	-	-	-	-	-	-	-	-	-
C202	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I VECTOR CALCULUS**12**

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities– Directional derivatives – Line, surface and volume integrals –Green's, Gauss divergence and Stoke's theorems (without proof) .

UNIT II ANALYTIC FUNCTIONS**12**

Limit of a complex functions-Derivative of $f(z)$ -Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: $1/z$, az , $az+b$ and bilinear transformation.

UNIT III COMPLEX INTEGRATION**12**

Line integral – Cauchy's integral theorem (statements only) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem (statement only) – Contour integration – Unit circle and semicircular contour.

UNIT IV MULTIPLE INTEGRALS**12**

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a double and Triple Integral.

UNIT V LAPLACE TRANSFORMS**12**

Definition-Conditions for existence- Transforms of elementary functions – Properties of Laplace Transform-Transforms of periodic functions – Transforms of derivatives and integrals– Inverse transforms – Convolution theorem– Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only- Unit step function and Unit impulse function [simple problems only]

Total: 60 Periods**LEARNING RESOURCES.****TEXT BOOKS.**

1. B. S. Grewal, Higher **Engineering Mathematics**, Khanna Publishers, New Delhi, 42nd Edition, 2012.

REFERENCES.

1. E. Kreyszig, **Advanced Engineering Mathematics**, John Wiley & Sons. Singapore, 10th Edition, 2012.
2. M.K. Venkataraman, **Engineering Mathematics: Vol I and II**, National Publishing., Chennai 2001.
3. T. Veerarajan, **Engineering Mathematics**, Tata McGraw Hill Publishing Co, New Delhi, 2004.



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Course code	21PH23T	Semester	II			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING PHYSICS II Common for (CSE, IT, ECE, CHEMICAL, CIVIL, AI&DS, CSE(AI&ML))		3	0	0	3

COURSE OBJECTIVES:

- To equip the students with the knowledge of carrier concentration and doping in semiconductors.
- To familiarize the basics of Magnetic and Superconducting materials.
- To empower the students in understanding the importance of fluid properties.
- To elucidate the physics and instrumentation of spectrometry

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C203.1	<i>Understand</i> basics of electronic states and energy band structure formation	K2
C203.2	<i>Understand</i> the importance of carrier concentration and doping in semiconductors	K2
C203.3	<i>Understand</i> physics of magnetic and superconducting materials.	K2
C203.4	<i>Understand the</i> importance of fluid properties.	K2
C203.5	<i>Understand</i> the physics of spectrometry and its instrumentation.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C203.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I SOLID STATE ELECTRONICS 9

Band theory of solids - Classification of solids on the basis of band theory - Classical free electron theory - expression for electrical conductivity - thermal conductivity - Wiedemann-Franz law - electrons in metals - Fermi-Dirac probability function - Position of Fermi level Temperature variation of carrier concentration - density of energy states - electron effective mass - concept of hole.

UNIT II SEMICONDUCTING MATERIALS AND DEVICES 9

Elemental and compound semiconductors - Intrinsic and extrinsic semiconductors - Properties. Carrier concentration in intrinsic, n-type and p-type semiconductors. Hall effect - experimental determination of Hall coefficient. Application - Hall and Peltier devices - Formation of p-n junctions - position of Fermi level in equilibrium - forward and reverse bias - p-n junction diode: I-V characteristics in forward and reverse bias - Photodiode - LDR, LED, and solar cell.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis. Soft and Hard magnetic materials - Anti-ferromagnetic materials - Ferrites, magneto resistance material Superconducting phenomena - properties of superconductors - Meissner effect and isotope effect. Type-I and Type-II superconductors, High TC superconductors - Magnetic levitation and SQUIDS.

UNIT IV FLUID MECHANICS 9

Introduction to ideal and real fluids- Basic concepts of density and pressure in a fluid-Newtonian fluids, Non-Newtonian fluids - Capillarity – Surface tension - Experimental determination of surface tension by capillary rise method – Viscosity - Coefficient of viscosity - Role of temperature on surface tension and viscosity - Measurement of pressure by strain-gauge diaphragms.

UNIT V SPECTROMETRY 9

Theory of Infrared absorption spectrometry – Quantum treatment– Instrumentation – Infrared sources and detectors. Applications – Theory of Raman spectroscopy – excitation mechanism. Instrumentation – Sources and detectors. Nuclear Magnetic Resonance – Relaxation process in NMR – Free induction decay – Chemical Shift – Instrumentation and components of NMR.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. N.Garcia, A. Damask and S.Schwarz “Physics for Computer Science Students”, SpringerVerlag, 2012.
2. Umesh Mishra and Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. C. Kittel , Introduction to solid state physics, Wiley. 2004
4. Yunus a. Çengel, john m. Cimbala Fluid Mechanics: fundamentals and applications Fourth edition Mc Graw Hill 2018
5. Aruldas Molecular Structure and Spectroscopy Prentice Hall 2007.

REFERENCES:

1. Arthur Beiser Concepts of Modern Physics; Tata McGraw – Hill Edition. 2003
2. Steven H. Simon, The Oxford Solid State Basics 1st Edition Oxford 2013
3. S O Pillai, Solid State Physics, New Age International 2006
4. Willard H H, Meritt L L Dean J A and Settle F A, “Instrumental Methods of Analysis”, CBS Publishers and Distributions, New Delhi, 2001.
5. C.N.Banwell Fundamentals of Molecular Spectroscopy , Fourth edition Tata Mc.Graw Hill
6. Bruce R. Munson, Alric P. Rothmayer, Theodore H. Okiishi, Wade W. Huebsch Fundamentals of fluid mechanics Wiley, 2012



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Course code	21EE24T	Semester	II				
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING Common for (CSE, IT, AI&DS, BIOTECH, CIVIL, MECH, CSE(AI&ML))			3	0	0	3

COURSE OBJECTIVES:

- The course is intended to introduce the students to basic theorems and laws in DC and AC circuits.
- This course aims at giving adequate exposure to students on the principles of electrical machines.
- The course will enable the students to acquire knowledge on fundamentals and applications of various electronic devices and measuring instruments.

PREREQUISITE:

- Engineering Physics, Mathematics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C204.1	<i>Impart</i> knowledge on electrical circuit components, laws and theorems.	K2
C204.2	<i>Analyze</i> the behavior of ac circuits components in power system	K3
C204.3	<i>Illustrate</i> the working of various ac machines, dc machines and special machines along with its characteristics.	K2
C204.4	<i>Infer</i> and <i>relate</i> the working and applications of various electronics devices and circuits.	K2
C204.5	<i>Categorize</i> the specific instruments for electrical measurements.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C204.1	3	2	-	-	-	-	-	-	2	-	1	1
C204.2	3	2	-	-	-	-	-	-	2	-	1	1
C204.3	3	2	-	-	-	-	-	-	2	-	1	1
C204.4	3	2	-	-	-	-	-	-	-	-	1	1
C204.5	3	2	-	-	-	-	-	-	2	-	1	1
C204	3	2	-	-	-	-	-	-	2	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I DC CIRCUITS 9

Basic circuit components (R, L & C) - Ohms Law - Kirchoff's Law – voltage and current division -source transformation-steady state solution of DC circuits - Nodal analysis, Mesh analysis-Thevenin's Theorem, Norton's Theorem, Maximum Power transfer -Superposition Theorem.

UNIT II AC CIRCUITS 9

Introduction to AC circuits – waveforms and RMS value – power and power factor, Analysis of single-phase ac circuits consisting of RL and RLC combinations -Resonance- Balanced and Unbalanced three-phase circuits-Star and Delta connections.

UNIT III ELECTRICAL MACHINES 9

Principles of operation and characteristics of DC machines, Construction and operation of Single-Phase transformer – Three phase transformer connections – Autotransformer. Construction and types of Single phase and Three phase Induction motor, Construction and working principle of Alternator, Stepper motors – Brushless DC Motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS 9

Types of Materials – Silicon & Germanium - PN Junction diodes – Structure, Operation and Characteristics – Display devices-LED, Laser diodes – Zener diode - Bipolar Junction Transistor – Characteristics and applications –Amplifiers - Basics, types and applications, Oscillators-Basics, types and its applications—D/A and A/D converters.

UNIT V MEASUREMENTS & INSTRUMENTATION 9

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive Thermoelectric, piezoelectric, photoelectric, Hall effect. Types and principle of indicating Instruments – Multimeters, Wattmeter, instrument transformers (CT and PT), Oscilloscopes.

TOTAL: 45 PERIODS**LEARNING RESOURCES:****TEXT BOOKS:**

1. D P Kothari and I.J Nagarath, —Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint ,2016
2. Leonard S Bobrow, “Foundations of Electrical Engineering”, Oxford University Press, 2013
3. D.V.S. Moorthy, ‘Transducers and Instrumentation’, Prentice Hall of India Pvt Ltd, 2007.

REFERENCES:

1. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, New Delhi, 2007
2. John Bird, “Electrical Circuit Theory and Technology”, Elsevier, First Indian Edition, 2006
3. N K De, Dipu Sarkar, “Basic Electrical Engineering”, Universities Press (India)Private Limited 2016
4. David A. Bell, “Electronic devices and circuits”, Oxford University higher education,5th edition2008.
5. Allan S Moris, “Measurement and Instrumentation Principles”, Elsevier, First Indian Edition, 2006.



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Course code	21CS25T	Semester		II			
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	DATA STRUCTURES (Common to AI&DS, CSE, CSE (AI&ML))			3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of ADTs
- To understand the structure of Linear data structures.
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures in real time applications.

PREREQUISITE:

- Programming knowledge in C

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C205.1	<i>Understand</i> the concepts of Abstract Data Types and Operations on it.	K2
C205.2	<i>Apply</i> the concepts of linear data structures in real time applications.	K3
C205.3	<i>Understand</i> the structure of Non-Linear Data Structure-Trees.	K2
C205.4	<i>Understand</i> the concepts of Graph and analyze its various applications.	K2
C205.5	<i>Apply</i> sorting algorithms in real time applications and understand the concept of hashing technique.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C205.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3
C205.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3
C205.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3
C205.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3
C205.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3
C205	3	2	1	-	-	-	-	-	-	-	-	1	3	2	3

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS**No. of Credits: 3****UNIT-I LINEAR DATA STRUCTURES – LIST 9**

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT-II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT- III NON-LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees– binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree -Minimum Spanning Tree - Dijkstra’s Algorithm - Heap – Applications of heap.

UNIT-IV NON-LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graphs - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT-V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort - Quick sort - Merge sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2013.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2014.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction To Algorithms”, Third Edition, Mcgraw Hill, 2009.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,2002.
3. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education 2004.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008, Biochemistry, 4th Edition, WH Freeman & Co., 2000.



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Course code	21IT26T	Semester	II				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	PROGRAMMING IN C (Common for CSE, IT, ECE, BIOTECH, CHEM, CSE(AI&ML))			3	0	0	3

COURSE OBJECTIVES:

- To learn Introduction of Algorithm and Basic Structure of C Programming.
- To gain knowledge on Implementation of Arrays and Strings concept in C Programming.
- To understand the Basic functions and Pointer declaration in C Programming.
- To apply the concepts of Structures and Unions in an example program.
- To write a sample C program to implement file handling and accessing Graphic Library function.

PREREQUISITE:

- Basic Mathematics Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C206.1	<i>Explain</i> the data types, syntax and control structures for solving different problems.	K2
C206.2	<i>Apply</i> the concepts of Arrays, Strings in 'C' language for user defined problems	K3
C206.3	<i>Make use of</i> functions and concepts of pointers in 'C' language	K3
C206.4	<i>Organize</i> data using structures and unions in 'C' Programs.	K3
C206. 5	<i>Develop</i> and implement applications using File handling Process and Graphics.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C206.1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	-	-
C206.2	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206.4	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206. 5	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT-I INTRODUCTION TO PROGRAMMING**9**

Basic Organization of a Computer - Introduction to Algorithm, Pseudo code, Flow Chart. Structure of 'C' program, compilation and linking processes - C Tokens: Keywords, Data Types, Constants, Variables - Declaration -Operator: precedence and associativity -Expressions - Input/Output statements -Assignment statements - Decision making statements Switch statement - Looping Statements-Bitwise operations- pre-processor-Syntax and Logical Errors in compilation solving simple scientific and statistical problems.

