HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Coimbatore – 641 032

B.TECH. INFORMATION TECHNOLOGY

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

Curriculum & Syllabus

2017-2018

CHOICE BASED CREDIT SYSTEM

VISION AND MISSION OF THE INSTITUTION

VISION

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

MISSION

IM1: To provide academic excellence in technical education through novel teaching methods.

IM2: To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.

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IT - HiCET

HINDUSTHAN ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
HiCET

VISION AND MISSION OF THE DEPARTMENT

VISION

To develop IT Professionals of the best caliber with entrepreneurship zeal

MISSION

To achieve the vision of the department with sustained efforts to,

DM1: To establish a best learning environment that helps the students to face the challenges of information technology field.

DM2: To enable students develop skills to solve technical problems and also endorse collaborative and multidisciplinary activities through curricular, co-curricular and extra-curricular activities.

DM3: To increase the visibility of academic programs at all level and fascinate talent to meet entrepreneurship skills.

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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

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

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

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

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

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

PO9: **Individual And Team Work**: Function effectively as an individual, and as amember or leader in diverse teams, and in multidisciplinary settings.

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

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

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

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PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO 1: Able to Design and develop software solutions by employing appropriate problem solving strategies, including Logically thinking, Create a user interface, Write code to connect a front end user interface with a backend database using a contemporary object-oriented language.

PSO 2: Ability to design and develop mobile applications and Web based Applications with testing skills, which consequently leads to employability and entrepreneurship skills.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Graduates of the program will be proficient in identifying, formulating and solving complex problems by applying their knowledge of mathematics, science and Information Technology principles.

PEO 2 Graduates of the program will be capable of analyzing, designing, implementing and managing software projects through continuous learning and use modern tools to meet real-world constraints.

PEO 3 Graduates of the program exhibits professionalism with ethical attitude, communication, team work and will contribute to society needs.

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CURRICULUM

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.TECH. INFORMATION TECHNOLOGY (UG)

REGULATION-2016

For the students admitted during the academic year 2017-2018 and onwards

SEMESTER I

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA1101	Engineering Mathematics-I	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers -I	3	1	0	4	25	75	100
5	16GE1103	Problem Solving and Python Programming	3	0	0	3	25	75	100
6	16EC1202	Basics of Electronics Engineering	3	1	0	4	25	75	100
PRACTICAL									
7	16PS1001	Physical Sciences Laboratory – I	0	0	2	1	50	50	100
8	16GE1004	Problem Solving and Python Programming Laboratory	0	0	4	2	50	50	100
9	16GE1002	Engineering Practices Laboratory	0	0	4	2	50	50	100
10	16GE1003	Value Added Course: Language Competency Enhancement Course-I	0	0	2	1	0	100	100
		Total Credits:	**18**	**3**	**12**	**27**	**300**	**700**	**1000**

SEMESTER -II

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA2102	Engineering Mathematics-II	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	3	0	0	3	25	75	100
3	16CY2102	Environmental Sciences	3	0	0	3	25	75	100
4	16HE2102R	Essential English for Engineers – II	3	1	0	4	50	50	100
5	16GE2102	Engineering Graphics	2	0	4	4	50	50	100
6	16IT2202	Programming in C and C++	3	0	0	3	25	75	100
PRACTICAL									
7	16PS2001	Physical Sciences Laboratory – II	0	0	2	1	50	50	100
8	16IT2002	Programming in C and C++ Laboratory	0	0	4	2	50	50	100

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9	16GE2001	Value Added Course: II Language Competency Enhancement Course-II	0	0	2	1	0	100	100
		Total Credits:	**17**	**2**	**12**	**25**	**300**	**600**	**900**

For the students admitted during the academic year 2016-2017 and onwards

SEMESTER III

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
		THEORY							
1	16MA3105	Discrete Mathematics and Graph Theory	3	1	0	4	25	75	100
2	16IT3201	Digital Principles and System Design	3	0	2	4	50	50	100
3	16IT3202	Data Structures	3	0	0	3	25	75	100
4	16IT3203	Database Management Systems	3	0	0	3	25	75	100
5	16IT3204	Operating System	3	0	0	3	25	75	100
		PRACTICAL							
6	16IT3001	Data Structures Laboratory	0	0	4	2	50	50	100
7	16IT3002	Operating Systems Laboratory	0	0	4	2	50	50	100
8	16IT3003	Database Management Systems Laboratory	0	0	4	2	50	50	100
		Total Credits:	**15**	**1**	**14**	**23**	**300**	**500**	**800**

SEMESTER IV

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
		THEORY							
1	16MA4108	Probability And Queuing Theory	3	1	0	4	25	75	100
2	16IT4201	Java Programming	3	0	0	3	25	75	100
3	16IT4202	Design and Analysis of Algorithm	3	0	0	3	25	75	100
4	16IT4203	Software Analysis and Design	3	0	0	3	25	75	100
5	16IT4204	Computer Architecture	3	0	0	3	25	75	100
6	16IT4205	Information Theory and Coding Techniques	3	0	0	3	25	75	100
		PRACTICAL							
7	16IT4001	Java Programming Laboratory	0	0	4	2	50	50	100
8	16IT4002	Algorithms Lab	0	0	4	2	50	50	100
9	16IT4003	Case Tools Lab	0	0	4	2	50	50	100
		Total Credits:	**18**	**1**	**12**	**25**	**300**	**600**	**900**

CREDIT DISTRIBUTION – R2016

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	23	25	21	26	24	16	187

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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA1101	ENGINEERING MATHEMATICS – I (MATRICES AND CALCULUS) (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
2. Find curvature, evolutes and envelopes using the concept of differentiation.
3. Solve ordinary differential equations of certain types using Wronskian technique.
4. Familiarize the functions of several variables which are needed in many branches of engineering.
5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
I	**MATRICES** Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley - Hamilton Theorem (excluding proof) – Orthogonal matrices – Diagonalization of matrices by orthogonal transformation–Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**DIFFERENTIAL CALCULUS** Curvature in cartesian co-ordinates – Radius and Centre of curvature - Circle of curvature – Involutes and Evolutes (parabola, ellipse, cycloid, asteroid) – Envelopes - single parameter and two parameter family of curves.	12
III	**ORDINARY DIFFERENTIAL EQUATIONS** Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n, sin ax or cos ax , e^{ax} f(x) and xf(x) where f(x) is sin bx or cos bx – Method of variation of parameters – Linear differential equations with variable coefficients(Euler's equation)	12
IV	**FUNCTIONS OF SEVERAL VARIABLES** Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables- Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers – Jacobians.	12
V	**MULTIPLE INTEGRALS** Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by the plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids using Cartesian co-ordinates.	12
	Total Instructional Hours	**60**

CourseOutcome

CO1: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes
CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve
CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems
CO4: Identify the maximum and minimum values of surfaces.
CO5: Computation of area of a region in simpler way by changing the order of integration andevaluation of triple integrals to compute volume of three dimensional solid structures

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–I", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearsonpublishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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Programme B.TECH.	Course Code	Name of the Course	L	T	P	C
	16PH1101	ENGINEERING PHYSICS	3	0	0	3

Course Objective

1. Illustrate the fundamental knowledge in mechanical properties of matter and thermal physics.
2. Gain knowledge about laser and their applications.
3. Conversant with principles of optical fiber, types and applications of optical fiber.
4. Discuss the architectural acoustics and applications of Ultrasonics.
5. Extend dual nature of matter and the Necessity of quantum mechanics to explore the behavior of subatomic particles.

