

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



VEL TECH HIGH TECH

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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	-	-	-	-	-	-	-	-	-	-

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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.TECH-INFORMATION TECHNOLOGY

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	8	5	-	-	-	-	23
3	-	4	5	15	-	-	-	-	24
4	-	4	-	16	-	-	1	0	21
5	-	-	-	16	3	-	1	0	20
6	-	-	-	12	3	3	2	-	20
7	-	-	-	13	3	3	2	-	21
8	-	-	-	-	6	-	6	-	12
Total credits	6 (3.59%)	27 (16.16%)	23 (13.77%)	77 (46.38%)	15 (9.09%)	6 (3.63%)	12 (7.18%)	0 (0%)	166

B.Tech. – Information Technology 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	21IT25T	Information Technology Essentials	ESC	40	60	100	3	0	0	3
6	21IT26T	Programming in C	PCC	40	60	100	3	0	0	3
PRACTICAL										
7	21IT27P	Information Technology Essentials Laboratory	ESC	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	21IT33T	Computer Architecture	PCC	40	60	100	3	0	0	3
4	21IT34T	Data Structures using C	PCC	40	60	100	3	0	0	3
5	21IT35IT	Object Oriented Programming	PCC	40	60	100	2	0	4	4
6	21HE36T	Principles of Communication	ESC	40	60	100	3	0	0	3
PRACTICAL										
7	21IT37P	Data Structures using C Laboratory	PCC	40	60	100	0	0	4	2
8	21HE38P	Digital Logic Circuit Laboratory	ESC	40	60	100	0	0	4	2
TOTAL									24	

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	21HC34T	Database Management Systems	PCC	40	60	100	3	0	0	3
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	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC47P	Operating Systems Laboratory	PCC	40	60	100	0	0	4	2
8	21HC39P	Database Management Systems Laboratory	PCC	40	60	100	0	0	4	2
9	21EE01P	Mini Project – I	EEC	40	60	100	0	0	2	1
TOTAL									21	

SEMESTER V										
S.No.	Course code	Course title	Category	CIE Marks	SEE marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21IT51IT	Internet of Things	PCC	40	60	100	2	0	4	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	PCC	40	60	100	2	0	4	4
5	-	Professional Elective I	PEC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC57P	Networks Laboratory	PCC	40	60	100	0	0	4	2
8	21EE03P	Technical Seminar	EEC	100	-	100	0	0	2	1
TOTAL										20

SEMESTER VI										
S. No.	Course code	Course title	Category	CIE Marks	SEE marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21IT61T	Mobile Computing	PCC	40	60	100	3	0	0	3
2	21IT62T	Web Technology	PCC	40	60	100	3	0	0	3
3	21IT63T	Compiler Design	PCC	40	60	100	2	0	4	4
4	-	Professional Elective II	PEC	40	60	100	3	0	0	3
5	-	Open Elective I	OEC	40	60	100	3	0	0	3
PRACTICAL										
6	21IT66P	Web Technology Laboratory	PCC	40	60	100	0	0	4	2
7	21IT67P	Internship	EEC	100	-	100	0	0	0	1
8	21IT68P	Mini Project – II	EEC	40	60	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	21IT71T	Information Security	PCC	40	60	100	3	0	0	3
2	21IT72T	Cloud Computing	PCC	40	60	100	3	0	0	3
3	21IT73T	Artificial Intelligence	PCC	40	60	100	3	0	0	3
4	-	Professional Elective III	PEC	40	60	100	3	0	0	3
5	-	Open Elective II	OEC	40	60	100	3	0	0	3
PRACTICAL										
6	21IT76P	Mobile and Security Laboratory	PCC	40	60	100	0	0	4	2
7	21IT77P	Cloud Computing Laboratory	PCC	40	60	100	0	0	4	2
8	21IT78P	Project 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	21IT83P	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	21HC563PT	Software Testing
2	21IT552PT	E-Learning Techniques
3	21EC743PT	Digital Image Processing
4	21IT554PT	Computer Graphics
5	21IT555PT	Big Data Analytics
6	21IT556PT	Advances in Databases
Professional Elective II		
7	21IT641PT	Agile Methodologies
8	21IT642PT	Service Oriented Architecture
9	21IT643PT	Embedded Systems
10	21IT644PT	Multimedia Tools and Design
11	21IT645PT	Information Retrieval
12	21IT646PT	Deep Learning
Professional Elective III		
13	21IT741PT	Software Project Management
14	21IT742PT	C#. Net Programming
15	21IT743PT	Geographical Information Systems
16	21IT744PT	Game Programming
17	21IT745PT	Computational Linguistics
18	21IT746PT	Machine Learning Techniques
Professional Elective IV		
19	21IT811PT	Graph Theory and Applications
20	21IT812PT	Human Computer Interaction
21	21HC54T	Blockchain Technology
22	21IT814PT	Advanced Networks
23	21IT815PT	Cyber Forensics
24	21IT816PT	Total Quality Management
Professional Elective V		
25	21IT821PT	Quantum Computing
26	21IT822PT	Green Computing
27	21IT823PT	Infrastructure Management
28	21IT824PT	Cryptography and Network Security
29	21IT825PT	Start up Management
30	21IT826PT	Professional Ethics

LIST OF OPEN ELECTIVES

S. No	COURSE CODE	NAME OF THE COURSE
1	21IT01OT	Business Intelligence
2	21HC52T	Data Analytics
3	21IT03OT	Augmented Reality and Virtual Reality
4	21IT04OT	Cloud Computing



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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 EditionBooks Longman Publishing Group, 2011.
4. Richard Johnson-Sheehan, “Technical Communication Today”4th EditionBooks 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. Gopala swamy, 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

SYLLABUS**No. of Credits: 4****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)		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)			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

SYLLABUS**No. of Credits: 3****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 Thermolectric, 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”, Elseveir, First Indian Edition, 2006.