UNIT-II ARRAYS AND STRINGS**9**

Arrays: Declaration, Initialization - One dimensional array: Assigning an array to another array - Equating an array with another array -Two dimensional Arrays: Declaration - usage of two-dimensional arrays - reading, storing and accessing elements in two dimensional arrays -String operations: Initialization of Strings - string library functions - command line arguments - Searching and Sorting of Strings.

UNIT-III FUNCTIONS AND POINTERS**9**

Introduction to functions: Classification of functions - function definition - function call -function with inputs and outputs - recursive function -example programs: copy one string to another string using recursion, binary search using recursion -Pointer Fundamentals: Pointer Declaration - Passing Pointers to a Function- Operations on pointers: Pointer Arithmetic - Pointer comparisons -Array of pointer: Pointers and one-dimensional arrays- Pointers and multi-dimensional arrays.

UNIT-IV STRUCTURES AND UNIONS**9**

Introduction to Structures: Defining structures - initializing structures -Array of Structures - Nested structures - Introduction to union Creating and using union variables - memory allocation of union - example programs: Store and display N employees information using Union- Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays.

UNIT-V FILE HANDLING AND GRAPHICS**9**

Files: Introductions - Data hierarchy - Types of file processing- Sequential access: Reading data from sequential access file - Updating sequential access file - Random access: Reading data from random access file - Writing data randomly to random access file -C Graphics: libraries and functions - 2D shapes - 3D shapes - Examples.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Sumitabha Das, "Computer Fundamentals & C Programming", McGraw Hill, 2018.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
3. Yashavant Kanetkar "Let usC", 15thedition.

REFERENCES:

1. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.



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Course code	21CS27P	Semester	II				
Category	PROFESSIONAL CORE COURSE (ESC)			L	T	P	C
Course Title	DATA STRUCTURES LABORATORY (Common to AI&DS, CSE, CSE (AI&ML))			0	0	4	2

COURSE OBJECTIVES:

- To understand various data representation techniques in the real world.
- To implement linear and non-linear data structures.
- To analyze various algorithms based on their time and space complexity.
- To develop real-time applications using suitable data structure.
- To identify suitable data structure to solve various computing problems

PREREQUISITE:

- Basic C Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C207.1	<i>Understand</i> various data representation techniques in the real world.	K3
C207.2	<i>Implement</i> linear and non-linear data structures.	K3
C207.3	<i>Analyze</i> various algorithms based on their time and space complexity.	K3
C207.4	<i>Develop</i> real-time applications using suitable data structure.	K3
C207.5	<i>Identify</i> suitable data structure to solve various computing problems.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO.No	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C207.1	3	2	1	-	3	-	-	2	2	2	-	1	3	2	3
C207.2	3	2	1	-	3	-	-	2	2	2	-	1	3	2	3
C207.3	3	2	1	-	3	-	-	2	2	2	-	1	3	2	3
C207.4	3	2	1	-	3	-	-	2	2	2	-	1	3	2	3
C207.5	3	2	1	-	3	-	-	2	2	2	-	1	3	2	3

Note: 1: Slight, 2: Moderate, 3: Substantial

List of Experiment No. of Credits: 2

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

LEARNING RESOURCES:**TEXT BOOKS:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2013.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2014.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Third Edition, McGraw Hill, 2009.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 2002.
3. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education 2004.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1	Systems with Linux Operating System with GNU Compiler [Open Source]	30 Nos



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Course code	21IT28P	Semester	II			
Category	PROFESSIONAL CORE COURSE (ESC)		L	T	P	C
Course Title	PROGRAMMING IN C LABORATORY (Common for CSE, IT, ECE, BIOTECH, CHEM, CSE(AI&ML))		0	0	3	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures
- To develop applications in C using file processing, Graphics

PREREQUISITE:

- Basic Mathematics Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C208.1	<i>Utilize</i> decision making and looping statements for problem solving.	K3
C208.2	<i>Apply</i> the concepts of Arrays and String to solve problem statements.	K3
C208.3	<i>Examine</i> the dynamic behaviour of memory by the use of pointers.	K4
C208.4	<i>Develop</i> simple applications using Structures and unions.	K3
C208.5	<i>Design</i> and develop simple applications using File Processing and Graphics.	K6

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C208.1	3	2	1	-	-	1	-	-	1	-	1	1	1	2
C208.2	3	2	1	-	-	1	-	-	1	-	1	1	2	1
C208.3	3	3	2	1	-	1	-	-	1	-	1	1	2	1
C208.4	3	2	1	-	-	1	-	-	1	-	1	1	2	1
C208.5	3	3	3	3	2	1	-	-	1	-	1	1	2	1
C208	3	2	2	3	2	1	-	-	1	-	1	1	2	1

Note: 1: Slight, 2: Moderate, 3: Substantial

LIST OF EXPERIMENT**No. of Credits: 4**

1. a) Write a C program to perform input / output of all basic data types.
b) Write a C program using decision making construct.
c) Write a program that finds if a given number, is a prime number.
2. a) Write a program to find whether the given year is a leap year or not?
(Hint: not every Centurion year is a leap. For example, 1700, 1800 and 1900 is not a leap year)
b) Write a program using looping statements.
c) Write a program to use swapping operations.
3. a) Write a C program for print pyramids and patterns.
b) Write a C program to generate Fibonacci series.
4. a) Write a C program to shut down or turn off the computer.
b) Write a C program to perform sorting operations.
5. Write a program using one dimensional and two-dimensional arrays.
6. From a given paragraph perform the following using built-in functions:
a) Count total number of vowels and consonants.
b) Capitalize the first word of each sentence.
c) Replace a given word with another word.
7. Write a program using user defined functions and recursive functions.
8. Write a C program using pointers functions.
9. Write a program using structures and unions.
10. Write a program using text files and binary files.
11. Write a program using string functions.
12. Write a program using dynamic memory allocation.

Total: 60 Periods

LEARNING RESOURCES:**TEXT BOOKS:**

1. Sumitabha Das, “Computer Fundamentals & C Programming”, McGraw Hill, 2018.
2. ReemaThareja, “Programming in c”, Oxford University Press, Second Edition, 2016
3. Yashavant P. Kanetkar, “Let Us C”, Sixteenth Edition, BPB Publications, 2018.

REFERENCES:

1. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Systems with Linux Operating System with GNU compiler[Open Source]	30

3rd SEMESTER CURRICULUM & SYLLABI

Applicable to the students admitted to

B.E-COMPUTER SCIENCE AND ENGINEERING
R-2021: CBCS

Academic year 2021-2022

Onwards



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B.E. – COMPUTER SCIENCE AND ENGINEERING R-2021: CBCS CURRICULUM

SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA31T	Discrete Mathematics and Applications	BSC	40	60	100	3	1	0	4
2	21HE32T	Digital Logic Circuits	ESC	40	60	100	3	0	0	3
3	21HC33T	Object Oriented Programming using Java	PCC	40	60	100	3	0	0	3
4	21HC34T	Database Management Systems	PCC	40	60	100	3	0	0	3
5	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
6	21HC37P	Object Oriented Programming using Java Laboratory	PCC	40	60	100	0	0	4	2
7	21HE38P	Digital Logic Circuits Laboratory	ESC	40	60	100	0	0	4	2
8	21HC39P	Database Management Systems Laboratory	PCC	40	60	100	0	0	4	2
TOTAL										19

Dean Academics

Principal



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Course code	21MA31T	Semester	III				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	DISCRETE MATHEMATICS AND APPLICATIONS (Common to CSE, IT)			3	1	0	4

COURSE OBJECTIVES:

- The objective of this course is to prepare the students
- To extend student's logical and mathematical maturity and ability to deal with abstraction
- To introduce the concept of graph theory
- To familiarize the applications of algebraic structures
- To understand the concepts and significance of lattice and Boolean algebra

PREREQUISITE:

- Basic Algebra

COURSE OUTCOMES:

CO. No	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C301.1	<i>Understand</i> the formal language of propositional logic and predicate logic through mathematical properties	K2
C301.2	<i>Understand</i> how to apply combinatorial ideas to practical problems	K2
C301.3	<i>Interpret</i> the basic concepts of graphs	K2
C301.4	<i>Exposed</i> to concepts and properties of algebraic structures such as groups, rings and fields	K2
C301.5	<i>Design and simplify</i> the logic gate networks by using lattices and Boolean algebra	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C301.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C301.2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C301.3	3	3	1	1	1	-	-	-	-	-	-	-	-	-	-
C301.4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C301.5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS**No. of Credits: 4****UNIT I MATHEMATICAL LOGIC 12**

Propositional and Logical operators- Equivalence and implications of statements Tautologies of statements-The existential and universal quantifiers-Predicate calculus including theory of inference

UNIT II COMBINATORICS 12

Mathematical Induction-the pigeon hole principle-Pascal's Formula-Permutations and combinations and the Binomial Theorem.-Recurrence relations Solving linear recurrence relations-Generating Functions-Inclusion and exclusion principle and its applications.

UNIT III GRAPHS 12

Graphs-Special types of graphs-Subgraphs-Planar Graphs Matrix representation of graphs-Euler and Hamilton Graphs-Trees-Spanning Trees-Rooted trees -Binary Trees-Traversals of Binary trees.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic systems – Groups and Subgroups – Semi groups and monoids - Homomorphism's-Normal subgroup and Cosets-Lagrange's theorem-Definitions and examples of Rings and Fields.

UNIT V LATTICE THEORY AND BOOLEAN ALGEBRA 12

Partial ordering - Posets-Lattices as posets - Properties of lattices-Sublattices-Direct product and homomorphism-Distributive lattices-Modular lattices- Complete lattices-Boolean algebra.

Total: 60 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2019.
2. Tremblay, J. P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. JoeLMott, "Discrete Mathematics for computer scientists", Reston Pub. Co

REFERENCES:

1. T Veerarajan Discrete Mathematics, With Graph Theory and Combinatorics, Tata McGraw Hill Pub.Co.Ltd, 2017
2. V. Sundaresan, K. S. Ganapathy Subramanian and K. Ganesan, Discrete Mathematics, New Revised Edition, A.R.Publications, 2001
3. A.Tamilarasi, "Discrete Mathematics and its Applications", Khanna publication Mc Graw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.



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Course code	21HE32T	Semester	III			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	DIGITAL LOGIC CIRCUITS (Common to CSE, IT)		3	0	0	3

COURSE OBJECTIVES:

- To Simplify logic digital Circuits using Boolean Functions.
- To Design Combinational and Sequential logic Circuits.
- To Learn Memory and logic devices.
- To understand VHDL model for digital circuits.

PREREQUISITE:

- Higher Secondary level Boolean Algebra

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C302.1	<i>Simplify</i> logic functions using Boolean Algebra and K-map.	K3
C302.2	<i>Design</i> minimal combinational and sequential logic circuits.	K3
C302.3	<i>Understand</i> VHDL for digital circuits	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C302.1	3	3	3	-		-	-	-	-	-	-	1
C302.2	3	3	3	-	1	-	-	-	-	-	-	1
C302.3	3	3	3	-	1	-	-	-	-	-	-	1

Note: 1: Slight, 2: Moderate, 3: Substantial



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Course code	21HC33T	Semester	III				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OBJECT ORIENTED PROGRAMMING USING JAVA (Common to CSE & ECE)			3	0	0	3

COURSE OBJECTIVES:

- To impart the core language features of Java and its Application Programming Interfaces(API).
- To demonstrate the use of threads, exceptions, files and collection frame works in Java.
- To familiarize students with GUI based application development and database connectivity.