Unit	Description	Instructional Hours
I	**PROPERTIES OF MATTER AND THERMAL PHYSICS** Elasticity – Hooke's law – Stress-strain diagram - Relation between three moduli of elasticity (qualitative) — Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of thematerial of the beam by Uniform bending – I-shaped girder. Modes of heat transfer – Thermal conductivity – Newton's law of cooling - Lee's disc method - Conduction through compound media (series and parallel).	9
II	**LASER AND APPLICATIONS** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Types of lasers – Nd:YAG laser, CO2 laser, Semiconductor lasers:(homojunction and heterojunction) – Laser Applications – Industrial applications: laser welding, lasercutting, laser drilling – Holography – Construction and reconstruction of images.	9
III	**FIBER OPTICS AND APPLICATIONS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication link –Fiber optic sensors – Temperature and displacement sensors.	9
IV	**ACOUSTICS AND ULTRASONICS** Classification of sound – Weber–Fechner law – Sabine's formula (no derivation) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies. Ultrasonic Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Nondestructive testing – Ultrasonic pulse echo system.	9
V	**QUANTUM PHYSICS AND APPLICATIONS** Black body radiation – Planck's theory (derivation) –Compton effect experimental verification only - Matter waves – Physical significance of wave function – Schroedinger's wave equations – Time independent and time dependent wave equations –Particle in a box (One dimensional) – Scanning electron microscope – Transmission electron microscope.	9
	Total Instructional Hours	**45**

CourseOutcome

CO1: Enhance the fundamental knowledge in Properties of Matter and Thermal Physics.
CO2: Understand the advanced technology of LASER in the field of Engineering and medicine.
CO3: Exposed the fundamental knowledge of Optical fiber in the field of communication Engineering.CO4: Understand the production of ultrasonic and its applications in NDT.
CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi,2013.

REFERENCE BOOKS:

R1 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd.,NewDelhi2014
R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16CY1101	ENGINEERING CHEMISTRY	3	0	0	3

Course Objective

1. The student should be conversant with boiler feed water requirements, related problems and water treatment techniques.
2. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites
3. The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
4. To acquaint the student with important concepts of spectroscopy and its applications.
5. To acquaint the students with the basics of nano materials, their properties and applications

Unit	Description	Instructional Hours
I	**WATER TECHNOLOGY** Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9
II	**POLYMER & COMPOSITES** Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9
III	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell applications.	9
IV	**ANALYTICAL TECHNIQUES** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.	9
V	**NANOMATERIALS** Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9
	Total Instructional Hours	**45**

Course Outcome

1. Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries.
2. Knowledge on basic properties and application of various polymers and composites as an engineering material.
3. Summarize the various energy sources and energy storage devices
4. Analyze various analytical skills in handling various machines, instruments, apart fromunderstanding the mechanism involved.
5. Describe the basic properties and application of nanomaterials.

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TEXT BOOKS

T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2015).T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).
R3 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2010).

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I	3	1	0	4

Course Objective

- ✓ It fulfills the necessary skills needed in today's global workplaces.
- ✓ Student will be able to interpret and illustrate formal communication.
- ✓ It empowers students in choosing right lexical techniques for effective presentation
- ✓ It equips the learner to analyze and list out things in logical order
- ✓ The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction-**General Vocabulary**.	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple, Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions- Synonyms – Antonyms- Recommendations-**Interpretation of a chart**.	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice-Talking about facilities(Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)-**Discussion on current affairs**– Tenses- Present – Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement(checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive- Talking about quality control Conditional 1 (real) (Making suggestions) – Itinery- Jumbled sentences-Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation-Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)-Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
	Total Instructional Hours	**60**

CourseOutcome

CO1 - Recognize different parts of speech for better usage.
CO2 - Interpret and illustrate formal communication
CO3 - Choosing right lexical techniques for effective presentation.
CO4 - Analyze and list out things in logical order.
CO5 - Create and integrate ideas in a professional way.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate –2nd Edition. 2014.

T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learningpress 2013.

REFERENCE BOOKS :

R1 - Meenakshi Raman and Sangeetha Sharma. "Technical Communication-Principles andPractice", Oxford University Press, 2009.

R2 - Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005

R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1103	PROBLEM SOLVING AND PYTHON PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs.
3. To develop Python programs with conditionals and loops.
4. To define Python functions and call them.
5. To use Python data structures – lists, tuples, dictionaries.
6. To do input/output with files in Python.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
	ALGORITHMIC PROBLEM SOLVING	
I	Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: Tofind the greatest among three numbers, prime numbers ,find minimum in a list.	9
	DATA, EXPRESSIONS, STATEMENTS	
II	Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Simple algorithms and programs: exchange the values of two variables, computeSimple interest for a given amount, Factorial of a given number.	9
	CONTROL FLOW, FUNCTIONS	
III	Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, sum an array of numbers, linear search.	9
	LISTS, TUPLES, DICTIONARIES	
IV	Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing -list comprehension; Illustrative programs: selection sort, insertion sort.	9
	FILES, MODULES, PACKAGES	
V	Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.	9
	TOTAL INSTRCTIONAL HOURS	**45**

CourseOutcome

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems

CO2: Structure simple Python programs for solving problems.

CO3: Decompose a Python program into functions.

CO4: Represent compound data using Python lists, tuples, dictionaries.

CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

T1 –Ashok Namdev Kamthane ,Amit Ashok Kamthane ," Programming and Problem solving with Python" McGrawHill Education,2006

T2-Sheetal Taneja, "Python Programming A Modular Approach With Graphics,Database,Mobile and Web Applications, PEARSON,2017

REFERENCE BOOKS:

R1 - Reema Thareja " Python Programming Using Problem Solving Approach "OXFORD,2017.

R2-E. Balagurusamy, "Problem solving and Python Programming" McGrawHill Education, 2017.

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Programme	Course code	Name of the course	L	T	P	C
B.TECH.	16EC1202	BASICS OF ELECTRONICS ENGINEERING	3	1	0	4

Course Objective

1. To explain the basic electronic circuits and the different components.
2. To explain the fundamentals of semiconductor and applications.
3. To explain the fundamentals of power supply circuits.
4. To explain the principles of digital electronics.
5. To impart knowledge of communication engineering

Unit	Description	Instructional Hours
I	**ELECTRIC CIRCUIT ANALYSIS** Ohm's Law – Kirchoff's Laws – Series and Parallel circuits –Voltage and Current division techniques - Mesh current and Node voltage method for DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase Circuits – R,RL,RC,RLCCircuits.	9
II	**SEMI CONDUCTOR DEVICES AND APPLICATIONS** Characteristics of PN Junction Diode – Zener Diode and its Characteristics – Zener Effect – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurationsand Characteristics, UJT -Characteristics.	9
III	**POWER TRANSISTORS AND POWER SUPPLY CIRCUITS** Halfwave and Fullwave Rectifier - Filter Types - Capacitive Filter - Configurations and Characteristics of SCR – FET – MOSFET - Linear Mode & Switched Mode Power Supply (Block Diagram Approach only)	9
IV	**DIGITAL ELECTRONICS** Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops: RS, JK, T & D FF – A/D and D/A Conversion (Dual Slope, SAR, Binary-weighted and R-2R)	9
V	**FUNDAMENTALS OF COMMUNICATION ENGINEERING** Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations - Satellite and Optical Fiber communication (Block Diagram Approach only).	9
	Total Instructional Hours	**45**

CourseOutcome

CO1: Ability to identify the electronic components
CO2:Ability to explain the characteristics of electronic devices.
CO3:Ability to understand power transistors and design power supply circuits.
CO4:Understand the basic principles of digital electronics.
CO5:Understand the fundamentals of Communication Engineering.

TEXT BOOKS:

T1 - Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition,2006.
T2 - David A. Bell, "Electronic Devices and Circuits", Prentice Hall of India, 2004.