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Course code	21IT25T	Semester	II				
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	INFORMATION TECHNOLOGY ESSENTIALS			3	0	0	3

COURSE OBJECTIVES:

- To design and develop web pages using HTML and CSS.
- To understand the general concepts of PHP scripting language and MySQL functionalities.
- To provide a basic knowledge of computer hardware and software.
- To familiarize with the basic taxonomy and terminology of computer networking and mobile communications.
- To understand various types of information systems and their complexities.

PREREQUISITE:

- Basic Computer knowledge.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C205.1	<i>Design</i> simple websites that interlinking sets of web pages created using the HTML tags and CSS.	K3
C205.2	<i>Design</i> and deploy web-sites, simple web-applications	K3
C205.3	<i>Apply</i> the Concepts in error handling techniques of HTML, Java Script, PHP and MYSQL through programming experiments.	K3
C205.4	<i>Design</i> the Computer Model with Various Components and different types of servers.	K2
C205.5	<i>Understand</i> the basic concepts of data communications and networking.	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
C205.1	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C205.2	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C205.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C205.4	3	1	-	-	-	-	-	-	-	-	-	-	2	1
C205.5	2	1	-	-	-	-	-	-	-	-	-	-	2	1
C205	3	2	1	-	-	-	-	-	-	-	-	-	3	2

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

SYLLABUS**No. of Credits: 3****UNIT I FUNDAMENTALS OF IT, WEB AND SCRIPTING ESSENTIALS 9**

Data and Information, Acquisition of Data – Text – Image – Audio - Video, Internet Application. Introduction to HTML5 – HTML5 Tags – HTML5 Forms –Cascading Style Sheets (CSS3) Fundamentals– Need for Scripting Languages – Introduction to JavaScript.

UNIT II SERVER-SIDE ESSENTIALS 9

Introduction to PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling –Form Handling– PHP and HTML-Database Management – Introduction to MySQL – MySQL Commands – MySQL Database Creation – Connecting MySQL and PHP – Querying MySQL Database with PHP – Cookies, Session and Authentication.

UNIT III HARDWARE ESSENTIALS 9

Motherboard – Networking Cards – Graphics Card – Processors – Hard Drive – USB Port – Monitor Ports – Servers – Types of Servers – Web Server – Database Server –Virtual Server– Proxy Server- Data Centre and Cloud Servers – Server Management.

UNIT IV NETWORK ESSENTIALS 9

Data Transmission Fundamentals – Communication Medium –Fundamentals of Computer Networking – Types of Computer Networks – Network Topologies – Network Standards: OSI Model, TCP/IP Model – Network Components – Network Switching - Introduction to Mobile Communication – Generations of Cellular Networks –GSM

UNIT V APPLICATION ESSENTIALS 9

Creation of Simple Interactive Applications – Simple Database Applications – Introduction to Information Systems – Personal Information System – Information Retrieval System – Social Networking Applications.

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

1. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5: Fifth Edition, May 2018, Publisher-O'Reilly Media, Inc.
2. James Kurose and Keith Ross, “Computer Networking: A Top-Down Approach”, Seventh Edition, 2017.

REFERENCES:

1. Steven Holzner, “PHP: The Complete Reference”, Fifth Edition, McGraw Hill, 2017.
2. Niederst Robbins, Jennifer, “Learning Web Design: A Beginner's Guide to HTML, CSS, Javascript, and Web Graphics”, Fifth Edition, O'Reilly Media, 2018.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & JavaScript Web Publishing”, BPB Publications, 2016.
4. Douglas E. Comer, “Computer Networks and Internets”, Sixth Edition, Prentice Hall, 2015.
5. Jochen Schiller, “Mobile Communications”, Pearson Education, 2012.
6. R. Kelly Rainer, Casey G. Cegielski, Brad Prince, “Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014.



VEL TECH HIGH TECH

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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 Outcome	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	21IT27P	Semester		II			
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	INFORMATION TECHNOLOGY ESSENTIALS LABORATORY			0	0	4	2

COURSE OBJECTIVES:

- To learn Markup languages and style sheets for web design.
- To get familiarized with JavaScript and PHP Programming.
- To develop simple websites and applications.
- To incorporate multimedia elements in websites.

PREREQUISITE:

- Basic Computer knowledge.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C207. 1	<i>Design</i> web page using Markup languages and cascading style sheets	K3
C207. 2	<i>Validate</i> HTML forms developed using JavaScript.	K3
C207. 3	<i>Create</i> web-based applications using HTML, PHP, and MYSQL databases.	K3
C207. 4	<i>Identify</i> and solve the real-time issues by developing data centric applications.	K3
C207. 5	<i>Develop</i> responsive websites using the programming languages and techniques associated with the World Wide Web.	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
C207. 1	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-
C207. 2	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-
C207. 3	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-
C207. 4	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-
C207. 5	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-
C207	3	2	1	-	3	-	-	2	2	2	-	1	3	2	-	-

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

LIST OF EXPERIMENTS

1. Develop static web pages - using HTML and Authoring Tools.
2. Implement form validation using CSS and HTML5.
3. Include image/audio and video elements in the web pages.
4. Implement basic JavaScript programs
5. Create small PHP scripts to manipulate data using various operators and PHP functions and display the results.
6. Write two different PHP scripts to demonstrate passing variables to a URL.
7. Write two different PHP scripts to demonstrate passing variables with sessions and cookies.
8. Write PHP script to connect MySQL server from the website incorporating error handling using exceptions.
9. Create Website Registration Form using text box, check box, radio button, select, submit button, and display user inserted value in new PHP page.
10. Study of Technologies associated with mobile devices.
11. Develop a Personal information system.