PREREQUISITE:

- Basic Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C303. 1	<i>Interpret</i> Java programs using Object Oriented Programming principles	K2
C303. 2	<i>Explain</i> Java programs with the concepts of inheritance and interfaces	K2
C303. 3	<i>Contrast</i> Java applications using exceptions and I/O streams	K2
C303. 4	<i>Relate</i> Java applications with threads and generics classes	K2
C303. 5	<i>Apply</i> interactive Java programs using Swings& JDBC	K3
C303.6	<i>Understand</i> the concepts of JDBC connectivity	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C303. 1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C303. 2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303.6	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS**No. of Credits: 3****UNIT I INTRODUCTION TO OOPS AND JAVA FUNDAMENTALS 10**

Object Oriented Programming– Abstraction – objects and classes - Encapsulation- Inheritance – Polymorphism- OOPS in Java – Characteristics of Java – The Java Environment – Java Source File Structure – Compilation. Basics of Java programming– Data Types, Variables, Operators, Control Flow, -Defining classes in Java –methods - constructors -access specifiers – static members – Comments- JavaDoc comments, Arrays – Strings-Use of Wrapper Class–Java API packages – Using system packages – Creating, accessing and using a package – Adding a class to a package.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – the Object class – abstract classes and methods- final methods and classes- Comparison between Abstract Class and interface -Object cloning -inner classes- Array Lists.

UNIT III EXCEPTION HANDLING AND I/O PROGRAMMING 8

Exceptions – Exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions. Input / Output Basics – Streams – Byte streams and Character streams– Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader, Output Stream Writer, File Reader, File Writer, Buffered Reader.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Introduction about Multithreading-Differences between multi-threading and multitasking-Java thread Model- thread life cycle, creating threads, synchronizing threads, Inter-thread communication - thread groups. Generic Programming – Generic classes – Generic methods – Bounded Types – Restrictions and Limitations- Lambda Expressions.

UNIT V EVENT DRIVEN PROGRAMMING AND DBMS CONNECTIVITY 10

Graphics programming- Frame – AWT Components- Introduction to Swing – Layout management – Swing Components –Text Fields, Text Areas – Buttons- Check Boxes – Radio Buttons – Lists-choices- Scrollbars – Windows –Menus – Dialog Boxes- JApplet –Event Handling Mechanisms - Event Classes – Event Listener-Data Base Connectivity: Basic structure of JDBC API-Database Management; Mechanism for connecting to a back-end database; Loading the ODBC driver.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Herbert Schildt, —Java The complete referencel, 11th Edition, McGraw Hill Education, 2020.
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentalsll, 11th Edition, Prentice Hall, 2020

REFERENCES:

1. Paul Deitel, Harvey Deitel, —Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner, —Java 2 Black book, Dreamtech press, 2011.
3. Timothy Budd, —Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.



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Course code	21HC34T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DATABASE MANAGEMENT SYSTEMS (Common to CSE, AI&DS)		3	0	0	3

COURSE OBJECTIVES:

The objective of this course is to prepare the students

- To understand the fundamentals of data models and to represent a database system using ER diagrams and relational database design.
- To learn the SQL basics and to use the normalization process in the databases.
- To understand the fundamental concepts of transaction and recovery procedures and to have an introductory knowledge about Indexing, Query Processing and Cost estimation.

PREREQUISITE:

- Basic knowledge of Database fundamentals

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C304. 1	<i>Understand</i> the applications of database models on various parameters.	K2
C304. 2	<i>Analyze</i> ER model to Relational model and to perform database design effectively.	K2
C304. 3	<i>Understand</i> queries for normalization and optimization criterions.	K2
C304. 4	<i>Understand</i> various concurrency and recovery procedures.	K2
C304. 5	<i>Analyze</i> various indexing strategies in different database systems	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C304. 1	3	2	2	1	-	-	-	-	-	-	-	-	3	3
C304. 2	3	2	3	2	1	-	-	-	-	-	-	-	3	3
C304. 3	3	2	2	1	-	-	-	-	-	-	-	-	3	3
C304. 4	3	2	2	1	-	-	-	-	-	-	-	-	3	3
C304. 5	2	2	3	2	1	-	-	-	-	-	-	-	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS**No. of Credits: 3****UNIT I INTRODUCTION TO RELATIONAL DATABASES****9**

Introduction, History and Purpose of Database System – Introduction to Big data– Database Schema and Instances- Views of data – Data Models – Database System Architecture – Introduction to relational databases Relational Model – Keys – Relational Algebra.

UNIT II BASICS OF SQL AND DATABASE DESIGN**9**

SQL fundamentals – Advanced SQL features, Triggers- Nested Queries and Embedded SQL, Dynamic SQL. Entity-Relationship model – ER Diagrams – Enhanced-ER Model – ER-to-Relational Mapping.

UNIT III NORMALIZATION TECHNIQUES**9**

Introduction and problem of data redundancy-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- Dependencies Preservation-Case Studies of database system.

UNIT IV TRANSACTIONS AND CONCURRENCY**9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction states- Concurrent Execution – Need for Concurrency – Types of Locks – Two Phase Locking – Deadlock detection– Transaction Recovery– Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT V IMPLEMENTATION TECHNIQUES**9**

Overview of Physical storage media, 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- Introduction to Distributed databases and client/server databases.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, Seventh Edition, Tata McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe,- Fundamentals of Database Systems, Sixth Edition, Pearson, 2016.

REFERENCES:

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



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Course code	21MC01T	Semester	III				
Category	MANDATORY COURSE (MC)			L	T	P	C
Course Title	CONSTITUTION OF INDIA			2	0	0	0

COURSE OBJECTIVES:

- To understand the importance of constitution.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

PREREQUISITE:

- Civic Knowledge.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	<i>Understand</i> historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration	K2
C001.2	<i>Understand</i> the directive principle of state policy, and strengthening of the constitutional institutions.	K2
C001.3	<i>Analyze</i> the role of Governor and Chief Minister, role of state election commission, the decentralization of powers.	K2
C001.4	<i>Understand</i> the Public Election Process.	K2
C001.5	<i>Know</i> the Special Provisions for Various category of People.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C001.1	-	-	-	-	-	3	-	2	-	-	-	1	-	-	-
C001.2	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C001.3	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C001.4	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-
C001.5	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS	No. of Credits: 0
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UNIT I INTRODUCTION TO INDIAN CONSTITUTION	6
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The Necessity of the Constitution, The Societies before and after the Constitution adoption. **Introduction to the Indian constitution**, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India.

UNIT II FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES	6
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Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. Directive Principles of State Policy (Art. 36-51).

UNIT III UNION EXECUTIVE AND STATE EXECUTIVE	6
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Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Parliamentary Terminologies. Supreme Court of India, State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts.

UNIT IV ELECTIONS, AMENDMENTS AND EMERGENCY PROVISIONS	6
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Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments Important Constitutional Amendments. Emergency Provisions, types of Emergencies and its consequences.

UNIT V DIRECTIVE PRINCIPLES & FUNDAMENTAL DUTIES	6
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Fundamental Duties (Art. 51A), Basic Features of Constitution & Constitutional **special provisions**: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. N. Shukla, Constitution of India, Eastern Book Agency, 2014.
2. P. Jain, Indian Constitutional Law, Lexis Nexis, 2013.
3. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint 2013.

REFERENCES:

1. Glanville Austin, Indian Constitution – cornerstone of the Nations, Oxford University Press, 1999.
2. M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2014.
3. D. Basu, Shorter Constitution of India (14th Ed. 2008, reprint 2010).
4. M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2014.
5. D. Basu, Shorter Constitution of India (14th Ed. 2008, reprint 2010).



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Course code	21HC37P	Semester	III				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY (Common to CSE & ECE)			0	0	4	2

COURSE OBJECTIVES:

- Practice object-oriented programs and build java applications.
- Implement java programs for establishing interfaces.
- Implement sample programs for developing reusable software components.
- Create database connectivity in java and implement GUI applications.

PREREQUISITE:

- Basic Programming Skill

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C307. 1	<i>Develop and implement</i> Java programs for simple applications that make use of classes	K3
C307. 2	<i>Develop and implement</i> Java programs with Array List	K3
C307. 3	<i>Build</i> software development skills using java programming for real-world applications	K3
C307. 4	<i>Apply</i> the concepts of classes, packages, interfaces, exception handling, Multithreading	K3
C307. 5	<i>Develop</i> applications using File Processing, generic programming and event handling	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C307. 1	3	2	2	1	-	-	-	-	-	-	-	-	1	-	1
C307. 2	3	2	2	1	-	-	-	-	-	-	-	-	2	-	2
C307. 3	3	2	2	1	-	-	-	-	-	-	-	-	2	-	2
C307. 4	3	2	2	1	-	-	-	-	-	-	-	-	2	1	2
C307. 5	3	2	2	1	-	-	-	-	-	-	-	-	3	1	3

Note: 1: Slight, 2: Moderate, 3: Substantial

List of Experiment	No. of Credits: 2
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1. Develop a Java Program for understanding reference to an instance of a class (object), methods
2. Develop a Program to implement constructor overloading.
3. Develop a Java Program to implement String Handling Methods
4. Implementation of Inheritance using Java.
5. Implementation of Interfaces and Packages using Java.
6. Implementation on Abstract Class in Java.
7. Write a Java Program using Exception Handling.
8. Implementation of I/O Streams in Java Interface.
9. Implementation of Multithreaded Programming using Java.
10. Implementation of Generic Function in Java Interface.
11. Implementation of AWT controls and Event classes using Java Program.
12. Develop a mini project for any application using JDBC

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Herbert Schildt, —Java The complete referencel, 11th Edition, McGraw Hill Education, 2020.
2. Cay S. Horstmann, Gary cornell, —Core Java Volume –I Fundamentalsl, 11th Edition, Prentice Hall, 2020.

REFERENCES:

1. Paul Deitel, Harvey Deitel, —Java SE 8 for programmersl, 3rd Edition, Pearson, 2015.
2. Steven Holzner, —Java 2 Black bookl, Dreamtech press, 2011.
3. Timothy Budd, —Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

ONLINE RESOURCES:

1. docs.oracle.com/java/6/tutorial/doc/girgm.html
2. www.webreference.com/programming/java.html
3. www.apl.jhu.edu/~hall/java/Documentation.html

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Systems with either NetBeans or Eclipse	30



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Course code	21HE38P	Semester	III			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	DIGITAL LOGIC CIRCUITS LABORATORY (Common to CSE & IT)		0	0	4	2

COURSE OBJECTIVES:

- Understand the various basic logic gates.
- Design and implement the various combinational circuits.
- Design and implement sequential circuits
- Understand and code with HDL programming

PREREQUISITE:

- Engineering Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C308.1	<i>Implement</i> simplified combinational circuits using basic logic gates.	K2
C308.2	<i>Implement</i> sequential circuits like registers and counters.	K2
C308.3	<i>Simulate</i> combinational and sequential circuits using HDL.	K2
C308.4	<i>Implement</i> simplified combinational circuits using basic logic gates.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C308.1	3	3	3	-	1	-	-	1	2	2	-	1	3	3	3
C308.2	3	3	3	-	1	-	-	1	2	2	-	1	3	3	3
C308.3	3	2	2	-	1	-	-	1	2	2	-	1	3	3	3
C308.4	3	2	2	-	1	-	-	1	2	2	-	1	3	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for given functions.
3. Design and implementation of combinational circuits using basic gates for Binary to gray, Excess 3 to BCD code converters and vice versa.
4. Design and implementation of half adder /full adder/ half subtractor/ full subtractor.
5. Design and implementation of 2-bit magnitude comparator and parity checker/generator.
6. Design and implementation of Boolean expression using multiplexer and De-multiplexer.
7. Design and implementation of Boolean expression using Encoder/Decoder.
8. Design and implementation of RS,JK,T and D flip-flops.
9. Design and implementation of ripple and synchronous counters using flip-flops .
10. Design and implementation of Mod-n counters and Johnson counters using flip-flops.
11. Implementation of SISO ,PISO,SIPO,PIPO shift register using flip-flops.
12. Design Code converters, Multiplexer, Demultiplexer, Counters and Flip-flops using VHDL.

Total: 60 Periods

LEARNING RESOURCES:**TEXT BOOKS:**

1. M. Morris R. Mano, Michael D. Ciletti, —Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog, 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 McGraw Hill, 2003.