REFERENCE BOOKS :

R1 - Mehta V K, "Principles of Electronics", S.Chand& Company Ltd, 1994.
R2 - Donald A Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2003.R3 - Floyd, "Electron Devices", Pearson Asia 5th Edition, 2001.
R4 - MSedha R.S., "Applied Electronics", S. Chand & Co., 2006.
R5 - Wayne Tomasi, "Electronic Communication Systems", Pearson Education, 3rd Edition,2001.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16PS1001	PHYSICAL SCIENCES LAB - I (PHYSICS LABORATORY –I)	0	0	2	1

Course Objective

1. Evaluate the particle size of micro particles and acceptance angle of fibres.
2. Employ instrumental method to determine Young's modulus of a beam of metals.
3. Apply the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum

Expt. No.	Description of the Experiments
1.	Determination of Wavelength, and particle size using Laser
2.	Determination of acceptance angle and numerical aperture in an optical fiber.
3.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
6.	Determination of Young's modulus by Non uniform bending method
7.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
8.	Post office box Measurement of an unknown resistance

Total Practical Hours 30

Course Outcome

CO:1 Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
CO:2 Assess the Young's modulus of a beam using non uniform bending methods.
CO:3 Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum Using spectrometer.
CO:4 Identify the velocity of ultrasonic's in the given liquid.
CO:5 Illustrate phenomena of thermal conductivity of a bad conductor.

*** Student will prepare lab record during the course of the semester.

Name of the Course
CHEMISTRY LAB – I

Course Objective

1. Acquire practical skills in the determination of water quality parameters.
2. Acquaint the students with the determination of molecular weight of a polymer by viscometry.
3. Acquaint the students with the estimation of chemical substances using instrumental analysis techniques.

Expt. No.	Description of the Experiments
1.	Preparation of molar and normal solutions and their standardization.
2.	Estimation of total, permanent and temporary hardness of Water by EDTA
3.	Determination of chloride content of water sample by argentometric method.
4.	Determination of available chlorine in bleaching powder.
5.	Conductometric titration of strong acid vs strong base (HCl vs NaOH).

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6. Conductometric titration (Mixture of weak and strong acids)

7. Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4

8. Determination of molecular weight and degree of polymerization using viscometry.

9. Estimation of iron content of the water sample using spectrophotometer. (1,10 phenanthroline / thiocyanate method).

Total Practical Hours 30

Course Outcome

CO1: Estimate the different types of hardness in a water sample.

CO2: Determine the chloride content of water sample.

CO3: Calculate the strength of acid using conductometric titrations.

CO4: Calculate the strength of strong and weak acid using conductometric titrations.CO5: estimate the amount of salt using conductometric precipitation titrations.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1004	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective

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

Ex.No	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
1	Compute the GCD of two numbers.	3
2	Find the square root of a number.	3
3	Exponentiation (power of a number)	3
4	Find the factorial of a given number	3
5	Print prime numbers from 1 to n numbers	3
6	Find the maximum of a list of numbers	3
7	Linear search, Binary search	3
8	Selection sort, Insertion sort	3
9	First n prime numbers	3
10	Multiply matrices	3
11	Programs that take command line arguments(word count)	3
12	Find the most frequent words in a text read from a file	3
13	Simulate bouncing ball using Pygame	3
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1: Write, test, and debug simple Python programs.
CO2: Implement Python programs with conditionals and loops.
CO3: Develop Python programs step-wise by defining functions and calling them.
CO4: Use Python lists, tuples, dictionaries for representing compound data.
CO5: Read and write data from/to files in Python.

PLATFORM NEEDED: Python 3 interpreter for Windows/Linux

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1002	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	0	0	4	2

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

GROUP A (CIVIL & MECHANICAL)

S.NO	DESCRIPTION OF THEEXPERIMENTS	TOTAL PRACTICAL HOURS
	I CIVIL ENGINEERINGPRACTICE	
	Study of plumbing and carpentry components of Residential and Industrial buildings.	
	(A) PLUMBINGWORKS:	
	Study on pipe joints, its location and functions: Valves, taps, couplings, unions,reducers,elbows in household fittings.	
1		
2	Study of pipe connection requirements for pumps.	
3	Preparation of plumbing line sketches for water supply and sewage works.	
	Hands-on-exercise:	
4	Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.	9
5	Demonstration of plumbing requirements of high-rise buildings.	
	(B) CARPENTRY USING POWER TOOLSONLY:	
1	Study of the joints in roofs, doors, windows and furniture.	
2	Hands-on-exercise in wood works by sawing, planning and cutting.	
	IIMECHANICAL ENGINEERING	
	(A) Welding:	
1	Preparation of arc welding of Butt joints, Lap joints and Teejoints	
	(B) Machining:	
1	Practice on Simple step turning and taper turning	
2	Practice on Drilling Practice	
	(C) Sheet Metal Work:	13
1	Practice on Models– Trays, cone and cylinder.	
	DEMONSTRATION	
	(D) Smithy	
	➢ Smithy operations: Upsetting, swaging, setting down and bending.	
	➢ Demonstration of – Production of hexagonal headed bolt.	
	(E) Gas welding	
	(F) Foundry Tools and operations.	

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GROUP B (ELECTRICAL & ELECTRONICS)

S.NO	DESCRIPTION OF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
ELECTRICAL ENGINEERING PRACTICES		
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	
2	Fluorescent lamp wiring	
3	Stair case wiring.	10
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	
5	Measurement of energy using single phase energy meter.	
ELECTRONICS ENGINEERING PRACTICES		
1	Study of Electronic components and equipments – Resistors - colour coding	
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency)using CRO.	
3	Study of logic gates AND, OR, NOT and NAND .	13
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.	
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

At the end of the course the students shall be able to
CO1: Fabricate wooden components and pipe connections including plumbing works.CO2: Fabricate simple weld joints.
CO3: Fabricate electrical and electronics circuits.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE1003	VALUE ADDED COURSE I: LANGUAGE COMPETENCY ENHANCEMENT COURSE- I (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

- ✓ To enhance student language competency
- ✓ To identify individual students level of communication skills
- ✓ To develop English Vocabulary and spoken communication skills.
- ✓ To revive the fundamentals of English Grammar.

Unit	Description	Instructional Hours
I	**Listening** Language of Communication- English listening- Hearing Vs Listening- Verbal and Non-verbal communication – Listening strategies-Sounds of English.	3
III	**Reading** English Language Enhancement – Indianism in English – Role of Reading in effective communication – Techniques for good reading (skimming and scanning) Reading articles from newspaper, magazine. Reading and interpreting a passage.	3
III	**Speaking** Common errors in Pronunciation – Signposts in English (Role play) – Public Speaking skills – Social Phobia – Eliminating fear – Common etiquette of speaking - Debate and Discuss.	3
IV	**Writing** Writing genre – Enhancement of basic English Vocabulary; Parts of Speech, Noun, Verbs, and Tenses – combining sentences, sentence formation and completion.	3
V	**Art of Communication** Communication process – Word building and roleplay – Exercise on English Language for various situations through online and offline activities.	3
	TOTAL INSTRUCTIONAL HOURS	**15**

Course Outcome

CO1: Trained to maintain coherence and communicate effectively.
CO2: Practiced to create and interpret descriptive communication.
CO3: Introduced to gain information of the professional world.
CO4: acquired various types of communication and etiquette.
CO5: Taught to improve interpersonal and intrapersonal skills.