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

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5: Fifth Edition, May 2018, Publisher-O'Reilly Media, Inc.
2. James Kurose and Keith Ross, "Computer Networking: A Top-Down Approach", Seventh Edition, 2017.

REFERENCES:

1. Steven Holzner, "PHP: The Complete Reference", Fifth Edition, McGraw Hill, 2017.
2. Niederst Robbins, Jennifer, "Learning Web Design: A Beginner's Guide to HTML, CSS, Javascript, and Web Graphics", Fifth Edition, O'Reilly Media, 2018.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, "Mastering HTML, CSS & JavaScript Web Publishing", BPB Publications, 2016.
4. Douglas E. Comer, "Computer Networks and Internets", Sixth Edition, Prentice Hall, 2015.
5. Jochen Schiller, "Mobile Communications", Pearson Education, 2012.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1	Computer System (with latest specifications)	30
2	Windows 98/XP/2000/Vista/Windows 7	1
3	phpMyAdmin	1
4	Eclipse	1



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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 Outcome	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. Reema Thareja, “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.TECH-INFORMATION TECHNOLOGY

R-2021: CBCS

Academic year 2021-2022

Onwards



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B.TECH. – INFORMATION TECHNOLOGY

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	21IT33T	Computer Architecture	PCC	40	60	100	3	0	0	3
4	21IT34T	Data Structures using C	PCC	40	60	100	3	0	0	3
5	21IT35IT	Object Oriented Programming	PCC	40	60	100	2	0	4	4
6	21HE36T	Principles of Communication	ESC	40	60	100	3	0	0	3
PRACTICAL										
7	21IT37P	Data Structures using C Laboratory	PCC	40	60	100	0	0	4	2
8	21HE38P	Digital Logic Circuit Laboratory	ESC	40	60	100	0	0	4	2
TOTAL										24

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 predictive 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
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	PSO-1	PSO-2
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	21IT33T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	COMPUTER ARCHITECTURE		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic units.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.
- To understand the memory hierarchies, cache memories, virtual memories and I/O devices.

PREREQUISITE:

- Basic knowledge of computer

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C303.1	<i>Summarize</i> the basic structure of computers, operations and instructions.	K2
C303.2	<i>Build</i> arithmetic and logic units.	K3
C303.3	<i>Infer</i> pipelined execution and design control unit.	K2
C303.4	<i>Explain</i> parallel processing architectures.	K2
C303.5	<i>Infer</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
C303.1	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C303.2	3	2	1	-	-	-	-	-	-	-	-	1	2	1
C303.3	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C303.4	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C303.5	2	1	-	-	-	-	-	-	-	-	-	1	2	1

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

SYLLABUS**No. of Credits: 3****UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM****9**

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**

Basic Number Systems - Addition and Subtraction – Carry Lookahead adders - Multiplication – Division – Floating Point Representation –Floating Point Operations – Subword Parallelism.

UNIT III PROCESSOR AND CONTROL UNIT**9**

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

UNIT IV PARALLELISM**9**

Instruction Level Parallelism - Parallel processing challenges – Flynn’s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – multicore processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

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 - RAID architecture.

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

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. 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	21IT34T	Semester	II			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DATA STRUCTURES USING C		3	0	0	3

COURSE OBJECTIVES:

- To Learn linear data structures like lists, stacks, and queues
- To Apply non- linear data structures like Tree and Graph structures
- To Understand sorting, searching and hashing algorithms

PREREQUISITE:

- Programming knowledge in C

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C304.1	<i>Implement</i> abstract data types for linear data structures	K3
C304.2	<i>Apply</i> linear data structures such as stacks and Queues in engineering applications	K3
C304.3	<i>Apply</i> non-linear data structures such as trees and heaps to problem solutions.	K3
C304.4	<i>Utilise</i> the graph structures in data structures	K3
C304.5	<i>Make use of</i> hashing techniques in data structures and various sorting 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
C304.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C304.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C304.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C304.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C304.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

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

SYLLABUS**No. of. Credits: 3****UNIT I LINEAR DATA STRUCTURES – LIST, ARRAY****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 - Binary Tree ADT – expression trees – binary search tree ADT –Threaded Binary Trees-AVL Trees – B-Tree - B+ Tree -Minimum Spanning Tree - Red black Tree- Tree Traversal- Application of Trees - 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 – Dijkstra’s algorithm, Prim's Algorithm– Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES**9**

Searching: Linear Search - Binary Search – Sorting: Bubble sort - Selection sort - Insertion sort – Quick sort - Merge sort - Heap sort - Shell sort – Radix 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,2017.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, -Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, -Data Structures and Algorithms", Pearson Education, 2002.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C++,Second Edition, University Press, 2008
4. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan,Cengage Learning.
5. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.