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	IC Trainer Kit	15
2.	Bread Boards	15
3.	PC with HDL Software	15
4.	Seven Segment Display	15
5.	ICs 7400/7402/7404/7486/7408/7432/7483/74150/74151/ 74147/7445/7476/7491/7494/7447/74180/7485/7473/ 7411/7474	Each 50



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Course code	21HC39P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DATABASE MANAGEMENT SYSTEMS LABORATORY (Common to CSE, AI&DS)		0	0	4	2

COURSE OBJECTIVES:

- To understand data definitions and data manipulation commands and to learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front-end tool.

PREREQUISITE:

- Basic Programming Skill

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C309.1	<i>Write</i> data definitions and manipulation commands.	K2
C309.2	<i>Design</i> applications to test Nested and Join Queries	K3
C309.3	<i>Apply</i> PL/SQL for processing database	K3
C309.4	<i>Implement</i> applications that required as Front-end Tool	K3
C309.5	<i>Analyze</i> the use of Tables, Views, Functions and Procedures	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C309.1	2	2	-	-	2	-	-	-	-	-	-	-	1	-
C309.2	3	2	1	-	1	-	-	-	-	-	-	-	2	-
C309.3	3	2	1	1	1	-	-	-	-	-	-	-	2	-
C309.4	3	2	1	-	-	-	-	-	2	1	-	-	2	1
C309.5	3	2	1	-	-	-	-	-	2	1	-	-	3	1

Note: 1: Slight, 2: Moderate, 3: Substantial

LIST OF EXPERIMENTS

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Creating an employee database to set various constraints and Creation of Views Indexes, Save point.
4. Database Programming: Implicit and Explicit Cursors
5. Write a PL/SQL block that handles all types of exceptions.
6. To create PL/SQL functions and to implement the stored procedures in SQL (Procedures and Functions).
7. To study the basics of front-end tools.
8. Creation of Database Triggers
9. Database Design using ER modeling, normalization and Implementation for any application
10. Creation of Database in MS Access.
11. Database connectivity using Front End Tools (Application Development using Oracle/ Mysql)
12. Case study of Big Data and NoSQL.

Total: 60 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, Seventh Edition, Tata McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe,- Fundamentals of Database Systems, Sixth Edition, Pearson, 2016.

REFERENCES:

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

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Systems with MySQL	30 Nos
2.	Visual Studio	30 Nos
3.	Server	1 No

IV & V SEMESTER CURRICULUM AND SYLLABI

Applicable to the students admitted to

B.E COMPUTER SCIENCE AND ENGINEERING

R-2021: CBCS

Academic year 2021-2022
onwards



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B.E – Computer Science and Engineering (R2021)

SEMESTER IV										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA41T	Probability and Queuing Theory	BSC	40	60	100	3	1	0	4
2	21HC42T	Design and Analysis of Algorithms	PCC	40	60	100	3	0	0	3
3	21CS43IT	Object Oriented Analysis and Design	PCC	40	60	100	2	0	4	4
4	21HC44T	Operating Systems	PCC	40	60	100	3	0	0	3
5	21HC45T	Software Engineering	PCC	40	60	100	3	0	0	3
6	21CS46T	Computer Architecture and Organization	PCC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE01P	Mini Project- I	EEC	40	60	100	0	0	2	1
8	21HC47P	Operating Systems Laboratory	PCC	40	60	100	0	0	4	2
TOTAL										23



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Course code	21MA41T	Semester	IV				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	PROBABILITY AND QUEUING THEORY (Common to CSE and IT)			3	1	0	4

COURSE OBJECTIVES:

- To understand one and two- dimensional random variables and to introduce some Standard distributions.
- To discuss the basic concepts of random processes which are widely used in CSE& IT Fields.
- To understand the concept of queuing models and apply in engineering.
- To identify and interpret the significance of advanced queuing models.

PREREQUISITE:

- Basic concepts in probability.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C401.1	<i>Understand</i> the fundamental knowledge of the concepts of probability and standard distributions.	K2
C401.2	<i>Comprehend</i> the basic concepts of one and two dimensional random variables and apply in engineering applications.	K2
C401.3	<i>Understand</i> various classifications of random processes.	K2
C401.4	<i>Analyse</i> different queuing models and its applications.	K4
C401.5	<i>Apply</i> Non-Markovian queuing models and Network.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C401.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C401.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C401.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C401.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C401.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1:Slight,2: Moderate,3:Substantial

SYLLABUS**No. of Credits: 4****UNIT I RANDOM VARIABLES AND DISTRIBUTIONS****9+3**

Discrete and continuous random variables- Distribution function of random variable – Properties – Probability mass function – Probability density function – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES**9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.

UNIT III RANDAM PROCESSES AND MARKOV CHAINS**9+3**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Transition probabilities.

UNIT IV QUEUEING MODELS**9+3**

Markovian queues – Birth and death Queuing models – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms.

UNIT V NON-MARKOVIAN QUEUES AND QUEUE NETWORKS**9+3**

M/G/1 queue – PollaczekKhinchin formula –M / D/ 1 - Series queues – Open and closed Jackson networks.

Total: 60 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2013.
2. Ibe, O.C., —Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2014.

REFERENCES:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2014.
2. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2017.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2017.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd. 2012.



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Course code	21HC42T	Semester	IV				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE & IT)			3	0	0	3

COURSE OBJECTIVES:

- To give adequate knowledge to students on the techniques of problem solving in computing.
- To introduce, students to analyze the asymptotic performance of algorithms.
- To enable, students to synthesize efficient algorithms in common engineering design situations
- To facilitate students to design algorithms for any problem statements.

PREREQUISITE:

- Basic Programming Skills
- Programming and Data Structures

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C402.1	<i>Analyze</i> the Time and Space Complexity of Algorithms	K3
C402.2	<i>Experiment</i> with the usage of different Algorithms	K3
C402.3	<i>Identify</i> Algorithms to Solve Problems	K2
C402.4	<i>Infer</i> Knowledge about different Problem-Solving Techniques	K2
C402.5	<i>Construct</i> algorithms for the given Problem Statements	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C402.1	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C402.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C402.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C402.4	3	3	2	1	-	-	-	-	-	-	-	1	3	3
C402.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I FUNDAMENTALS OF ALGORITHM**9**

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

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER**9**

Brute Force: Sequential Search and Brute Force String Matching - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem- - Assignment problem - Heuristic Search - Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Multiplication of Large Integers and Strassen’s Matrix Multiplication -Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**9**

Dynamic Programming: Coin Change Problem - Computing a Binomial Coefficient - Multistage Graph - Optimal Binary Search Trees - Knapsack Problem and Memory functions. – Warshall’s and Floyd’s Algorithm- Greedy Technique: Fractional Knapsack Problem - Optimal Merge pattern, Minimum Spanning Tree: Prim's Algorithm, Kruskal's Algorithm, Huffman Tree.

UNIT IV LINEAR PROGRAMMING AND ITERATIVE IMPROVEMENT**9**

Linear Programming: Standard and Slack Forms of Linear Programming Problems – Problem Formulation – Initial Basic Feasible Solution – Simplex Algorithm – Duality - 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**

Classes and Reducibility, Cook-Levin theorem, NP Complete Problems and NP Hard Problems – Back Tracking: N-queens Problem, Hamilton Circuit Problem, Subset-Sum Problem, Branch and Bound: Assignment Problem, Travelling Salesman Problem, Approximation Algorithms for NP - Vertex Cover and Set Covering.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Anany Levitin "Introduction to the Design and Analysis of Algorithm", Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.
3. Sadeep San, Amit Kumar, "Design and Analysis of Algorithm – A Contemporary Perspective", Cambridge University, 2019.

REFERENCES:

1. Thomas H. Cormen Charles E. Leiserson Ronald L. Rivest Clifford Stein "Introduction to Algorithms", Third Edition, The MIT Press 2009.
2. V.V. Muniswamy, "Design and Analysis of Algorithm", I.K. International Publishing House.2015.
3. Manas Ranjan Kabat, "Design and Analysis of Algorithm", PHI Learning, 2013.



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Course code	21CS43IT	Semester	IV				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OBJECT ORIENTED ANALYSIS AND DESIGN			2	0	4	4

COURSE OBJECTIVES:

- To learn the basics of Object Oriented Analysis and design and various UML diagrams.
- To understand how to create design patterns
- To understand the various stages of the design process using a case study.
- To learn how to apply design patterns using various UML diagrams
- To know how to map design to code and learn different testing techniques

PREREQUISITE:

- Basic understanding of Object Oriented Programming.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C403.1	<i>Understand</i> the basics of Object Oriented Analysis and design and various UML diagrams	K2
C403.2	<i>Demonstrate</i> how to create design patterns.	K2
C403.3	<i>Identify</i> the different stages of the design process with a case study	K2
C403.4	<i>Apply</i> design patterns using various UML diagrams.	K3
C403.5	<i>Compare</i> and contrast various testing techniques	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C403.1	3	3	3	1	1	-	-	-	-	-	-	1	2	2
C403.2	1	2	2	2	2	-	-	-	-	-	-	-	2	2
C403.3	3	2	1	2	-	-	-	-	-	-	1	-	2	2
C403.4	1	1	2	2	1	-	-	-	-	-	-	-	2	2
C403.5	3	1	3	2	1	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS

No. of Credits: 4

UNIT I UML DIAGRAMS 6

Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component, and Deployment Diagrams.

UNIT II DESIGN PATTERNS 6

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge – Adapter - behavioural – Strategy – observer.

UNIT III APPLYING DESIGN PATTERNS 6

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns.

UNIT IV CODING AND TESTING METRICS 6

Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing-Metrics for Object Oriented Design- Class Oriented Metrics

UNIT V CASE STUDY 6

Case study – the Next Gen POS system, Inception -Use case Modelling - Relating Use cases – include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition

Total: 30 Periods

LIST OF EXPERIMENTS

1. Draw the standard UML diagrams using an UML modeling tool for a **Passport Automation system** and map design to code where the system requirement specification is satisfied.
2. Identify and document the System Requirement Specification of **Book Bank system** that needs to be developed and implemented using the UML design to code.
3. Implement the modified system of **Foreign Trading System** and test it under for various scenarios using UML diagrams and map design to code according to the specified requirements where the system requirement specification is satisfied

4. Identify the conceptual classes and develop a domain model for a **Exam Registration System** that satisfy the System Requirement Specification
5. Test the software system for all the scenarios identified as per the use case diagram in **stock maintenance system** to design and validate the code where the SRS is satisfied
6. Implement the **Online Course reservation system** using UML Model as per the SRS specified.
7. Improve the reusability and Maintainability of the **software personal Management system** by applying the appropriate design patterns using UML diagram
8. Implement the modified system of **Airline / Railway reservation system** and test it for various scenarios given in the use case UML diagram
9. Using the identified scenarios find the interaction between the objects and represent the model of **Credit card Processing system** using UML Sequence and Collaboration system.
10. Draw the relevant state chart and activity diagram for the **conference management system**
11. Draw the standard UML diagrams using an UML modeling tool for a **Library Management system** and map design to code according to the specified requirements.
12. Implement the **Automation of Recruitment System** to design a code according to the specified requirements.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Craig Larman, “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

REFERENCES:

1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.
2. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third edition, Addison Wesley, 2003



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Course code	21HC44T	Semester	IV				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OPERATING SYSTEMS (Common to CSE , IT, ECE & AI&DS)			3	0	0	3

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

PREREQUISITE:

- Basic knowledge in Computer.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C404.1	<i>Analyze</i> various scheduling algorithms and process synchronization.	K3
C404.2	<i>Explain</i> deadlock prevention and avoidance algorithms.	K2
C404.3	<i>Compare</i> and contrast various memory management schemes.	K3
C404.4	<i>Explain</i> the functionality of file systems, I/O systems, and Virtualization	K2
C404.5	<i>Compare</i> iOS and Android Operating Systems.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C404.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION**9**

Computer System - Elements and organization; Operating System Overview - Objectives and Functions Evolution of Operating System; Operating System Structures – Operating System Services – User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

UNIT II PROCESS MANAGEMENT**9**

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT**9**

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames – Thrashing.