REFERENCE BOOKS:

1. Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc graw Hill
2. Word Power Made Easy by Norman Lewis,– Print, 1 June 2011.
3. High School English Grammar by Wren and Martin, S CHAND Publications, 1 January 2017.
4. Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA2102	ENGINEERING MATHEMATICS – II (VECTOR CALCULUS, COMPLEX VARIABLES ANDLAPLACE TRANSFORMS) (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
2. Understand analytic functions of complex variables and conformal mappings.
3. Know the basics of residues, complex integration and contour integration.
4. Apply Laplace transform techniques to solve linear differential equations.
5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics

Unit	Description	Instructional Hours
I	**VECTOR CALCULUS** Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.	12
II	**ANALYTIC FUNCTIONS** Analytic function - Cauchy-Riemann equations - sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method) – Conformal mapping: $w = z+c$, cz, $1/z$ and bilinear transformation without problems related to the concept of conformal mapping.	12
III	**COMPLEX INTEGRATION** Complex integration – Statements of Cauchy's integral theorem – Taylor's and Laurent's series expansions - Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
IV	**LAPLACE TRANSFORM** Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform - Convolution theorem (with out proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
V	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-Solution of standard types of first order partial differential equations of the form $f(p,q) = 0$, Clairaut's type: $z = px + qy + f(p, q)$ – Lagrange's linear equation- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluidflow, electricity and magnetism.
CO2: Test the analyticity to construct the analytic function and transform complex functions from oneplane to another plane graphically.
CO3: Evaluate real and complex integrals over suitable closed paths or contours.
CO4: Know the applications of Laplace transform and its properties and to solve certain lineardifferential equations using Laplace transform technique.
CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineering Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–II", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.R2-Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol II, Second Edition, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16PH2102	PHYSICS OF MATERIALS	3	0	0	3

Course Objective

1. Gain knowledge about conducting materials.
2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
3. Extend the properties of magnetic materials, applications and super conducting materials.
4. Defend the various types of dielectric materials and their uses.
5. Expose the students to smart materials and the basis of nanotechnology.

Unit	Description	Instructional Hours
I	**CONDUCTING MATERIALS** Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
II	**SEMICONDUCTING MATERIALS** Introduction – Intrinsic semiconductor – Compound and elemental semiconductor (direct and indirect band gap of semiconductors). carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – Extrinsic semiconductor - derivation of carrier concentration in n-type and p-type semiconductor – variation ofFermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications	9
III	**MAGNETIC & SUPERCONDUCTING MATERIALS** **Magnetic Materials**: Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. **Superconducting Materials :** Superconductivity : properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.	9
IV	**DIELECTRIC & COMPOSITES MATERIALS** Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown(qualitative) Introduction to composites materials – types of composites materials – polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment.	9
V	**SMART MATERIALS AND NANOTECHNOLOGY** **New Engineering Materials:** Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications. **Nano Materials**: Synthesis - plasma arcing – Chemical vapour deposition – properties of nano paricles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
	Total Instructional Hours	**45**

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Course Outcome

CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every daylife
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideasto synthesis Nanomaterials.

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011T2- Rajendran V "Materials Science" McGraw-Hill Education" New Delhi -2016.

REFERENCE BOOKS:

R1 – William D Callister, Jr "Material Science and Engineering" John wiley and Sons, New York, 2014.
R2 - Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India,New Delhi 2016.
R3 -Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16CY2102	ENVIRONMENTAL SCIENCES	3	0	0	3

Course Objective

1. To gain knowledge on the importance of environmental education, ecosystem and biodiversity.
2. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. To find and implement scientific, technological, economic and political solutions to environmental problems.
4. To study about the natural resources, exploitation and its conservation
5. To be aware of the national and international concern for environment and its protection.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** 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 processes – 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.	9
II	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution – Air pollution standards - control methods- Water pollution – Water quality parameters- Soil pollution - Marine pollution - Noise pollution- Thermal pollution - Nuclear hazards–role of an individual in prevention of pollution – pollution case studies.	9
III	**NATURAL RESOURCES** 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 overutilization of surface and ground 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. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- energy conversion – electrical energy calculations- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Global issues – Climatic change, Acid rain, greenhouse effect and Ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9

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V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health – Case studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the natural environment and its relationships with human activities.CO2: Characterize and analyze human impacts on the environment

CO3: Apply systems concepts and methodologies to analyze and understand interactions betweensocial and environmental processes

CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actorsin a complex, interconnected world.

CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

T1- Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New AgeInternational Publishers, New Delhi, 2014.

T2 – Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning,2012.

REFERENCES:

R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, EnviroMedia.

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning,2010.

R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, PearsonEducation, 2004

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Programme B.TECH.	Course Code	Name of the Course	L	T	P	C
	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II	3	1	0	4

Course Objective

- ✓ The learner will be introduced to global corporate culture and professional communication.
- ✓ It helps the students to focus on organizing professional event and documentation.
- ✓ The student will be able to describe the events and process in an effective way.
- ✓ It trains the student to analyze the problems and to find solution toit.
- ✓ The learner will be familiar with business communication.

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions-**Reading comprehension.**	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice- **interpretation of posters or advertisements.**	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)-Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – **E-mail Writing - Note completion-** Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replyingfor quotations – Placing an order and Complaint and **reply to a complaint**.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Introduced corporate culture and professional communication.CO2: It focused on organizing a professional event and its documentation.
CO3: Improved the ability to describe the events and process in an effective wayCO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate –2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I&II", OrientBlackswan,2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE2102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	2	0	4	4

Course Objective
1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

UNIT	DESCRIPTION	TOTAL HOURS
I	**PLANE CURVES** Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding, Lettering and dimensioning, BIS standards and scales. Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclinedto both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicularand inclined to one plane and objects inclined to both the planes by rotating object method.	15
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to 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, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections of simple and truncated solids such as - Prisms, pyramids,cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
	TOTAL INSTRUCTIONAL HOURS	**75**

Course Outcome
At the end of the course the students will be able to:
CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.CO2: Recognize the International Standards in Engineering Drawing practices.

TEXT BOOKS:

1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi2016.
2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers,Chennai.

REFERENCEBOOKS:

1. Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited,New Delhi2008.
2. K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore,1998.
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India,2005.
4. N.S. Parthasarathy,Vela Murali, "Engineering Drawing", Oxford University press, India2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT2202	PROGRAMMING IN C AND C++ (COMMON TO CSE & IT)	3	0	0	3

Course Objective

1. Learn the basic of C programming.
2. Gain knowledge in functions and pointers.
3. Be familiar with the C++ concepts of abstraction, encapsulation, constructor.
4. To understand the concepts of polymorphism, overloading and Inheritance
5. To learn the concept of file and exception handling and use built classes from STL.

Unit	Description	Instructional Hours
I	**BASICS OF 'C' PROGRAMMING** Fundamentals of 'C' programming – Structure of a 'C' program – Constants - Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations- BranchingandLooping- Arrays–OnedimensionalandTwodimensionalarrays-String-String Manipulations.	9
II	**FUNCTIONS AND POINTERS** Function – definition – Declaration – Types of Function definition – Call by value-Call by reference- Recursion – Introduction to Pointers - Pointers arithmetic – Pointers and Array, Structure- Union – Storage classes, Pre-processor directives	9
III	**BASICS OF 'C++' PROGRAMMING** Object oriented programming concepts – Objects – Classes – Abstraction - Encapsulation- Inheritance - Abstract Class - Polymorphism. Introduction to C++- Type Conversions - Constructors - Default, Copy, Parameterized, Dynamic constructors, Default argument -Destructor	8
IV	**POLYMORPHISM AND INHERITANCE** Function overloading- Friend functions - Operator overloading-Unary, Binary - Inheritance – Public, Private and Protected derivations- Runtime Polymorphism-Pure Virtual functions- Virtual Base class -RTTI	10
V	**TEMPLATES, EXCEPTION AND FILE HANDLING** Function Templates – Class Templates- Exception handling -Standard Template Library -Streamsand formatted I/O – I/O manipulators - File handling – Namespaces	9
Total Instructional Hours		**45**

Course Outcome

CO1: Use data representation for the fundamental data types, read, understand and trace theexecution of programs written in C language.
CO2: Explain the use of pointers, Structures and union.
CO3: Design problem solutions using Object Oriented Techniques and apply the concepts of data abstraction, encapsulation and constructors & destructors for problem solutions.
CO4: Apply concepts of operator overloading, inheritance for real world problems.
CO5: Apply exception handling and use built -in classes from STL.