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Course code	21IT35IT	Semester	III				
Category	PROFESSIONAL CORE COURSE (PCC)			L	T	P	C
Course Title	OBJECT ORIENTED PROGRAMMING			2	0	4	4

COURSE OBJECTIVES:

- To introduce basic concepts and advanced features of Object-Oriented Programming.
- To know the principles of classes, inheritance and Interfaces.
- To develop a java application with collection and I/O Streams.
- To design and build simple applications using JDBC.

PREREQUISITE:

- Basic Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C305.1	<i>Apply</i> object-oriented principles in the software design process.	K3
C305.2	<i>Experiment with</i> various object-oriented features like inheritance and interface to solve various computing problems using Java language.	K3
C305.3	<i>Make use of</i> Exception handling along with in Java.	K3
C305.4	<i>Experiment with</i> generic programming to solve various computing problems using Java language.	K3
C305.5	<i>Make use of</i> multithreading along with I/O in Java.	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
C305.1	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C305.2	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C305.3	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C305.4	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C305.5	3	2	1	-	2	-	-	2	2	2	-	1	3	2

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

- UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 8**
Object oriented programming – Abstraction-Objects and Classes – Encapsulation – Inheritance – Polymorphism – OOP in Java – Characteristics of java – The Java Environment – Java Source File – Structure – Compilation. Fundamental Programming structures in Java- Defining classes in Java – Constructors, methods – Access Specifiers – Command Line Arguments - Static Members – Comments, data Types, variables, Operators, Control Flow, Arrays, Packages – JavaDoc Comments.
- UNIT II INHERITANCE 6**
Inheritance –Superclasses – Subclasses – Protected Members – Constructors in subclasses – The Object Class –Final and This Keyword- Abstract classes and Methods – Final Methods and Classes – Interfaces – Defining an interface – Implementing Interface, difference between Classes and Interfaces and extending Interfaces- Method Overriding.
- UNIT III EXCEPTION HANDLING 5**
Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – Built-in-Exceptions, Creating own exceptions, Stack Trace Elements.
- UNIT IV GENERIC PROGRAMMING 5**
Cosmic Class – Object Cloning – Inner Classes, Array Lists – Strings– Garbage Collection, Generic Programming – Generic Classes – Generic Methods – Bounded types – Restrictions and limitations.
- UNIT V I/O AND MULTITHREADING 6**
String Buffer-Input / Output Basics – Streams – Byte Streams and Character Streams –Wrapper Class- Reading and Writing Console – Reading and Writing Files, Differences between Multithreading and Multitasking, Thread Life Cycle, Creating Threads, Synchronizing Threads, Inter-thread Communication, daemon threads, thread Groups – MetaData & Prepared Statements.

Total: 30 Periods

List of Experiments:

1. Simple programs using Classes and objects, control Structures and Command Line arguments
2. Programs using Arrays
3. Programs using Inheritance & Interfaces
4. Programs using Packages & Abstract Classes
5. Programs using Array List
6. Programs to handle different type of Exceptions
7. Programs using Strings & String Buffer and I/O Streams
8. Programs using files and Collection
9. Programs using Multithreading.
10. Programs using Generic Functions.
11. Programs using Event-Driven programming paradigms.
12. Develop a Mini Project using java programming

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Herbert Schildt, Java the Complete Reference 11th Edition, McGraw hill Education,2019.
2. Cay S. Horstmann, Gary Comell,--Core java Volume-I Fundamentals, 9th edition, Prentice Hall, 2013.
3. Y. Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition, Pearson ltd 2015.

REFERENCES:

1. Paul Deitel, Harvey Deitel, —Java SE 8 for programmers, 3rdEdition, 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.
4. SCJP Sun Certified Programmer for Java 6 Study Guide. McGrawHill, 6th edition.

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	21HE36T	Semester	III				
Category	ENGINEERING SCIENCE COURSE (ESC)			L	T	P	C
Course Title	PRINCIPLES OF COMMUNICATION			3	0	0	3

COURSE OBJECTIVES:

- Understand analog and digital communication techniques.
- Learn pulse communication techniques.
- Be familiarized with source and Error control coding.
- Gain knowledge on multi-user radio communication.

PREREQUISITE:

- Digital logic design

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms Level
On successful completion of this Course, students will be able to		
C306.1	<i>Apply</i> analog and digital communication techniques.	K3
C306.2	<i>Explain</i> pulse communication techniques.	K2
C306.3	<i>Analyze</i> Source and Error control coding.	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
C306.1	3	2	2	-	-	-	-	1	-	-	-	-
C306.2	3	2	1	-	-	-	-	1	-	-	-	-
C306.3	3	2	1	-	-	-	-	1	-	-	-	-

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

SYLLABUS**No. of Credits: 3****UNIT I ANALOG COMMUNICATION****9**

Introduction to Communication Systems - Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems – Superheterodyne receiver .

UNIT II PULSE COMMUNICATION**9**

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

UNIT III DIGITAL COMMUNICATION**9**

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK –QPSK – Quadrature Amplitude Modulation (QAM) – Bandwidth Efficiency– Comparison of various Digital Communication System.

UNIT IV SOURCE AND ERROR CONTROL CODING**9**

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, Error Control Coding, linear block codes, cyclic codes.

UNIT V MULTI-USER RADIO COMMUNICATION**9**

Overview of Multiple Access Schemes - Global System for Mobile Communications (GSM) – Cellular Concept and Frequency Reuse - Bluetooth - Satellite Communication – Elements of Optical fibre communication system.

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

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2009.

REFERENCES:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2007.
5. Blake, “Electronic Communication Systems”, Thomson Delmar Publications, 2002.
6. Martin S.Roden, “Analog and Digital Communication System”, 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, “Digital Communication Fundamentals and Applications” 2nd Edition Pearson Education 2007.