UNIT IV STORAGE MANAGEMENT**9**

Mass Storage system – Disk Structure - Disk Scheduling and 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 - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V VIRTUALIZATION AND MOBILE OPERATING-SYSTEM**9**

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Ninth Edition, 2012, Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", TataMcGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, PrenticeHall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.



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Course code	21HC45T	Semester		IV			
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	SOFTWARE ENGINEERING (Common to CSE & IT)			3	0	0	3

COURSE OBJECTIVES:

- To explore the fundamental concepts of software development process.
- To develop skills that will enable them to analyse and design software of high quality.
- To know the concepts of different testing and maintenance techniques.
- To analyze the software using metrics and measurement and predict the complexity and the risk associated.
- To understand advance software engineering tools.

PREREQUISITE:

- Problem Solving and Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C405.1	<i>Explain</i> the concept of Software life cycle models.	K2
C405.2	<i>Analyze</i> the software requirement specification and design software according to the specification.	K3
C405.3	<i>Make use</i> of different types of testing techniques and software maintenance.	K3
C405.4	<i>Develop</i> project schedule, estimate project cost and effort required.	K3
C405.5	<i>Illustrate</i> reusability and distributed software engineering and tools.	K2
C405.6	<i>Apply</i> the Software Engineering Concepts for Developing a Project	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C405.1	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C405.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C405.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C405.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C405.5	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C405.6	3	2	1	-	-	-	-	-	-	-	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

- UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9**
Introduction to Software Engineering, - Software Process – Process models – Prescriptive Process Models – Specialized Process Models – Agile Development – Extreme Programming (XP) –XP Process- Other Agile Process Models.
- UNIT II REQUIREMENTS ANALYSIS AND DESIGN PRINCIPLES 9**
Functional and non functional – Software requirement document – Requirement engineering process – Feasibility studies – Functional and behavioural models – Structured analysis and data dictionary - Design process and concepts – Design heuristic – Architectural design – Mapping data flow into a software architecture - Data design – User interface design - Interface analysis, Interface Design – Component level Design: Designing Class based components, traditional Components, Real time software design
- UNIT III TESTING AND MAINTENANCE 9**
Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering
- UNIT IV SOFTWARE PROJECT MANAGMENT 9**
Software Project Management Concepts – Process and Project Metrics – Estimation for Software Projects- LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling –Software Configuration Management – Software Process Improvements (SPI) – The SPI Process – Capability Machine Model Integration (CMMI) – Risk Management – Identification, Projection -RMMM Plan-CASE TOOLS.
- UNIT V ADVANCE SOFTWARE ENGINEERING AND TOOLS 9**
Software Reuse – Component Based Software Engineering- Distributed Software Engineering - Aspect Oriented Software Engineering-Scrum- - Product backlog - Sprint backlog -Iteration planning - User story definition- Sprint planning and retrospective - Daily scrum - Scrum roles – Product Owner - Scrum Master - Scrum Team – Scrum, Case Study- Software tools and environments: Programming environments; Configuration management tools-Case Studies.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Roger S. Pressman, —Software Engineering – A Practitioner’s Approach, Eighth Edition, Mc Graw-Hill International Edition, 2015.
2. Ian Sommerville, —Software Engineering, 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.
2. Watts S. Humphrey, “A Discipline For Software Engineering”, Pearson Education, 2007.
3. Shari Lawrence Pfleeger, Joanne M. Atlee, “Software Engineering: Theory and Practice”, Fourth Edition, Pearson Education, 2010.
4. Pankaj Jalote, “CMM in Practice: Processes for Executing Software Projects at Infosys”, Addison-Wesley Professional; 1 edition (November 7, 1999).



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Course code	21CS46T	Semester	IV				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	COMPUTER ARCHITECTURE AND ORGANIZATION			3	0	0	3

COURSE OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To understand parallelism and multi-core processors.
- To expose the students to the concept of pipelining and with hierarchical memory system including cache memories and I/O devices.

PREREQUISITE:

- Basic computer knowledge and Basic digital logic design Skills.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C406.1	<i>Summarize</i> the basic structure of computers, operations and instructions.	K2
C406.2	<i>Build</i> arithmetic and logic unit.	K3
C406.3	<i>Understand</i> pipelined execution and design control unit	K2
C406.4	<i>Analyze</i> parallel processing architectures	K4
C406.5	<i>Understand</i> the various memory systems and I/O communication	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C406.1	3	2	-	-	-	-	-	-	-	-	-	-	3	3
C406.2	3	2	-	-	-	-	-	-	-	-	-	-	1	2
C406.3	3	2	-	-	-	-	-	-	-	-	-	-	2	1
C406.4	2	2	-	-	-	-	-	-	-	-	-	-	1	2
C406.5	2	2	-	-	-	-	-	-	-	-	-	-	1	2

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Eight Great Ideas in Computer Architecture - Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – instruction representation – Logical operations – decision making – MIPS Addressing

UNIT II ARITHMETIC FOR COMPUTERS 9

Fixed point representation of numbers-algorithms for arithmetic operations: Addition (Carry Lookahead adders)and Subtraction, multiplication (Booths, Modified Booths) - division (restoring and non-restoring),– Floating Point Representation, Floating Point Operations.

UNIT III PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISIM 9

Parallel processing challenges – Flynn’s classification – SISD, MIMD, SIMD, SPMD - Subword Parallelism and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units (GPU), Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors – Case Study: Intel Core i7 versus NVIDIA Tesla GPU.

UNIT V MEMORY & I/O SYSTEMS 9

Memory Hierarchy – memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB’s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB– Case Study: Memory Hierarchies in Intel Core i7 and ARM Cortex-A8.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2018.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
3. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.

REFERENCES:

1. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
2. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.



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Course code	21EE01P	Semester	IV				
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)			L	T	P	C
Course Title	MINI PROJECT – I			0	0	2	1

COURSE OBJECTIVES:

- To introduce Project based learning

PREREQUISITE:

- All Core Courses

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	<i>Formulate</i> specific problem statements for ill-defined real life problems with reasonable assumptions and constraints.	K6
C001.2	<i>Perform</i> literature search and / or patent search in the area of interest	K3
C001.3	<i>Conduct</i> experiments / design and analysis / solution iterations and document the results/ Perform error analysis	K4
C001.4	<i>Synthesize</i> the results and arrive at scientific conclusions / products / solution	K4
C001.5	<i>Document</i> the results in the form of technical report /	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C001.1	3	3	2	2	2	1	1	1	3	2	2	2	2	2	2	2
C001.2	3	3	2	2	2	1	1	1	3	2	2	2	2	2	2	2
C001.3	3	3	2	2	2	1	1	1	3	2	2	2	2	2	2	2
C001.4	3	3	2	2	2	1	1	1	3	2	2	2	2	2	2	2
C001.5	3	3	2	2	2	1	1	1	3	2	2	2	2	2	2	2

Note: 1: Slight; 2: Moderate; 3: Substantial

DOMAINS:

Students are advised to carry out the projects in the following domains

- Data Science
- Artificial Intelligence
- Machine Learning
- Big Data
- Internet of Things

Total: 30 Periods

ONLINE RESOURCES:

1. https://swayam.gov.in/nc_details/NPTEL
2. <https://www.sciencedirect.com/>
3. <https://www.ibm.com/>
4. <https://www.ai.google.com/>
5. <https://www.kaggle.com/>



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Course code	21HC47P	Semester	IV				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OPERATING SYSTEMS LABORATORY (Common to CSE & IT)			0	0	4	2

COURSE OBJECTIVES:

- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement various memory allocation methods.
- To be familiar with File Organization and File Allocation Strategies.

PREREQUISITE:

- Basics on Programming for problem solving.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C407.1	Define and implement UNIX Commands	K3
C407.2	Compare the performance of various CPU Scheduling Algorithms.	K3
C407.3	Compare and contrast various Memory Allocation Methods.	K3
C407.4	Define File Organization and File Allocation Strategies.	K3
C407.5	Implement various Disk Scheduling Algorithms.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C407.1	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C407.2	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C407.3	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C407.4	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C407.5	3	2	1	-	3	-	-	2	2	2	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

LIST OF EXPERIMENTS

1. Illustrate UNIX commands and Shell Programming
2. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
3. Write C programs to implement the various CPU Scheduling Algorithms
4. Illustrate the inter process communication strategy
5. Implement mutual exclusion by Semaphore
6. Write C programs to avoid Deadlock using Banker's Algorithm and Deadlock Detection Algorithm
7. Write C program to implement Threading
8. Implement the paging Technique using C program
9. Write C programs to implement the following Memory Allocation Methods
 - a. First Fit
 - b. Worst Fit
 - c. Best Fit
10. Write C programs to implement the various Page Replacement Algorithms
11. a) Write C programs to Implement the various File Organization Techniques
 - b) Implement the following File Allocation Strategies using C programs
 - a. Sequential
 - b. Indexed
 - c. Linked
12. Write C programs for the implementation of various disk scheduling algorithms
13. Case study on iOS mobile operating system.

TOTAL: 60 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Ninth Edition, 2012, Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", TataMcGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, PrenticeHall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.



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B.E – Computer Science and Engineering (R2021)

SEMESTER V										
S.No	Course code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21MA44T	Numerical Methods	BSC	40	60	100	3	1	0	4
2	21HC52T	Theory of Computation	PCC	40	60	100	3	0	0	3
3	21HC53T	Computer Networks	PCC	40	60	100	3	0	0	3
4	21HE54IT	Microprocessor and Microcontroller	ESC	40	60	100	2	0	4	4
5	-	Professional Elective I	PEC	40	60	100	3	0	0	3
6	-	Open Elective I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21HC57P	Networks Laboratory	PCC	40	60	100	0	0	4	2
8	21EE03P	Technical Seminar	EEC	100	-	100	1	0	0	1
TOTAL										23



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Course code	21MA44T	Semester	V				
Category	BASIC SCIENCE COURSE (BSC)			L	T	P	C
Course Title	NUMERICAL METHODS (Common to CSE, Chemical and Civil)			3	1	0	4

COURSE OBJECTIVES:

- To provide the necessary basic concepts of a few numerical methods.
- To provide procedures for solving numerically different kinds of problems occurring in the field of Engineering and Technology.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

PREREQUISITE:

- Basic knowledge of ordinary differential equations.
- Multivariable calculus.

COURSE OUTCOME:

CO No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C404.1	<i>Solve</i> algebraic equations that arise during the study of Engineering problems	K3
C404.2	<i>Use</i> various interpolation techniques for solving problems in Engineering.	K3
C404.3	<i>Apply</i> the numerical techniques of differentiation and integration for engineering problems.	K3
C404.4	<i>Solve</i> initial value problems numerically that arise in Science and Engineering.	K3
C404.5	<i>Solve</i> boundary value problems that encounter in different fields of Engineering study	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C404.1	2	1	1	1	-	-	-	-	-	-	-	-	-	-
C404.2	2	1	-	1	-	-	-	-	-	-	-	-	-	-
C404.3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C404.4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C404.5	2	1	-	-	-	-	-	-	-	-	-	-	-	-

Note: - 1: Slight 2: Moderate 3: Substantial

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals – Lagrange's interpolation – Inverse interpolation using Lagrange's method-Newton's divided difference interpolation –Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule and Simpson's 3/8 rule– Romberg's Method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Taylor's series method - Picard's - Euler's method - Modified Euler's method -Runge - Kutta method - Milne's and Adams-Bashforth predictor corrector methods for solving first order equations

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving second order two – point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation – Bender - Schmidt recurrence relation - Crank - Nicolson method – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS**LEARNING RESOURCES:****TEXT BOOKS:**

1. Numerical methods with C++ programming by Nita H. Shah, PHI. 2009.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
3. Burden, R. Land Faires, J.D., "Numerical Analysis", 9th Edition, Cengage Learning, 2016.

REFERENCES:

1. Numerical methods for engineers and scientists by Joe D. Hoffman. Marcel Dekker, Inc. 2001.
2. Numerical methods with programs in C by T. Veerarajan and T. Ramachandran. Tata McGraw-Hill. 2006.
3. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt.Ltd, 3rd Edition, New Delhi, 2007.
4. Sastry, S. S, "Introductory Methods of Numerical Analysis ", PHI Learning Pvt.Ltd, 5th Edition, 2015.