TEXT BOOKS

T1: Balagurusamy, "Programming in ANSI C", 6th Edition, Tata McGraw-Hill,2010
T2: Rohit Khurana, "Object Oriented Programming with C++", Vikas Publishing, 2edition,2016.

REFERENCE BOOKS

R1: Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.
R2: E. Balagurusamy , "Object Oriented Programming with C++", 6th Edition, Tata Mc Graw Hill Publication,2013.
R3: B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
R4: Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing; 4th Edition, 2002.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16PS2001	PHYSICAL SCIENCES LAB- II (PHYSICS LABORATORY –II)	0	0	2	1

Course Objective

1. Evaluate the band gap of semiconductor.
2. Apply the concept of interference and calculate the thickness of thin wire.
3. Acquire the practical skills in Young's modulus by uniform bending method.

Expt. No.	Description of the Experiments
1.	Determination of Young's modulus by uniform bending method
2.	Determination of band gap of a semiconductor
3.	Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4.	Determination of Dispersive power of a prism - Spectrometer
5.	Determination of thickness of a thin wire – Air wedge method
6.	Determination of Rigidity modulus – Torsion pendulum
7.	Magnetic hysteresis experiment.
8.	Calibration of ammeter using potentiometer

Total Practical Hours 30

Course Outcome

CO: 1. Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO: 2. Determine the band gap of a semiconductor and variation of Energy Gap (E_g)with temperature.CO: 3 Assess the Young's modulus of a beam using non uniform bending method.
CO: 4. Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO:5. Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

*** Student will prepare lab record during the course of the semester.

Name of the Course

CHEMISTRY LAB – II

Course Objective

1. Acquire practical skills in the quantitative analysis of water quality parameters.
2. Acquire practical skills in the instrumental methods for quantitative estimation of metal ion content.
3. Gain knowledge in determination of rate of corrosion.

Expt. No.	Description of the Experiments
1.	Determination of Dissolved Oxygen in water by Winkler's method.
2.	Estimation of alkalinity of water sample by indicator method.
3.	Estimation of hydrochloric acid by pH metry.
4.	Estimation of ferrous iron by Potentiometry.
5.	Estimation of Copper by EDTA

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6. Determination of sodium by flame photometry

7. Determination of corrosion rate of mild steel by weight loss method.

Total Practical Hours 30

Course Outcome

CO1: Determine the level of DO in a water sample.

CO2: Identify and estimate the different types of alkalinity in water sample.CO3:

Estimate the acidity of water sample using pH metry.

CO4: Estimate the amount of copper in a brass sample.

CO5: Determine the metal ion content using instrumental methods.

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Programme	CourseCode	Name of the Course	L	T	P	C
B.TECH.	16IT2002	PROGRAMMING IN C AND C++ LAB (COMMON TO CSE & IT)	0	0	4	2

Course Objective

1. Be familiar with the concept of Array and functions.
2. Be exposed to Pointers and Structures.
3. Understand the concepts of constructors and Inheritance.
4. Gain knowledge in polymorphism and templates.
5. Learn the concepts of STL and File Stream classes.

Expt. No.	Description of the Experiments	
	C Programming	
1.	Write a program in C using Array and String.	
2.	Write a program in C using Functions and Pointers.	
3.	Write a program in C using Structures.	
	C++ Programming	
4.	Write a C++ program using Constructors.	
5.	Write a C++ program using the concept of Inheritance.	
6.	Write a C++ program to implement the concept of Compile time and Runtime polymorphism.	
7.	Write a C++ program using Class templates & function templates.	
8.	Write a C++ program to illustrate Exception Handling Mechanism.	
9.	Write a C++ program using Standard Template Library concept.	
10.	Write a C++ program to illustrate File Stream classes, manipulations of file and execution time.	
	Total Practical Hours	45

Course Outcome

CO1: Apply the concepts of arrays and functions. CO2: Explore the concepts of Pointers and Structures.
CO3: Implement the concepts of Constructors and Inheritance.CO4: Explore the concepts of polymorphism and templates.
CO5: Exploit the concepts of STL and File Stream classes.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.TECH.	16GE2001	VALUE ADDED COURSE – II: LANGUAGE COMPETENCY ENHANCEMENT COURSE- II	0	0	2	1

(COMMON TO ALL BRANCHES)

Course Objective

- ✓ To improve communication skills and Professional Grooming.
- ✓ To impart deeper knowledge of English Language and its practical application in different facets of life.
- ✓ To equip the techniques of GD, Public Speaking, debate etc.

Unit	Description	Instructional Hours
I	**Listening** Listening for gist and respond – Listen for detail using key words to extract specific meaning – listen for phonological detail – Listen and identify the main points for short explanations and presentation.	3
II	**Reading** Strategies for effective reading – read and recognize different text types – Genre and Organization of Ideas – Quantifying reading – reading to comprehend – Interpreting sentences – contrasting, summarizing or approximating	3
III	**Speaking** Speak to communicate – Make requests and ask questions to obtain personal information – use stress and intonation – articulate the sounds of English to make the meaning understood – speaking to present & Interact – opening and closing of speech.	3
IV	**Writing** Plan before writing – develop a paragraph: topic sentences, supporting sentences – write a descriptive paragraph – elements of good essay – descriptive, narrative, argumentative – writing emails – drafting resumes – project writing – convincing proposals.	3
V	**Language Development** Demonstration at level understanding of application of grammar rules – revision of common errors : preposition, tenses, conditional sentences –reference words – pronouns and conjunctions.	3
	TOTAL INSTRUCTIONAL HOURS	**15**

Course Outcome

CO1: Introduced to different modes and types of communication.
CO2: Practiced to face and react to various professional situations efficiently.
CO3: learnt to practice managerial skills.
CO4: Familiarized with proper guidance to writing.
CO5: Trained to analyze and respond to different types of communication.

REFERENCE BOOKS:

1. Verbal Ability and Reading Comprehension by Arun Sharma, 9th edition, Tata Mc graw Hill
2. Word Power Made Easy by Norman Lewis,– Print, 1 June 2011.
3. High School English Grammar by Wren and Martin, S.CHAND Publications, 1 January 2017.
4. Practical course in Spoken English by J.K. Gangal, PHI Learning , Second edition, 1 January 2018.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA3105	DISCRETE MATHEMATICS AND GRAPH THEORY (COMMON TO CSE & IT)	3	1	0	4

Course Objectives

1. Introduce logical theory and proportional calculus techniques that will create logical thinking.
2. Generalize counting problems using mathematical induction, inclusion and exclusion principles.
3. Study the Boolean algebra which is used in the Boolean logics and circuits.
4. Create the basic knowledge of graph theory which is applied in Computer networks.
5. Recognize the concepts of trees in computer engineering.

Unit	Description	Instructional Hours
I	**MATHEMATICAL LOGIC** Propositional logic - Tautology and Contradiction - Propositional equivalences - Normal forms - Principal normal forms - Theory of Inference.	12
II	**COMBINATORICS** Mathematical induction – Recurrence relations – Solving linear recurrence relations - generating functions – principle of inclusion and exclusion – applications.	12
III	**LATTICES AND BOOLEAN ALGEBRA** Lattices – Properties of lattices – Lattices as algebraic system – Sub lattices - some special lattices – Boolean algebra – Definition and simple properties.	12
IV	**GRAPHS** Graphs – introduction – types of graphs – matrix representation of graphs – paths, cycles connectivity – connectedness in undirected graphs – Euler and Hamiltonian graphs – connectedness in directedgraphs.	12
V	**TREES** Trees – properties of trees –spanning tree – minimum spanning tree – Rooted and binary trees – properties of binary trees - spanning trees in a weighted graph.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Study the notion of mathematical thinking, mathematical proofs, and algorithmic thinking and be able to apply them in problem solving.
CO2: Solve problems using counting techniques and recurrence relations.
CO3: Gain knowledge about Lattices and Boolean Algebra.
CO4: Apply the properties of graphs and related discrete structures in computer networks.
CO5: Analyze the various types of trees and their properties.