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Course code	21IT37P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DATA STRUCTURES USING C LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To implement linear and non-linear data structures.
- To understand the different operations of search trees.
- To implement graph traversal algorithms.
- To get familiarized to sorting and searching algorithms.

PREREQUISITE:

- A Course on "Programming in C".

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C307. 1	<i>Experiment with</i> linear data structure operations	K3
C307. 2	<i>Utilize</i> trees operations for solving a given problem	K3
C307. 3	<i>Make use of</i> the graph structure algorithms for a given problem	K3
C307. 4	<i>Apply</i> searching and sorting algorithms for problem solving	K3
C307. 5	<i>Apply</i> appropriate hash functions that result in a collision free scenario for data storage and retrieval	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
C307. 1	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C307. 2	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C307. 3	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C307. 4	3	2	1	-	3	-	-	2	2	2	-	1	3	2
C307. 5	3	2	1	-	3	-	-	2	2	2	-	1	3	2

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

LIST OF EXPERIMENTS

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Binary Heap
9. Implementation of Graph Traversal algorithms
10. Write a C program to find the shortest path using Dijkstra's algorithm.
11. Implementation of searching and sorting algorithms
12. Hashing – any two collision techniques
13. Implementation of Tries.

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

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson Education, 2011.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, —Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, —Data Structures and Algorithms", Pearson Education, 1983.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C++, Second Edition, University Press, 2008
4. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
5. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

LIST OF EQUIPMENT REQUIRED

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	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 Nos
2.	Bread Boards	15 Nos
3.	PC with HDL Software	15 Nos
4.	Seven Segment Display	15 Nos
5.	ICs 7400/7402/7404/7486/7408/7432/7483/74150/74151/ 74147/7445/7476/7491/7494/7447/74180/7485/7473/ 7411/7474	Each 50 Nos

IV & V SEMESTER CURRICULUM AND SYLLABI

Applicable to the students admitted to

B. TECH-INFORMATION TECHNOLOGY

R-2021: CBCS

Academic year 2021-2022
onwards



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B.Tech. – Information Technology Curriculum (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	21HC34T	Database Management Systems	PCC	40	60	100	3	0	0	3
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	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC47P	Operating Systems Laboratory	PCC	40	60	100	0	0	4	2
8	21HC39P	Database Management Systems Laboratory	PCC	40	60	100	0	0	4	2
9	21EE01P	Mini Project-I	EEC	40	60	100	0	0	2	1
TOTAL										21



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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

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 RANDOM 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



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Course code	21HC34T	Semester	IV			
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	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

SYLLABUS**No. of Credits: 3****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 Approachll, Eighth Edition, Mc Graw-Hill International Edition, 2015.
2. Ian Sommerville, —Software Engineeringll, 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentll, 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	21MC02T	Semester	IV				
Category	MANDATORY COURSE (MC)			L	T	P	C
Course Title	ENVIRONMENTAL SCIENCES (Common for All Branches except Chemical)			2	0	0	0

COURSE OBJECTIVES:

- To study the nature, interrelationship between living organism and environment, biodiversity, natural resources, pollution control and waste management.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To appreciate the importance of environment by assessing its impact on the human world.

PREREQUISITE:

- Basic awareness on environment.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C002.1	<i>Illustrate</i> the interrelationship between living organism and environment.	K2
C002.2	<i>Relate</i> Public awareness, environmental pollution and its problem.	K2
C002.3	<i>Classify</i> the dynamic processes and the features of natural resources.	K2
C002.4	<i>Measure</i> the development and improvement in standard of living.	K2
C002.5	<i>Summarize</i> the knowledge about human health and welfare.	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
C002.1	1	-	-	-	-	-	1	-	-	-	-	-
C002.2	2	-	-	-	-	-	1	-	-	-	-	-
C002.3	1	-	-	-	-	-	1	-	-	-	-	-
C002.4	1	-	-	-	-	-	2	1	-	-	-	1
C002.5	1	-	-	-	-	-	1	1	-	-	-	1

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

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds, etc., Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards, accidents and holocaust – solid waste management: causes, effects and control measures of municipal solid wastes- E waste and Scrap tyres – Recycling of Plastic, Glass and Paper wastes- role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides- case studies. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

From unsustainable to sustainable development- Equitable use of resources for sustainable lifestyles – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of nongovernmental organization- environmental ethics: Issues and possible solutions – principles of green chemistry – climate change, global warming, acid rain, ozone layer depletion, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – environmental impact assessment- enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 7

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – women and child welfare – HIV/AIDS – SARS- Covid-19- role of information technology in environment and human health – Case studies.

LEARNING RESOURCES:

TEXT BOOKS:

1. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2014.
2. Anubha Kaushik, and Kaushik, C. P., Environmental Science and Engineering, New Age International Publishers, 6th Edition, 2019.

REFERENCES:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, 2nd Edition, University Grants Commission, Universities Press, 2013.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Pearson Education, 2004.
3. Tyler Miller, G., and Scott E. Spoolman, Environmental Science, Cengage Learning India Pvt, Ltd, Delhi, 2014.