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Course code	21HC52T	Semester	V				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	THEORY OF COMPUTATION (Common to CSE & IT)			3	0	0	3

COURSE OBJECTIVES:

- To introduce Automata Theory and Regular Languages.
- To understand Context Free languages and recognizers for different languages.
- To design Turing Machines for various languages.
- To understand the concepts involved in software development.
- To gain knowledge on undecidable problems.

PREREQUISITE:

- Basic knowledge of programming and mathematical skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C502.1	<i>Construct</i> automata, regular expression for any pattern	K3
C502.2	<i>Classify</i> Context free grammar for any Construct	K2
C502.3	<i>Illustrate</i> Turing Machines for any language	K2
C502.4	<i>Demonstrate</i> Computation solutions using Turing Machines	K2
C502.5	<i>Identify</i> whether a problem is decidable or not	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C502.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C502.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C502.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C502.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C502.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS**No. of Credits: 3****UNIT I AUTOMATA FUNDAMENTALS****9**

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**9**

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**9**

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES**9**

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM – Universal TM.

UNIT V UNDECIDABILITY**9**

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem (PCB) – Modified PCB – Rice Theorem.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. J.E.Hopcroft, R.Motwani and J.D Ullman, —Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2003.
2. Introduction to Languages and the Theory of Computation (third edition), by John Martin, McGraw-Hill, 2003.
3. Introduction to Automata Theory, Languages, and Computation (third edition), by John Hopcroft, Rajeev Motwani, Jeffrey Ullman, Addison Wesley, 2007.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, —Elements of the theory of Computation, Second Edition, PHI, 2008.
2. J.Martin, —Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2007.
3. Micheal Sipser, —Introduction of the Theory and Computation, Third Edition, Cengage Learning 2013.



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Course code	21HC53T	Semester	V				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	COMPUTER NETWORKS (Common to CSE, IT, CSE(AI&ML))			3	0	0	3

COURSE OBJECTIVES:

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

PREREQUISITE:

- Basic knowledge in Computer.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C503.1	<i>Describe</i> the general principles of data communication.	K2
C503.2	<i>Analyze</i> the contents in a given data link layer packet, based on the layer concept.	K3
C503.3	<i>Analyze</i> and design routing algorithms	K3
C503.4	<i>Design</i> protocols for various functions in the network.	K3
C503.5	<i>Understand</i> the working of various application layer protocols	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C503.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C503.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C503.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C503.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C503.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

Note: - 1: Slight 2: Moderate 3: Substantial

UNIT I FUNDAMENTALS & LINK LAYER 9

Building a network – Requirements - Layering and protocols – OSI Model -Performance - Networking Devices: Hubs, Bridges, Switches, Routers, and Gateways – Performance Metrics - Link layer Services - Framing - Error Detection - Flow control – Signals – Bandwidth and Data Rate – Encoding – Multiplexing – Shift Keying – Transmission Media

UNIT II MEDIA ACCESS & INTERNETWORKING 9

Media access control - Ethernet (802.3) - Virtual LAN - Wireless LANs - 802.11– Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

UNIT III ROUTING 9

Routing Principles – Distance Vector Routing – Link State Routing - Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).

UNIT IV TRANSPORT LAYER 9

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER 9

Internet Architecture – Network software – Introduction to Sockets - Traditional applications - Electronic Mail (FTP, SMTP, POP3, IMAP, MIME, Telnet, SSH) – HTTP – Web Services – DNS - SNMP

TOTAL: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.



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Course code	21HE54IT	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	MICROPROCESSOR AND MICROCONTROLLER (Common to ECE, CSE & IT)		2	0	4	4

COURSE OBJECTIVES:

- To introduce the architectures of microprocessors, microcontroller.
- To familiarize with assembly language programming in 8086 microprocessor.
- To interface the peripherals with the 8051 microcontroller.
- To execute ALP concepts with processor and controller.
- To execute different Peripheral interfacing.

PREREQUISITE:

- Digital System Design

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C504.1	<i>Understand</i> the basic architecture of Microprocessor and Microcontroller.	K2
C504.2	<i>Explain</i> the interfacing of Microprocessor and Microcontroller to external devices.	K3
C504.3	<i>Develop</i> ALP's using various addressing modes of Microprocessor and Microcontroller.	K3
C504.4	<i>Design</i> to interface various peripherals with Microprocessor and Microcontroller.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C504.1	2	1	1	-	-	-	-	-	-	-	-	1	2	1
C504.2	3	2	1	-	-	-	-	-	-	-	-	1	2	1
C504.3	3	2	1	-	1	-	-	1	1	1	-	1	2	1
C504.4	3	2	1	-	1	-	-	1	1	1	-	1	2	1

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I 8086 MICROPROCESSOR**6**

Introduction to 8086 — Microprocessor architecture — Addressing modes — Instruction Set — Macros — Interrupts and interrupt service.

UNIT II 8086 SYSTEM BUS STRUCTURE**6**

8086 signals — Basic configurations — System bus timing — System design using 8086 — I/O programming — System Bus Structure — Multiprocessor configurations.

UNIT III I/O INTERFACING**6**

Memory Interfacing and I/O interfacing — Parallel communication interface (8255) — Serial communication interface (8251) — Keyboard /display controller (8279) — Interrupt controller (8259) — DMA controller (8257).

UNIT IV MICROCONTROLLER**6**

Architecture of 8051 — Special Function Registers (SFRs) — I/O Pins Ports and Circuits — Instruction Sets: Data Processing - Stack, Arithmetic, Logical; Branching – Unconditional and Conditional — Addressing Modes.

UNIT V INTERFACING MICROCONTROLLER**6**

Programming 8051 Timers — Serial Port Programming — Sensor with Signal Conditioning Interface - Stepper Motor and Waveform generation — Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

Total: 30 Periods**LEARNING RESOURCES:****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.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.

REFERENCES:

1. Douglas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012.
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

LIST OF EXPERIMENTS:

CYCLE 1

PROGRAMMING 8086 USING 8086 KITS AND MASM

1. Basic arithmetic and Logical operations.
2. Move a data block without overlap.
3. Code conversion, decimal arithmetic and Matrix operations.
4. Counters and Time Delay.
5. Traffic light control.
6. Stepper motor control.

CYCLE 2

PROGRAMMING 8051 USING 8051 KITS AND PROTEUS SOFTWARE

7. Digital clock.
8. Key board and Display.
9. Serial interface and Parallel interface.
10. A/D and D/A interface and Waveform Generation.
11. Basic arithmetic and Logical operations using 8051.
12. Square and Cube program, Find 2's complement of a number.

TOTAL:60 PERIODS



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Course code	21CS561PT	Semester		V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	DATA WAREHOUSING AND DATA MINING			3	0	0	3

COURSE OBJECTIVES:

- Learn the fundamentals of warehousing and mining.
- Obtain knowledge about technologies of mining.
- Determine the factors such as price, product positioning, or staff skills, and economic indicators, competition, and customer demographics.
- Learn Data mining is primarily used by the companies with a strong consumer focus.

PREREQUISITE:

- Basic knowledge about Data base Management System.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5601.1	<i>Understand</i> the fundamentals of Data warehousing and easy access to data and user friendly reporting environment.	K2
C5601.2	<i>Illustrate</i> and <i>explain</i> perform business analysis with OLAP tools and mining pre-processing, visualization techniques for data analysis	K3
C5601.3	<i>Apply</i> frequent pattern and association rule mining techniques for data analysis	K3
C5601.4	<i>Analyze</i> appropriate classification and clustering techniques for data analysis	K3
C5601.5	<i>Apply</i> appropriate concepts of various data mining Techniques	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5601.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C5601.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C5601.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C5601.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C5601.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1:Slight, 2: Moderate,3:Substantial

UNIT I INTRODUCTION TO DATA WAREHOUSE**9**

Basic Concepts -Data warehousing Components –Building a Data warehouse –Mapping the Data Warehouse to a Multiprocessor Architecture –Database Architectures for Parallel Processing – Parallel DBMS Vendors –Multidimensional Data Model DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT II ON-LINE ANALYTICAL PROCESSING (OLAP) AND INTRODUCTION TO DATA MINING**9**

Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP. Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Pre-processing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS**9**

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT IV CLASSIFICATION AND CLUSTERING**9**

Decision Tree Induction - Bayesian Classification – Rule Based Classification –Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis -Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL**9**

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–Rule learners.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP, TataMcGraw – Hill Edition, 35th Reprint 2016.
2. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCES:

1. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
3. G. K. Gupta, “ Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006



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Course code	21EC743PT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	DIGITAL IMAGE PROCESSING		3	0	0	3

COURSE OBJECTIVES:

- To understand the mathematical concept of image and theoretical concept of fundamental digital image processing techniques
- To analyze image enhancement, segmentation, restoration and compression techniques
- To develop algorithm for feature extraction and classification of image
- To understand the practical techniques for digital image analysis

PREREQUISITE:

- Digital signal processing

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C7403.1	<i>Explain</i> the digital image and its mathematical representation to transform a given image	K2
C7403.2	<i>Interpret</i> basic image processing algorithms for image segmentation and image enhancement	K2
C7403.3	<i>Apply</i> different algorithms for image classification and restoration techniques in noisy images	K3
C7403.4	<i>Apply</i> the performance of different image recognition and compression techniques	K3
C7403.5	<i>Implement</i> feature extraction and classification for given image	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C7403.1	3	1	1	-	-	-	-	-	-	-	-	1	3	3
C7403.2	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C7403.3	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C7403.4	3	3	1	-	-	-	-	-	-	-	-	1	2	2
C7403.5	3	2	1	-	-	-	-	-	-	-	-	1	2	2

Note:1:Slight,2: Moderate,3:Substantial

UNIT I DIGITAL IMAGE FUNDAMENTALS**9**

Digital image representation, Image I/O and display, Classes and image types, M-function programming, Color image representation, Basics of color image processing, conversion of gray to color.

UNIT II IMAGE TRANSFORMS**9**

2DDFT, DCT, Hadamard Transform, Wavelet transform, Fast wavelet transform, Computing and visualization of 2D DFT, Color transformation.

UNIT III IMAGE ENHANCEMENT**9**

Basic intensity transformations – Histogram equalization and specification techniques, Spatial Filtering, Frequency domain filtering, Homomorphic filtering.

UNIT IV IMAGE RESTORATION AND SEGMENTATION**9**

Wiener filtering constrained least squares restoration, Edge detection, Segmentation based on thresholding, region-based segmentation and watershed transform, Morphological Processing. Study of Line and Edge Detection Techniques.

UNIT V IMAGE COMPRESSION**9**

Compression fundamentals, Variable length Coding, Huffman, Arithmetic coding, Bit plane coding, Run Length encoding, Predictive coding, Transform coding, study of lossless compression techniques.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2011.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson Education, 2003.
3. Alberto S. Aguado and Mark S. Nixon, Feature extraction and image processing, Academic Press, Third Edition, 2012.
4. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing using MATLAB", 2nd Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Anerozdemi R, Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms, John Wiley & Sons.
2. Gonzalez and Woods, Digital Image Processing, Pearson, Third Edition, 2008.
3. Anil. K. Jain, Fundamentals of Digital Image Processing, PHI, Second Edition, 2004.
4. Milan Sonka et al, "Image Processing, Analysis and Machine Vision", 3rd Edition, Vikas Publishing House, 2007.



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Course code	21HC563PT	Semester	V				
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	SOFTWARE TESTING (Common to CSE & IT)			3	0	0	3

COURSE OBJECTIVES:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management and test automation techniques.
- To apply test metrics and measurements.