TEXT BOOKS:

T1 - Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fifth Edition, Pearson Education Asia, Delhi, 2014.
T2- T.Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata. McGraw-Hill Education, 15th reprint, 2012.

REFERENCE BOOKS :

R1 - Jean Paul Trembley ,R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw Hill,Inc. New York, 30th reprint, 2008.
R2 - Kenneth H.Rosen, "Discrete Mathematics and its Applications", seventh Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2013.
R3 - Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications,2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3201	DIGITAL PRINCIPLES AND SYSTEM DESIGN (COMMON TO CSE & IT)	3	0	2	4

Course Objective

1. To understand different methods used for the simplification of Boolean functions.
2. To study combinational circuits.
3. To learn synchronous sequential circuits.
4. To understand asynchronous sequential circuits.
5. To study the fundamentals of HDL.

Unit	Description	Instructional Hours
I	**MINIMIZATION TECHNIQUES AND LOGIC GATES** Boolean algebra and laws-De-Morgan's Theorem-Principle of Duality-Minimization of Boolean expressions – Minterm – Maxterm – Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions-Tabulation method-Implementation of Boolean functions using logic gates.	9
II	**COMBINATIONAL CIRCUITS** Analysis and design of combinational circuits- Circuits for arithmetic operations: adder, subtractor, Serial adder/ Subtractor - Parallel adder/ Subtractor-Carry look ahead adder-BCD adder-Magnitude comparator-Encoders and Decoders-Multiplexers and Demultiplexers, Code converters-Memory and Programmable logic.	9
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Flip flops - Design of synchronous sequential circuits: State diagram - State table – State minimization - State assignment. Shift registers-Counters.	9
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS** Analysis and design of asynchronous sequential circuits-Reduction of state and flow tables–Race-free state assignment–Hazards.	9
V	**HARDWARE DESCRIPTION LANGUAGE** Introduction to Hardware Description Language (HDL)- HDL for combinational circuits- Half adder, Full adder, Multiplexer, De-multiplexer, HDL for Sequential Circuits-Flip flops, Synchronous and Asynchronous Counters, Registers.	9
	Total Instructional Hours	**45**

DIGITAL LABORATORY: LIST OF EXPERIMENTS

1. Verification of Boolean theorems using digital logic gates.
2. Design and implementation of Half/Full Adder & Half/Full Subtractor.
3. Design and implementation of Binary to Gray and Gray to Binary Conversion.
4. Design and implementation of Parity generator/checker.
5. Design and implementation of Multiplexers and Demultiplexers.
6. Design and implementation of Synchronous and Asynchronous Counters.
7. Coding Combinational/Sequential circuits using HDL.

Total Instructional Hours	**15**
Total (45+15)	**60**

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Course Outcome	Upon completion of this course, the students will be able to CO1: Simplify boolean functions using different methods. CO2: Design and implement combinational logic circuits. CO3: Design and implement various sequential logic circuits. CO4: Design using PLD. CO5: Write HDL code for digital circuits.

TEXT BOOKS:

T1 - Morris Mano M. and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.
T2 - Charles H.Roth,Jr.,Lizy Kurian John, and Byeong Kil Lee,"Digital Systems Design using Verilog" First Edition,Cengage Learning,2014.

REFERENCE BOOKS:

R1-.S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design",Second Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2010.
R2-.Thomas L. Floyd, "Digital Fundamentals", Pearson Education, Inc, New Delhi, 2013
R3-.Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw-Hill Publishing company limited, New Delhi, 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3202	DATA STRUCTURES (COMMON TO CSE & IT)	3	0	0	3

Course Objective

1. To study the design and applications of ADTs and Linked List
2. To understand the various non-linear data structures like binary tree, binary search tree, AVL, and Binary Heap Tree
3. To build an application using sorting and searching
4. To understand the graph ADT and its applications
5. To Understand various hashing techniques

Unit	Description	Instructional Hours
I	**Linear Structures** Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists	9
II	**Stack and queues** Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues.	7
III	**Non Linear Data Structures** Tree Tree ADT –Representation of trees–Binary Tree ADT – expression trees – applications of trees – BST ADT – tree traversals. AVL Trees –B-Tree – heaps – binary heaps – applications of binary heaps-Binomial heaps.	10
IV	**Non Linear Data Structures** Graphs Introduction to Graphs- Definitions – Breadth First Search -Depth First Search-Topological sort – Shortest-Path Algorithms – Dijkstra algorithm- MST- Prim's and Kruskal's algorithms – Floyd algorithm- Warshall's Algorithm - Biconnectivity – Euler circuits – applications of graphs.	10
V	**Sorting, Searching** Sorting algorithms: Insertion sort -Selection sort -Shell sort -Bubble sort -Quick sort -Merge sort - Radix sort –Searching: Linear search –Binary Search - Hashing – Separate chaining – open addressing – rehashing – extendible hashing	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to
CO1: Implement the linear data structures
CO2: Understand the implementation of Stack and Queue
CO3: Formulate the different non-linear data structures like binary trees
CO4: Design algorithms for various searching and sorting techniques
CO5: Work with various Graph algorithms

TEXT BOOKS:

T1 - Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley,2007
T2 – A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2009.

REFERENCE BOOKS:

R1 – Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 7th Edition, Wiley. 2004.
R2 - Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publications, 2007.
R3 - Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C and C++", 2nd ed, Prentice-Hall of India, 2009.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3203	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Objective

1. Learn the basic file systems and database design.
2. Acquire knowledge about ER diagrams and Normalization.
3. Gain knowledge about various SQLs and optimization techniques
4. Familiarize with the concepts of transactions and concurrency control.
5. Acquire knowledge about various storage media and databases.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DBMS** Purpose of Database System - Database characteristics - Views of data –Data models – Types of datamodels – Relational Algebra.	8
II	**RDBMS AND NORMALIZATION** Relational DBMS – ER model - Extended ER- Normalization – Functional Dependencies, Anomaly - 1NF to 5NF - Domain Key Normal Form	8
III	**SQL & QUERY OPTIMIZATION** SQL fundamentals -SQL Standards - Data types - DDL – DML – DCL – TCL - Integrity – Trigger-Cursors-Embedded SQL - Static Vs Dynamic SQL - Query Processing and Optimization	10
IV	**TRANSACTION PROCESSING AND CONCURRENCY CONTROL** Introduction - ACID Properties -Transaction Concepts - Transaction Recovery – System Recovery –Media Recovery — Locking Protocols – Two Phase Locking –SQL Facilities for Concurrency- Serializability - Concurrency – Need for Concurrency- Concurrency Control – Two Phase Commit Protocol - Dead lock.	9
V	**TRENDS IN DATABASE TECHNOLOGY** RAID – Tertiary storage – File Organization – Organization of Records in Files – Indexing and Hashing – B and B+ tree Index Files – Database access Control – Types of Privileges - Introduction to Multidimensional and Parallel databases , Spatial and multimedia databases , Mobile databases, Object Oriented Databases and XMLDatabases.	10
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able toCO1: Able to design a data model.
CO2: Apply ER diagrams and normalization concepts for real time applications.CO3: Apply SQL queries and optimization techniques in real time.
CO4: Apply transactions and concurrency mechanisms for real time applications.CO5: Evaluate the performance of various storage media.