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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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Course code	21HC39P	Semester	IV				
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



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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:

- Previous Semester Core Courses

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	<i>Evaluate</i> specific problem statements for ill-defined real-life problems with reasonable assumptions and constraints.	K5
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 / presentation	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	3	2	2	2	1	1	2	2	2	2	2	3	2
C001.2	3	3	2	2	2	1	1	2	2	2	2	2	3	2
C001.3	3	3	2	2	2	1	1	2	2	2	2	2	3	2
C001.4	3	3	2	2	2	1	1	2	2	2	2	2	3	2
C001.5	3	3	2	2	2	1	1	2	2	2	2	2	3	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

- Database management
- Web development
- Software development
- Mobile app development
- Python...
- Java....

Total: 30 Periods

ONLINE RESOURCES

1. https://swayam.gov.in/nc_details/NPTEL
2. <https://www.sciencedirect.com/>
3. <https://www.ncbi.nlm.nih.gov/>
4. <https://www.ncbi.nlm.nih.gov/pmc/>
5. <https://mtccindia.res.in/>
6. <https://www.atcc.org/>



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B.Tech. – Information Technology Curriculum (R2021)

SEMESTER V										
S. No.	Course code	Course title	Category	CIE Marks	SEE marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21IT51IT	Internet of Things	PCC	40	60	100	2	0	4	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	PCC	40	60	100	2	0	4	4
5	-	Professional Elective I	PEC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC57P	Networks Laboratory	PCC	40	60	100	0	0	4	2
8	21EE03P	Technical Seminar	EEC	100	-	100	0	0	2	1
TOTAL										20



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Course code	21IT51IT	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	INTERNET OF THINGS		2	0	4	4

COURSE OBJECTIVES:

- To understand Smart Objects and IoT Architectures
- To understand data analytics and cloud in the context of IoT
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To develop IoT infrastructure for popular applications.

PREREQUISITE:

- Basic Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C501.1	<i>Explain</i> the fundamental elements and concepts related to Internet of Things.	K2
C501.2	<i>Apply</i> data analytics and use cloud offerings related to IoT.	K3
C501.3	<i>Design</i> a PoC of an IoT system using Raspberry Pi/Arduino.	K3
C501.4	<i>Design</i> and Develop a Domain Specific Application which will address for domestic issues.	K3
C501.5	<i>Design</i> and Develop a Domain Specific Application which will address the contemporary issues,	K3
C501.6	<i>Develop</i> a portable IoT prototype using Arduino/Raspberry Pi /open platform to solve Real World 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
C501.1	2	1	-	-	2	-	-	2	2	2	-	1	2	1
C501.2	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C501.3	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C501.4	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C501.5	3	2	1	-	2	-	-	2	2	2	-	1	3	2
C501.6	3	2	1	1	2	1	1	2	2	2	1	1	3	2

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

UNIT I FUNDAMENTALS OF IoT**7**

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: one M2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II DATA ANALYTICS AND SUPPORTING SERVICES**7**

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT- System Management with NETCONF, YANG.

UNIT III DESIGN AND DEVELOPMENT**6**

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV DOMESTIC IOT APPLICATIONS**5**

Home Automation - Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Surveillance, Indoor Air Quality Monitoring, Structural Health Monitoring Environment - Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Health & Lifestyle, Wearable Electronics, Smart Payments, Smart Vending Machines.

UNIT V INDUSTRY IOT APPLICATIONS**5**

Forest Fire Detection, River Floods Detection, Energy- Smart Grids, Renewable Energy Systems, Prognostics, Retail- Inventory Management, Logistics- Route Generation & Scheduling, Shipment Monitoring, Remote Vehicle Diagnostics, Cities- Smart Parking Agriculture- Smart Irrigation, Green House Control, Industry- Machine Diagnosis & Prognosis.

Total: 30 Periods

LIST OF EXPERIMENTS

1. Develop simple application for Water Level monitoring system with Peripheral devices
2. Develop simple application for Home Automation.
3. Develop simple application for Weather Forecasting System (Via Internet).
4. Develop simple application for Workplace Monitoring System.
5. Develop simple application for Forest Fire Detection
6. Develop simple application for Logistics- Route Generation & Scheduling
7. Develop simple application for Smart Parking
8. Develop simple application for Agriculture- Smart Irrigation
9. Develop simple application for Industry- Machine Diagnosis & Prognosis.
10. Develop simple application for Air quality.
11. Develop simple application for Health care monitoring. monitoring system
12. Deploy IOT applications using platforms such as Bluemix.

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

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press (India), Hyderabad, 2014.

REFERENCES:

1. Jonathan Follett, Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies, O'Reilly, 2014.
2. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
4. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
<https://www.arduino.cc/>
https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet



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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	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	21IT552PT	Semester		V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	E-LEARNING TECHNIQUES			3	0	0	3

COURSE OBJECTIVES:

- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions.

PREREQUISITE:

- Programming Knowledge

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5502.1	<i>Compare</i> the phases of activities in models of E-learning.	K2
C5502.2	<i>Identify</i> appropriate instructional methods and delivery strategies.	K2
C5502.3	<i>Choose</i> appropriate E-learning Authoring tools.	K2
C5502.4	<i>Create</i> interactive E-learning courseware.	K2
C5502.5	<i>Evaluate</i> the E-learning courseware.	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
C5502.1	2	1	-	-	-	-	-	-	-	-	-	1	2	1
C5502.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5502.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5502.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5502.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

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

UNIT I INTRODUCTION 9

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – Synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win.

UNIT II DESIGNING E-LEARNING COURSE CONTENT 9

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III CREATING INTERACTIVE CONTENT 9

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests – Adding Additional Resources– Courseware Development – Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

UNIT IV LEARNING PLATFORMS 9

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V COURSE DELIVERY AND EVALUATION 9

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Clark, R. C., Mayer, R. E., “E-Learning and the Science of Instruction”. Third Edition, 2011.