PREREQUISITE:

- Basic Knowledge in Software Engineering.
- Basic Knowledge in Programming Skills.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5603.1	<i>Design</i> test cases suitable for a software development for different domains.	K2
C5603.2	<i>Identify</i> suitable tests to be carried out.	K2
C5603.3	<i>Understand</i> test plans based on the document.	K2
C5603.4	<i>Apply</i> Document test plans and test cases designed.	K3
C5603.5	<i>Develop</i> and validate a test plan using automatic testing tool.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5603.1	3	2	1	-	-	-	-	-	-	-	-	-	3	3
C5603.2	3	2	2	-	-	-	-	-	-	-	-	-	2	2
C5603.3	3	1	1	-	-	-	-	-	-	-	-	-	2	2
C5603.4	3	2	2	-	-	-	-	-	-	-	-	-	2	2
C5603.5	3	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

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

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

LEARNING RESOURCES:

TEXT BOOKS:

1. Srinivasan Desikan and Gopaldaswamy Ramesh, —Software Testing – Principles and Practices, Pearson Education, 2017.
2. Ron Patton, —Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com

REFERENCES:

1. Naresh Chauhan, “Software Testing Principles and Practices”, Oxford University Press, New Delhi, 2010
2. Ilene Burnstein, —Practical Software Testing, Springer International Edition, 2003
3. Edward Kit, Software Testing in the Real World – Improving the Process, Pearson Education, 1995.
4. Boris Beizer, Software Testing Techniques – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
5. Aditya P. Mathur, —Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.



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Course code	21CS564PT	Semester	V				
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	WIRELESS ADHOC AND SENSOR NETWORKS			3	0	0	3

COURSE OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To equip the students with knowledge of 4G networks and its applications
- To teach the students about various MAC and Routing protocols of Ad hoc and WSN.
- To educate the students on introduction and application of 6lowpan.

PREREQUISITE:

- Basic knowledge of Networks

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5604.1	<i>Define</i> and <i>explain</i> the applications of adhoc network	K2
C5604.2	<i>Develop</i> the concept of adhoc and sensor networks	K3
C5604.3	<i>Apply</i> the design new MAC and Routing protocols for Adhoc and sensor network.	K3
C5604.4	<i>Understand</i> the concept and learn new operating systems used for WSN.	K2
C5604.5	<i>Analyse</i> the application of 6LoWPAN	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5604.1	3	2	-	-	-	-	-	-	-	-	-	-	2	2
C5604.2	3	3	2	-	-	-	-	-	-	-	-	-	3	3
C5604.3	3	3	2	-	-	-	-	-	-	-	-	-	3	3
C5604.4	3	2	-	-	-	-	-	-	-	-	-	-	3	3
C5604.5	3	3	2	-	-	-	-	-	-	-	-	-	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION AND APPLICATIONS 9

Introduction to Ad hoc Networks - Issues and challenges in ad hoc networks-Characteristic features, Need for Ubiquitous Computing network, Applications of Ad hoc ,Mobility Models : - Brownian Model, Column model, Random Walk Model, Random Waypoint model, Random Gauss Markov Model, Reference point Group Mobility Model.

UNIT II ROUTING PROTOCOLS 9

Need for Different routing Protocols, Proactive Vs Reactive Routing. Unicast: Dynamic Source Routing, Ad Hoc On-Demand Distance Vector Routing, Temporally Ordered Routing Algorithm, Signal Stability Based Routing, Location Aided Routing, Associativity Based Routing, Zone Routing Protocol. Multicast: Tree Based Algorithm: CAMP, Mesh based Algorithm: On-Demand Multicast Routing Protocol.

UNIT III OVERVIEW OF WIRELESS SENSOR NETWORKS 9

Challenges for Wireless Sensor Networks-Transport Layer and QoS in Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks-.Single- Node Architecture- Hardware Components, Energy Consumption of Sensor Nodes.

UNIT IV NETWORKING OF SENSORS 9

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts- S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols - Energy-Efficient Routing, Geographic Routing-IEEE802.15.4 MAC protocol-ZIGBEE.

UNIT V INTRODUCTION AND APPLICATION OF 6LoWPAN 9

Introduction - Architecture, Protocol stack - Link layers – Addressing - Header format – Bootstrapping-Mesh topologies - Internet integration, Functions of an Adaptation Layer, Routing -Mesh-Under - Route-Over –ROLL, Common Protocols –WSP, MQTTS, CAP, Operating system – Contiki - μ IPv6, case study - Industrial automation - Health care.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Wireless adhoc and sensor networks, Management, Performance, and Applications By Jing (Selina) He, Mr.ShoulingJi, YingshuLi,Yi Pan, Published September 16, 2019 by CRC Press
2. Kazem Sohraby,Daniel Minoli,& TaiebZnati,—Wireless Sensor Networks - Technology, Protocols, and Applications, JohnWiley,2015.

REFERENCES:

1. Charles E. Perkins—Adhoc Networking, Addison-Wesley, 2000
2. Tracy Camp, Jeff Boleng, Vanessa Davies, — A survey on Mobility Models for Ad hoc Network Research. Wireless Communications and Mobile Computing: Special Issue on Mobile Adhoc Networking: Research, Trends and Applications, 2002.
3. Hongmei Deng, Wei Li and Dharma P. Agrawal — Routing security in wireless ad hoc networks, IEEE Communication magazine, Oct. 2002.
4. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2005.
5. Feng Zhao & Leonidas J. Guibas,—Wireless Sensor Networks-An Information Processing Approach”, Elsevier, 2007.
6. Zach Shelby, Carsten Bormann, —6LoWPAN: The Wireless Embedded Internet, John Wiley & Sons, November 2009,



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Course code	21CS565PT	Semester	IV				
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	TOTAL QUALITY MANAGEMENT			3	0	0	3

COURSE OBJECTIVES:

- Understand the principles of total quality management.
- Choose appropriate statistical techniques for improving processes.
- Develop the organizational, competitive and economic potential of quality.
- Integrate biblical principles with the practice of total quality management

PREREQUISITE:

- Managerial Skills.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5605.1	<i>Identify</i> the quality gurus and their contributions, who have made a tremendous impact on the management and control of quality	K2
C5605.2	<i>Influence</i> of leadership, strategic planning and realize the importance of employee involvement.	K2
C5605.3	<i>Generate</i> innovative idea to apply statistical thinking to quality improvement and adopt in bench marking process.	K2
C5605.4	<i>Significance</i> of Taguchi's quality principles and development of Total Protective Maintenance.	K2
C5605.5	<i>Realize</i> the importance of implementing ISO standards in manufacturing and service sectors.	K3
C5605.6	<i>Understand</i> the various levels of quality measures and standards	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5605.1	3	3	2	-	-	-	-	-	-	-	2	1	-	-
C5605.2	3	3	2	-	-	-	-	-	-	-	2	1	-	-
C5605.3	3	3	2	-	-	-	-	-	-	-	2	1	-	-
C5605.4	3	3	2	-	-	-	-	-	-	-	2	1	-	-
C5605.5	3	3	2	-	-	-	-	-	-	-	1	1	-	-
C5605.6	3	3	2	-	-	-	-	-	-	-	1	1	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION**9**

Definition of quality – dimensions of quality. Quality planning – quality costs. Total Quality Management: historical review and principles – leadership – quality council – quality statements – strategic planning – Deming philosophy. Barriers to TQM implementation.

UNIT II PRINCIPLES & CUSTOMER MANAGEMENT ANALYSIS**9**

Customer satisfaction – Customer retention – Employee involvement – Performance appraisal – Continuous process improvement – Supplier partnership – Performance measures. Seven tools of quality. Statistical fundamentals – Control Charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools – Benchmarking.

UNIT III TQM QUALITY SYSTEM**9**

Quality function deployment (QFD) – Taguchi quality loss function – Total Productive Maintenance (TPM) – FMEA. Need for quality systems – ISO 9000:2000 – Elements of quality systems (such as ISO 9000:2000). Implementation of quality system – documentation – quality auditing – QS 9000-ISO 14000.

UNIT IV TQM PRODUCTIVE TOOLS**9**

Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.

UNIT V TQM SEVEN MANAGEMENT TOOLS**9**

The seven tools of quality, Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigmas', New seven Management tools.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Dale H. Besterfield, et al., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.
2. Mary B.Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt Ltd., 2006.



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Course code	21CS01OT	Semester	V				
Category	OPEN ELECTIVE COURSE (OEC)			L	T	P	C
Course Title	BIO PYTHON			3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Python as prelude for Bio python.
- To learn the control statements and file parsing methods in Python.
- To learn sequence handling using python.
- To learn how to use python for handling the biological databases.
- To get familiarized with some of the advanced options in Bio python.

PREREQUISITE:

- Programming knowledge in Python

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	<i>Define</i> and <i>Explain</i> the Python as prelude for Bio python.	K2
C001.2	<i>Identify</i> the control statements and file parsing methods in Python.	K3
C001.3	<i>Recognize</i> the sequence handling using python.	K2
C001.4	<i>Analyze</i> how to use python for handling the biological databases.	K3
C001.5	<i>Interpret</i> the advanced options in Bio python.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C001.1	3	2	3	-	-	-	-	-	-	-	-	2	3	-
C001.2	3	3	3	-	-	-	-	-	-	-	-	2	3	-
C001.3	3	3	3	-	-	-	-	-	-	-	-	2	3	-
C001.4	3	2	2	-	-	-	-	-	-	-	-	2	3	-
C001.5	3	3	3	-	-	-	-	-	-	-	-	2	3	-

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION TO PYTHON 9

Simple values, expressions, operators. Names, functions-User defined and Built in functions, modules. Collections: Sequences, mappings, streams, and expression features.

UNIT II CONTROL STATEMENTS, FILE PARSING 9

Conditional statements: loops, iterations, exception handlers. Extended examples - Extracting Information from an HTML File, Bioinformatics File Parser, Parsing Gen Bank Files, Translating RNA Sequences, Constructing a Table from a Text File.

UNIT III SEQUENCES AND BIOPYTHON 9

Introduction to Bio python, sequence objects, sequence record objects. Sequence input and output: parsing sequences, parsing sequences from the net, sequence files as dictionaries, writing sequence files. Multiple Sequence Alignment objects.

UNIT IV DATABASE SEARCH USING BIOPYTHON 9

BLAST using Bio python: running BLAST, parsing BLAST output, PSI-BLAST and RPS-BLAST. Accessing NCBI's Entrez databases. Swiss-Prot and ExPASy.

UNIT V ADVANCED MODULES IN BIOPYTHON 9

PDB module - Reading and writing crystal structure files, structure representation, Hetero residues, analyzing structure, common problem in PDB files, Accessing protein data bank phylogenetics, sequence motif analysis and cluster analysis.

Total: 45 Periods**LEARNING RESOURCES:****TEXT BOOKS:**

1. Jeff Chang, Brad Chapman, Iddo Friedberg, Thomas Hamelryck, Bio python Tutorial and Cookbook", 2013
2. Timothy A. Budd, — Exploring Python, Mc-Graw Hill Education (India) Private Ltd.,2015.

REFERENCES:

1. Mitchell L Model, "Bioinformatics Programming Using Python", O'Reilly media, Cambridge, 2010.
2. Tim.J.Stevan and Wayne Boucher " Python Programming for Biology" 2015.



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Course code	21CS02OT	Semester	V				
Category	OPEN ELECTIVE COURSE (OEC)			L	T	P	C
Course Title	CYBER SECURITY			3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of Security.
- To understand the need for Cyber Security and its related threats and attacks.
- Become knowledgeable about the best practices related to cyber security, regulations and laws associated with the same.
- To learn the difference between threat, risk, attack and vulnerability.

PREREQUISITE:

- Basic knowledge in Computer Networks.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C002.1	<i>Understand</i> the various tools and methods used in cybercrime.	K2
C002.2	<i>Identify</i> risk management processes, risk treatment methods, organization of information security.	K2
C002.3	<i>Classify</i> cyber security solutions and information assurance.	K2
C002.4	<i>Examine</i> software vulnerabilities and security solutions to reduce the risk of exploitation.	K2
C002.5	<i>Analyze</i> the cyber security needs of an organization.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C002.1	2	2	1	1	-	-	-	-	-	-	-	-	2	1
C002.2	2	2	1	1	-	-	-	-	-	-	-	-	3	1
C002.3	2	2	1	1	-	-	-	-	-	-	-	-	3	1
C002.4	2	2	1	1	-	-	-	-	-	-	-	-	2	1
C002.5	2	2	1	1	-	-	-	-	-	-	-	-	3	1

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION TO CYBER SECURITY 9

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Comprehensive Cyber Security Policy

UNIT II CYBERSPACE AND THE LAW & CYBER 9

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics.