TEXTBOOKS:

T1 - Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education,2016.
T2- Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, TataMcGraw Hill, 2011.

REFERENCE BOOKS :

R1- C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, PearsonEducation, 2006.
R2- Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3204	OPERATING SYSTEMS (COMMON TO CSE & IT)	3	0	0	3

Course Objective

1. Study the basic concepts and understand the structure of operating systems
2. Learn about Processes, Scheduling algorithms and Deadlocks.
3. Learn various memory management schemes.
4. Study I/O management and Files ystems.
5. Learn the Distributed operating systems

Unit	Description	Instructional hours
I	**OPERATING SYSTEMS OVERVIEW** Introduction –operating systems overview- Evolution of Operating System.- ComputerSystem Organization-Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.	7
II	**PROCESS MANAGEMENT** Processes-Process Concept, Process Scheduling, Interprocess Communication; Threads-Overview, Multicore Programming, Multithreading Models. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling andDeadlocks	11
III	**STORAGE MANAGEMENT** Main Memory-Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory-Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory	9
IV	**FILE SYSTEM IMPLEMENTATION & MASS STORAGE STRUCTURE** Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management- I/O Systems	9
V	**TYPES OF OPERATING SYSTEMS** Single processor systems – Multiprocessor Systems – Clustered Systems – Real Time Systems – Open source operating system- Distributed Systems –Distributed operating systems –Distributed file systems –Distributed Synchronization. Case study: Linux Systems- Virtualization	9
	Total Instructional Hours	45

Course Outcome

Upon completion of this course, the students will be able to
CO1:Analyze various Scheduling algorithms.
CO2: Apply deadlock, prevention and avoidance algorithms.
CO3: Compare and contrast various memory management schemes.
CO4:Analyze and Implement a prototype file systems.
CO5:Study the distributed operating systems

TEXT BOOK:

T1:Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9thEdition, John Wileyand Sons Inc., 2012.
T2:TomAdelstein,BillLubanovic,"LinuxSystemAdministrationSolveReal-lifeLinuxProblems Quickly", O'ReillyMedia.

REFERENCES:

R1: Andrew S. Tanenbaum, "Modern Operating Systems", 4/E, Pearson Publications, 2014.
R2: Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.R3: D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, TataMcGraw-Hill Education,2007.
R4: Harvey M.Deitel-Operating systems,Third Edition,Pearson/Prentice Hall,2004.
R5:William Stallings, "Operating Systems –Internals and Design Principles", 8/E, Pearson Publications, 2014

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3001	DATA STRUCTURES LABORATORY (COMMON TO CSE & IT)	0	0	4	2

Course Objective

The student should be made to:

1. To learn the methodical way of solving problem
2. To comprehend the different methods of organizing large amount of data
3. To efficiently implement the different data structures
4. To efficiently implement solutions for specific problems

Expt. No.	Description of the Experiments
1	Write a C++ program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.
2	Write a C++ program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion.
3	Write a C++ program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.
4	Write C++ programs to implement a double ended queue ADT using i) array and ii) doubly linked list respectively.
5	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively in Post order.
6	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of integers. b) Traverse the above Binary search tree non recursively in order.
7	Write C++ programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Insertion sort b) Merge sort
8	Write C++ programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quicksort b) Selection sort
9	Write C++ programs to perform the following searching i) Linear search ii) Binary Search
10	Write a C program for implementing Heap sort algorithm for sorting a given list of integers in ascending order.
11	Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.
12	Write C++ programs for implementing the following graph traversal algorithms: a)Depth first traversal b)Breadth first traversal

Total Practical Hours **45**

Course Outcome

Upon completion of this course, the students will be able to

CO1: Abstract data and entities from the problem domain, build object models and design software solutions using object-oriented principles and strategies.

CO2: Break a problem into logical pieces and develop algorithms for solving simple problems.

CO3: Discover, explore and apply tools and best practices in object-oriented programming.

CO4: Develop programs that appropriately utilize key object-oriented concepts.

CO5: Analyze various data structures such as list, stack, tree , graphs etc.,

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3002	OPERATING SYSTEMS LABORATORY (COMMON TO CSE & IT)	0	0	4	2

Course Objective

1. Learn shell programming and the use of filters in the UNIX environment.
2. Be exposed to programming in C using system calls.
3. Learn to use the file system related system calls.
4. Be exposed to process creation and inter process communication.
5. Be familiar with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance

Expt. No.	Description of the Experiments
1	Basics of UNIX commands.
2	Shell Programming.
3	Implement the following CPU scheduling algorithms a. Round Robin b. SJF c. FCFS d. Priority
4	Implement all file allocation n strategies a. Sequential b. Indexed c. Linked
5	Implement Semaphores
6	Implement all File Organization Techniques a. Single level directory b.Twolevel c. Hierarchical d.DAG
7	Implement Bankers Algorithm for Dead Lock Avoidance
8	Implement an Algorithm for Dead Lock Detection
9	Implement all page replacement algorithms a. FIFO b.LRU c.LFU
10	Implement IPC using Shared memory.
11	Experiments on fork
12	Implement Paging Technique of memory management.
	Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Implement deadlock avoidance, and Detection Algorithms
CO2: Compare the performance of various CPU Scheduling Algorithm
CO3: Critically analyze the performance of the various page replacement algorithms
CO4: Create processes and implement IPC
CO5: Implement paging and synchronization.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT3003	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	4	2

Course Objective

1. Learn to create and use a database with a query language
2. Have hands on experience on DDL, DML and DCL Commands
3. Familiarize advanced SQL queries.
4. Study PL/SQL
5. Be Exposed to different applications

Expt. No.	
1.	Creation of a database and writing SQL queries to retrieve information from the database.
2.	Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3.	Implementing SQL queries on Integrity constraints and Views
4.	Implementing Join operation and Nested Queries
5.	Study of PL/SQL block.
6.	Apply the concepts of High level programming language extensions (Control structures and Exceptions).
7.	Demonstrate Procedures and Function in PL/SQL block.
8.	Creation of database Cursors.
9.	Creation of database Triggers.
10.	Creation of database Forms& Reports
11.	Working with XML
12.	Database Design and implementation (Mini Project) a) Inventory Control System. b) Material Requirement Processing. c) Hospital Management System. d) Railway Reservation System. e) Personal Information System. f) Web Based User Identification System. g) Timetable Management System. h) Hotel Management System

Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to

CO1: The student should be able to Design and implement a database schema for a given problem-domain

CO2: The student should be able to Populate and query a database

CO3: The student should be able to Create and maintain tables using PL/SQL.

CO4: The student should be able to Prepare reports.

CO5: The student should be able to create different applications using sql commands

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16MA4108	PROBABILITY AND QUEUEING THEORY (COMMON TO CSE & IT)	3	1	0	4

Course Objectives

1. Construct a well-defined knowledge of probability and random variables.
2. Understand the concept of standard distributions which can describe the real life phenomenon.
3. Know the concept of two dimensional random variables and determine covariance.
4. Understand the concept of random processes and Marko chain.
5. Apply the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

Unit	Description	Instructional Hours
I	**PROBABILITY AND RANDOM VARIABLE** Definition – Axioms of Probability – Conditional Probability – Total Probability – Bayes Theorem (with out proof) -Random variable –Discrete and continuous random variables – Moment generating functions.	12
II	**STANDARD DISTRIBUTIONS** Discrete Distributions - Binomial, Poisson, Geometric distributions - Continuous Distributions - Uniform, Exponential and Normal distributions.	12
III	**TWO DIMENSIONAL RANDOM VARIABLES** Joint distributions – discrete and continuous random variables – marginal and conditional probability distributions – covariance – correlation.	12
IV	**RANDOM PROCESSES** Classification - Stationary process - Markov process - Markov chains - Transition probabilities - Limiting distributions - Poisson process – Birth and death process.	12
V	**QUEUEING THEORY** Markovian models – Birth and death queueing models – Steady state results – Single and Multiple server queueing models – (M/M/1):(∞/FCFS), (M/M/1):(N/FCFS), (M/M/C):(∞/FCFS) and (M/M/C):(N/FCFS) – Little's formula. (Derivations excluded).	12
	Total Instructional Hours	**60**

Course Outcomes

CO1: Understand the concepts of probability and random variables.
CO2: Describe various discrete and continuous distribution functions.
CO3: Understand and characterize phenomenon of two dimensional random variables.
CO4: Obtain a fundamental knowledge of the random processes which evolves with respect to time in a probabilistic manner.
CO5: Identify the queuing models in the given system, find the performance measures and analyse the result.