REFERENCES:

1. Crews, T. B., Sheth, S. N., Horne, T. M., “Understanding the Learning Personalities of Successful Online Students”, Educause Review, 2014.
2. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O’ReillyMedia, 2017.
3. Madhuri Dubey, “Effective E-learning Design, Development and Delivery”, University Press, 2011.



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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

SYLLABUS**No. of Credits: 3****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 Sonkaetal, "Image Processing, Analysis and Machine Vision", 3rd Edition, Vikas Publishing House, 2007.



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Course code	21IT554PT	Semester	V				
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	COMPUTER GRAPHICS			3	0	0	3

COURSE OBJECTIVES:

- To know the mathematical basis of computer graphics.
- To train the students to acquire knowledge in Computer Graphics modeling, animation, and rendering.
- To create graphical applications.
- To acquire knowledge about tools and technologies related to graphics.
- To create visually realistic animations.

PREREQUISITE:

- Knowledge of vectors, matrices and transformations is preferable.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5504.1	<i>Make Use of</i> OpenGL to create visual objects using lines and apply clipping algorithms.	K3
C5504.2	<i>Apply</i> transformations and create three dimensional solid objects.	K3
C5504.3	<i>Apply</i> shadows and lighting effects on modelled objects.	K3
C5504.4	<i>Demonstrate</i> curves and curved objects.	K3
C5504.5	<i>Design</i> and develop simple and realistic animations.	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
C5504.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5504.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5504.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5504.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5504.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

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

UNIT I INTRODUCTION TO COMPUTER GRAPHICS**9**

Graphics Display Devices – Graphics Input Primitives and Devices – OpenGL Basic Graphic Primitives – Line Drawing Algorithms DDA and Bresenham – Windows and Viewports – Clipping Algorithms for Lines, Regular Polygons, Circles and Arcs – Parametric Form for a Curve – Visibility Algorithms – Review of Vectors – Representations of Key Geometric Objects – Lines and Planes.

UNIT II MODELING AND TRANSFORMATIONS OF OBJECTS**9**

Introduction to Transformations – Two Dimensional Transformations – 3D Affine Transformations – Homogeneous Coordinates – Matrix Representation – Drawing 3D Scenes Interactively – Introduction to Solid Modeling with Polygonal Meshes – Mesh Approximations to Smooth Objects – Particle Systems and Physically Based Systems.

UNIT III VIEWING AND VISUAL REALISM**9**

Three-Dimensional Viewing – Illumination Models-Depth Cueing – Perspective Projections of 3D Objects – Introduction to Shading Models – Flat Shading and Smooth Shading – Adding Texture to Faces – Morphing – To Add Shadows of Objects – OPENGL Shading Language – Manipulating Pixmaps – Manipulating Symbolically Defined Regions – Aliasing and Anti Aliasing Techniques – Creating More Shades and Colours.

UNIT IV SURFACE DESIGN**11**

Describing Curves using Polynomials – Bezier Curves – Blending Functions – The B-Spline Basis Functions – Modeling Curved Surfaces – Rational Splines and NURBS – Interpolation – Modeling Curved Surfaces – Color Theory – Overview of the Ray Tracing Process – Intersecting Rays with other Primitives – Adding Shadows for Greater Realism – Reflections and Transparency – Boolean Operations on Objects – Ray Casting - Hidden Surface Removal: Back face detection - Z-buffer method - Painter's algorithm - scan-line algorithm.

UNIT V ANIMATIONS**7**

Design of Animation Sequence – Animation Function – Raster Animation – Key Frame Systems – Motion Specification – Morphing – Tweening – Types of Animation – Fractals.

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

1. F. S. Hill, Jr., Stephen M. Kelley, Jr., “Computer graphics using OpenGL”, Pearson Prentice Hall, Third Edition, 2007.
2. Donald D. Hearn, M. Pauline Baker, W. Carithers., “Computer Graphics with Open GL”, Fourth Edition, Pearson Education, 2010.

REFERENCES:

1. Tay Vaughan., “Multimedia: Making it Work”, Ninth Edition, McGraw-Hill Education, 2014.
2. Alan Watt, “3D Computer Graphics”, Third Edition, Pearson Addison Wesley, 2000.
3. Ralf Steinmetz, Klara Nahrstedt, “Multimedia Systems”, Springer, 2004.
4. Mark S. Drew, Zee Nian Li, “Fundamentals of multimedia”, Prentice Hall, 2006.



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Course code	21IT555PT	Semester	V				
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	BIG DATA ANALYTICS			3	0	0	3

COURSE OBJECTIVES:

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

PREREQUISITE:

- Basic knowledge of algorithms and Database management Systems.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5505.1	<i>Experiment with</i> big data tools and its analysis techniques.	K3
C5505.2	<i>Analyze</i> data by utilizing clustering and classification algorithms.	K3
C5505.3	<i>Apply</i> different mining algorithms and recommendation systems for large volumes of data.	K3
C5505.4	<i>Apply</i> analytics on data streams.	K3
C5505.5	<i>Utilize</i> NoSQL databases and management.	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
C5505.1	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C5505.2	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C5505.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C5505.4	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C5505.5	3	2	1	-	-	-	-	-	-	-	-	-	3	2

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

UNIT I INTRODUCTION TO BIG DATA**9**

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

UNIT II CLUSTERING AND CLASSIFICATION**9**

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

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM**9**

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

UNIT IV STREAM MEMORY**9**

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

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATIO 9

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

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.