UNIT III CYBER CRIME 9

Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT IV CYBER SECURITY 9

Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

UNIT V PRIVACY ISSUES 9

Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Total: 45 Periods

LEARNING RESOURCES:

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.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press T&F Group
3. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 2018.



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Course code	21CS03OT	Semester	V				
Category	OPEN ELECTIVE COURSE (OEC)			L	T	P	C
Course Title	JAVA PROGRAMMING			3	0	0	3

COURSE OBJECTIVES:

- To impart the core language features of Java and its Application Programming Interfaces
- To demonstrate the use of threads, exceptions, files and collection frame works in Java.
- To familiarize students with GUI based application development and database connectivity.

PREREQUISITE:

- Basic Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C003.1	<i>Interpret</i> Java programs using Object Oriented Programming principles	K2
C003.2	<i>Explain</i> Java programs with the concepts of inheritance and interfaces	K2
C003.3	<i>Contrast</i> Java applications using exceptions and I/O streams	K2
C003.4	<i>Relate</i> Java applications with threads and generics classes	K2
C003.5	<i>Apply</i> interactive Java programs using Swings & JDBC	K3
C003.6	<i>Understand</i> the concepts of JDB Connectivity	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C003.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C003.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C003.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C003.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C003.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C003.6	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

UNIT I INTRODUCTION TO OOPS AND JAVA FUNDAMENTALS 10

Object Oriented Programming— Abstraction – objects and classes - Encapsulation- Inheritance – Polymorphism- OOPS in Java – Characteristics of Java – The Java Environment – Java Source File Structure – Compilation. Basics of Java programming– Data Types, Variables, Operators, Control Flow,-Defining classes in Java–methods-constructors-access specifies– static members – Comments- Java Doc comments, Arrays – Strings-Use of Wrapper Class– Java API packages – Using system packages – Creating, accessing and using a package – Adding a class to a package.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- – Interfaces defining an interface, implementing interface, differences between classes and interfaces and extending interfaces–the Object class–abstract classes and methods-final methods and classes- Comparison between Abstract Class and interface -Object cloning - inner classes- Array Lists.

UNIT III EXCEPTION HANDLING AND I/O PROGRAMMING 8

Exceptions – Exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions. Input / Output Basics – Streams – Byte streams and Character streams– Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader, Output Stream Writer, File Reader, File Writer, Buffered Reader.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Introduction about Multithreading-Differences between multi-threading and multitasking- Java thread Model-thread life cycle, creating threads, synchronizing threads, Inter-thread communication - thread groups. Generic Programming – Generic classes – Generic methods – Bounded Types – Restrictions and Limitations-Lambda Expressions.

UNIT V EVENT DRIVEN PROGRAMMING AND DBMS CONNECTIVITY 10

Graphics programming -Frame–AWT Components- Introduction to Swing– Layout management – Swing Components –Text Fields, Text Areas – Buttons- Check Boxes – Radio Buttons – Lists-choices- Scrollbars – Windows –Menus – Dialog Boxes- J Applet –Event Handling Mechanisms -Event Classes – Event Listener-Data Base Connectivity: Basic structure of JDBC API-Database Management; Mechanism for connecting to a back-end database; Loading the ODBC driver.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Herbert Schildt,—Java The complete reference, 11th Edition, McGraw Hill Education, 2020.
2. Cay S. Horstmann, Gary Cornell,—Core Java Volume I Fundamentals, 11th Edition, Prentice Hall, 2020.

REFERENCES:

1. Paul Deitel, Harvey Deitel,—Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner,—Java 2 Black book, Dreamtech press, 2011.
3. Timothy Budd,—Understanding Object oriented programming with Java, Updated Edition, Pearson Education, 2000.



VEL TECH HIGH TECH

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Course code	21CS04OT	Semester	V				
Category	OPEN ELECTIVE COURSE (OEC)			L	T	P	C
Course Title	DATABASE SYSTEM DESIGN			3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the fundamentals of Database Management Systems.
- To make the students understand the relational model.
- To expose the students to SQL.
- To make the students to understand the fundamentals of Transaction Processing and Query Processing.
- To familiarize the students with the different types of databases.
- To make the students understand the Security Issues in Databases.

PREREQUISITE:

- Basic Databases for Applications.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C004.1	<i>Design</i> Databases for applications.	K2
C004.2	<i>Use</i> the Relational model, ER diagrams.	K2
C004.3	<i>Apply</i> concurrency control and recovery mechanisms for practical Problems.	K2
C004.4	<i>Design</i> the Query Processor and Transaction Processor.	K2
C004.5	<i>Apply</i> security concepts to databases.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C004.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C004.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C004.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C004.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C004.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3:Substantial

UNIT I INTRODUCTION TO DBMS & DATA BASE DESIGN 9

Database Design and its Importance: Database Development Life Cycle -Requirement Analysis- Database designing-Implementation-File Systems Organization - Sequential, Pointer, Indexed, Direct - Database System Terminologies-Database characteristics- Data models – Types of data models – Components of DBMS- Relational Algebra. Relational DBMS - Codd's Rule - Entity-Relationship model -Normalization – Functional Dependencies, Anomaly- 1NF to 5NF- Domain Key Normal Form – Demoralization.

UNIT II SQL & QUERY OPTIMIZATION 9

SQL Standards - Data types - Database Objects- DDL-DML-DCL-TCL-Embedded SQL-Static Vs Dynamic SQL - QUERY OPTIMIZATION: Query Processing and Optimization - Heuristics and Cost Estimates in Query Optimization.

UNIT III TRANSACTION PROCESSING AND CONCURRENCY CONTROL 9

Introduction-Properties of Transaction- Serializability- Concurrency Control – Locking Mechanisms- Two Phase Commit Protocol-Dead lock.

UNIT IV TRENDS IN DATABASE TECHNOLOGY 9

Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary storage – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing - Introduction to Distributed Databases- Client server technology- Multidimensional and Parallel databases- Spatial and multimedia databases- Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.

UNIT V DATABASE SECURITY 9

Data Classification-Threats and risks – Database access Control – Types of Privileges – Cryptography- Statistical Databases.- Distributed Databases-Architecture- Transaction Processing-Data Warehousing and Mining-Classification-Association rules- Clustering- Information Retrieval- Introduction to NoSQL & Mongo DB: Advantages, Architecture, Data Models MongoDB Data types and CRUD Operations.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education, 2008.

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2011.
2. C.J.Date, A.Kannan and S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
3. AtulKahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi, 2006.
4. Alexis Leon and Mathews Leon, “Database Management Systems”, Vikas Publishing House Private Limited, New Delhi, 2003.
5. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, Tata McGraw Hill, 2010.
6. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.
7. Rob Cornell, “Database Systems Design and Implementation”, Cengage Learning, 2011.



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Course code	21HC57P	Semester	V				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	NETWORKS LABORATORY (Common to CSE & IT)			0	0	4	2

COURSE OBJECTIVES:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

PREREQUISITE:

- Programming Knowledge of C and Java.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C507.1	<i>Implement</i> various protocols using TCP and UDP.	K3
C507.2	<i>Compare</i> the performance of different transport layer protocols	K3
C507.3	<i>Use</i> simulation tools to analyze the performance of various	K3
C507.4	<i>Analyze</i> various routing algorithms.	K3
C507.5	<i>Implement</i> error correction codes.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C507.1	3	3	1	-	-	-	-	-	-	-	-	-	3	2
C507.2	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C507.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C507.4	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C507.5	3	2	1	-	-	-	-	-	-	-	-	-	3	2

Note: - 1: Slight 2: Moderate 3: Substantial

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute.
2. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
3. Write a HTTP web client program to download a web page using TCP sockets.
4. Applications using TCP sockets like:
 - (i) Echo client and echo server
 - (ii) Chat
 - (iii) File Transfer
5. Simulation of DNS using UDP sockets.
6. Write a code simulating ARP /RARP protocols.
7. Traffic Analysis using Wireshark.
8. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
9. Study of TCP/UDP performance using Simulation tool.
10. Simulation of Distance Vector / Link State Routing algorithm.
11. Performance evaluation of Routing protocols using Simulation tool.
12. Simulation of error correction code (like CRC).
13. Simulation of RIP and OSPF using NS2/Qualnet/JSim/OmneT++.

Total: 60 Periods

LEARNING RESOURCES:**TEXT BOOKS:**

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.



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Course code	21EE03P	Semester	V					
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)				L	T	P	C
Course Title	TECHNICAL SEMINAR				0	0	2	1

COURSE OBJECTIVES:

- To inculcate the habit of critical thinking
- To emphasise the importance of reading and effective writing
- To expose meta-disciplinary research works
- To cultivate a scholarly habit

PREREQUISITE:

- Professional Communication Skill

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C003.1	<i>Define</i> a compelling and viable problem, question, or project by exploring the purpose and philosophy on topics in technology	K2
C003.2	<i>Learn</i> to infuse material from primary and secondary sources with their own ideas in research papers	K2
C003.3	<i>Understand</i> the stages of writing process which strengthens the technical and workplace writing tasks	K2
C003.4	<i>Demonstrate</i> an ability to synthesize and assess arguments in scholarly articles and monographs professionally	K3
C003.5	<i>Develop</i> Presentation and Communication skills.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C003.1	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C003.2	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C003.3	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C003.4	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C003.5	2	2	-	-	-	-	-	-	3	2	-	2	2	2

Note: 1: Slight; 2: Moderate; 3: Substantial

DOMAINS:

Students are advised to carry out the projects in the following domains, but not limited with

- Artificial Intelligence
- Machine Learning
- Data Science
- Internet of Things
- Zigbee Technology
- Cloud Computing
- Bluejacking
- Li-Fi Technology
- Quantum Information Technology
- Biometrics
- 5G Wireless System
- Swarm intelligence & traffic Safety
- Nano Robotics
- Ethical Hacking

Total: 15 Periods

ONLINE RESOURCES:

1. https://swayam.gov.in/nc_details/NPTEL
2. <https://www.sciencedirect.com/>
3. <https://www.kaggle.com/>
4. <https://aws.amazon.com/>
5. <https://www.cybrary.it/>
6. <https://ai.google/>
7. <http://carrerfoundry.com/>
8. <https://www.geeksforgeeks.org/>
9. <https://www.w3schools.com/>

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Engineering Stream Courses
PROFESSIONAL ELECTIVE I		
1	21CS551PT	Data Warehousing and Data Mining
2	21EC743PT	Digital Image Processing
3	21HC563PT	Software Testing
4	21CS554PT	Wireless Adhoc and Sensor Networks
5	21CS555PT	Total Quality Management
PROFESSIONAL ELECTIVE II		
6	21CS641PT	Social Network Analysis
7	21CS642PT	Microcontroller and Embedded Systems
8	21CS643PT	Machine Learning Techniques
9	21CS644PT	Gaming Technology
10	21CS645PT	Speech Processing
PROFESSIONAL ELECTIVE III		
11	21CS751PT	Soft Computing
12	21CS752PT	Database and Web Application
13	21CS753PT	Internet of Things
14	21CS754PT	Information Security
15	21CS755PT	Human Computer Interaction
PROFESSIONAL ELECTIVE IV		
16	21HC54T	Block Chain Technology
17	21CS812PT	Information Retrieval
18	21CS813PT	Edge Computing
19	21CS814PT	Natural Language Processing
20	21CS815PT	Agile Methodologies
PROFESSIONAL ELECTIVE V		
21	21CS821PT	Software Project Management
22	21CS822PT	Sensor Networks Applications of AI in Healthcare
23	21CS823PT	Multi Core Architecture
24	21CS824PT	Cyber Security and Forensics
25	21CS825PT	Computer Vision

LIST OF OPEN ELECTIVE COURSES

S. No	COURSE CODE	NAME OF THE COURSE
1	21CS01OT	Bio Python
2	21CS02OT	Cyber Security
3	21CS03OT	Java Programming
4	21CS04OT	Data Base System Design