REFERENCES:

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



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Course code	21IT556PT	Semester		V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)			L	T	P	C
Course Title	ADVANCES IN DATABASES			3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data modeling and design in advanced databases.
- To study the working principles of distributed databases.
- To have an introductory knowledge about the query processing in object-based databases and its usage.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To learn emerging databases such as XML, Data warehouse and NoSQL.

PREREQUISITE:

- Database management Systems

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5506.1	<i>Design</i> a distributed database system and execute distributed queries.	K3
C5506.2	<i>Make Use of</i> NoSQL database systems and manipulate the data associated with it.	K3
C5506.3	<i>Experiment with</i> spatial, temporal and mobile databases.	K3
C5506.4	<i>Design</i> a data warehouse system and apply OLAP operations.	K3
C5506.5	<i>Design</i> XML database systems and validating with XML schema.	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
C5506.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5506.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5506.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5506.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C5506.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

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

SYLLABUS**No. of Credits:3****UNIT I DISTRIBUTED DATABASES****9**

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

UNIT II NOSQL DATABASES**9**

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, Deployment – Using MongoDB with PHP / JAVA – Advanced MongoDB Features – Cassandra: Data Model, KeySpace, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features.

UNIT III ADVANCED DATABASE SYSTEMS**9**

Spatial Databases: Spatial Data Types, Spatial Relationships, Spatial Data Structures, Spatial Access Methods – Temporal Databases: Overview – Active Databases – Deductive Databases – Recursive Queries in SQL – Mobile Databases: Location and Handoff Management, Mobile Transaction Models, Concurrency – Transaction Commit Protocols – Multimedia Databases.

UNIT IV XML AND DATAWAREHOUSE**9**

XML Database: XML – XML Schema – XML DOM and SAX Parsers – XSL – XSLT – XPath and XQuery – Data Warehouse: Introduction – Multidimensional Data Modeling – Star and Snowflake Schema – Architecture – OLAP Operations and Queries.

UNIT V INFORMATION RETRIEVAL AND WEB SEARCH**9**

IR concepts – Retrieval Models – Queries in IR system – Text Pre-processing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

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

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education/Addison Wesley, 2017.

REFERENCES:

1. C. J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Jiawei Han, MichelineKamber , Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2012.
3. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing,2014.
4. ShashankTiwari, “Professional NoSQL”, O’Reilly Media, 2011.
5. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.



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An Autonomous Institution

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Course code	21MC01T	Semester	V				
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****UNIT I INTRODUCTION TO INDIAN CONSTITUTION****6**

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**

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**

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**

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**

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	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	Implement various protocols using TCP and UDP.	K3
C507.2	Compare the performance of different transport layer protocols	K3
C507.3	Use simulation tools to analyze the performance of various	K3
C507.4	Analyze various routing algorithms.	K3
C507.5	Implement 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
C003.6	<i>Define</i> a compelling and viable problem, question, or project by exploring the purpose and philosophy on topics in technology	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	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
C003.6	2	2	-	-	-	-	-	-	3	2	-	2	2	2

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

DOMAINS**No. of Credits:3**

Students are advised to carry out a technical presentation in the following domains, but not limited with

- Artificial Intelligence
- Machine Learning
- Big Data
- Blockchain Technology
- Cloud Computing
- Cyber Security
- Data Science
- Programming Languages
- Emerging recent trends

Total: 30 Periods**ONLINE RESOURCES:**

1. <https://www.sciencedirect.com/>
2. <https://www.ncbi.nlm.nih.gov/>
3. <https://www.ncbi.nlm.nih.gov/pmc/>
4. <https://mtccindia.res.in/>
5. <https://www.atcc.org/>



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List of Professional Elective Courses

S. No.	Course Code	Engineering Stream Courses
Professional Elective I		
1	21HC563PT	Software Testing
2	21IT552PT	E-Learning Techniques
3	21EC743PT	Digital Image Processing
4	21IT554PT	Computer Graphics
5	21IT555PT	Big Data Analytics
6	21IT556PT	Advances in Databases
Professional Elective II		
7	21IT641PT	Agile Methodologies
8	21IT642PT	Service Oriented Architecture
9	21IT643PT	Embedded Systems
10	21IT644PT	Multimedia Tools and Design
11	21IT645PT	Information Retrieval
12	21IT646PT	Deep Learning
Professional Elective III		
13	21IT741PT	Software Project Management
14	21IT742PT	C#. Net Programming
15	21IT743PT	Geographical Information Systems
16	21IT744PT	Game Programming
17	21IT745PT	Computational Linguistics
18	21IT746PT	Machine Learning Techniques
Professional Elective IV		
19	21IT811PT	Graph Theory and Applications
20	21IT812PT	Human Computer Interaction
21	21HC54T	Blockchain Technology
22	21IT814PT	Advanced Networks
23	21IT815PT	Cyber Forensics
24	21IT816PT	Total Quality Management
Professional Elective V		
25	21IT821PT	Quantum Computing
26	21IT822PT	Green Computing
27	21IT823PT	Infrastructure Management
28	21IT824PT	Cryptography and Network Security
29	21IT825PT	Start up Management
30	21IT826PT	Professional Ethics



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LIST OF OPEN ELECTIVES

S. No	COURSE CODE	NAME OF THE COURSE
1	21IT01OT	Business Intelligence
2	21HC52T	Data Analytics
3	21IT03OT	Augmented Reality and Virtual Reality
4	21IT04OT	Cloud Computing