TEXT BOOKS:

T1 - Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 2011.
T2 - Veerarajan, T., Probability, Statistics and Random Processes, Tata McGraw-Hill, 2nd Edition, New Delhi, 2010.

REFERENCE BOOKS:

R1- O.C. Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier, First Indian Reprint, 2010.
R2 - A.O. Allen, "Probability, Statistics and Queueing Theory with Computer Applications", Elsevier, Second Edition, 2012.
R3 - K.S. Trivedi, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, Second Edition, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4201	JAVA PROGRAMMING (COMMON TO CSE & IT)	3	0	0	3

Course Objective

1. Learn the basics of java programming language
2. Discuss the packages and interfaces in java programming
3. Learn input and output streams in java
4. Understand the event handling classes in java
5. Learn frames and windows in java and its applications

Unit	Description	Instructional Hours
I	**OVERVIEW OF JAVA PROGRAMMING** Review of Object oriented programming-Introduction to java programming-Features of JavaLanguage, JVM -The Java Environment-Primitive Data types-variables-arrays-control statements-classes and objects-access specifier-methods-constructor-finalize method-strings-Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes.	9
II	**PACKAGES AND INTERFACES** Packages-defining package-access protection-importing packages- interfaces-Defining an interface-implementing an interface-applying interface-variables in interface-extended interface-Exception Handling-exception types-uncaught exception-multiple catch-nested try-throw and finally-built-in exceptions-multithreaded programming-java thread model-thread priorities-synchronization-thread class and runnable interface-creating multiple threads- inter thread communication-string-input and output	9
III	**INPUT AND OUTPUT STREAMS** I/O basics-reading console input-writing console output-reading and writing files-applet fundamentals-Applet Basics-An Applet Skeleton-Simple Applet Display Methods-The HTML APPLET Tag-Passing Parameters to Applets-using instanceof-native method.	9
IV	**EVENT HANDLING** The Delegation Event Model-Event Classes-The ActionEvent Class-The AdjustmentEvent Class-The ComponentEvent Class-The ContainerEvent Class-Event Listener Interfaces-The ActionListener Interface-The AdjustmentListener Interface-The ComponentListener Interface-The ContainerListener Interface-Using the Delegation Event Model-adapter class-inner classes.	9
V	**FRAMES AND WINDOWS** Window Fundamentals-Working with Frame Windows-Creating a Frame Window in an Applet-Displaying Information Within a Window-Working with Graphics-Drawing Lines-Drawing Rectangles-Drawing Ellipses and Circles-Working with Color-Working with Fonts.	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to
CO1: To Understand the Basics of java Programming
CO2: Design program using user defined packages and interfaces
CO3: Develop applications using applet class in java
CO4: Apply event handling classes to create different events in java
CO5: Design real time applications using frames and windows

TEXT BOOKS:

T1 - Herbert Schildt, "The complete reference java 2",seventh edition, McGraw – Hill 2007.

REFERENCE BOOKS :

R1 - E.Balagurusamy,"Programming with java A Primer", fifth edition, McGraw – Hill 2014
R2 - H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited,2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4202	DESIGN AND ANALYSIS OF ALGORITHM	3	0	0	3

Course Objective

1. To learn general techniques for analyzing algorithms.
2. To understand the divide and conquer techniques.
3. To gain knowledge about greedy and dynamic programming
4. To learn Branch and Bound technique.
5. To study about NP complete problems.

Unit	Description	Instructional Hours
I	**ALGORITHM ANALYSIS** Importance - role of algorithms in computing - Algorithm efficiency - Mathematical analysis for Recursive and Non-recursive algorithms - Empirical analysis of algorithm	9
II	**DIVIDE AND CONQUER & BRUTE FORCE** Divide And Conquer Technique: Merge sort - Quick sort- Finding maximum and minimum BruteForce Approach: Selection Sort - Bubble Sort	9
III	**GREEDY & DYNAMIC PROGRAMMING** Greedy approach: Prims Algorithms - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Treesand Codes - Dynamic programming: Knapsack Problem and Memory functions - Optimal Binary Search Trees - Warshall's and Floyd's Algorithms.	9
IV	**BACKTRACKING & BRANCH-AND-BOUND** Backtracking: N - Queens Problem - Hamiltonian Circuit Problem - Subset Sum ProblemBranch and bound: Assignment Problem - Knapsack Problem – Travelling Salesman Problem.	9
V	**NP PROBLEMS & ADVANCED ALGORITHMS** NP-completeness – Polynomial time verification – Theory of reducibility – Circuit satisfiability -NP-complete problems: Vertex cover - Hamiltonian cycle and traveling salesman problems – Introduction to approximation algorithms - Randomization algorithms and parallel algorithms - Parallel sorting.	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to
CO1: Analyze the implications of iterative and recursive algorithms
CO2: Recognize general principles and good algorithm design techniques for developing efficient algorithms
CO3: Design and implement problem solving techniques such as Divide and conquer greedy method,dynamic programming, Backtracking, Branch and Bound
CO4: Apply mathematical preliminaries to the analysis and design stages of different types of algorithms
CO5: Analyze the efficiency of NP-complete problems

TEXT BOOKS:

T1 - Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3rdEdition, 2012.
T2 - Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms", Prentice Hall ofIndia Publications, 3rd Edition, 2009.

REFERENCE BOOKS :

R1-AnanyLevitin,"IntroductiontotheDesignand AnalysisofAlgorithms",PearsonPublications, 3rdEdition, 2012.
R2-Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms", Prentice Hall ofIndia Publications, 3rd Edition, 2009.
R3-Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms," 2nd Edition, Galgotia Publications, 2008 R4-Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis",Pearson Publications, 3rd Edition, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4203	SOFTWARE ANALYSIS AND DESIGN	3	0	0	3

Course Objective

1. Aware of a member of generic models to structure the software development process.
2. Understand fundamental concepts of requirements engineering and specification.
3. Capture, document and analyze requirements.
4. Study the concepts of modeling in object oriented contexts.
5. Understand Object Constraint Language.

Unit	Description	Instructional Hours
I	**SOFTWARE PROCESS MODELS** Software- Legacy Software-A layered technology-Categories of Software-A process frame work-CMMI-Product and Process-Process Models-The Waterfall Model-Incremental Process Models-Incremental Model-The RAD Model-Evolutionary Process Models-Prototyping-The Spiral Model-The Concurrent Development Model-Specialized Process Models.	9
II	**REQUIREMENT ENGINEERING** Requirement Engineering-Requirements Engineering Tasks-Initiating the Requirements Engineering Process- Eliciting Requirements-Developing Use cases-Building the Analysis Models-Elements of the Analysis Model- Analysis Pattern-Negotiating Requirements-Validating Requirements.	9
III	**ANALYSIS MODELING** Requirement Analysis-Analysis modeling approaches-Data modeling concepts-Object Oriented Analysis-Scenario based modeling-Flow oriented Modeling-Class based modeling-Creating a behavior model.	10
IV	**OBJECT-ORIENTED ANALYSIS BASICS** Introduction-Overview of object oriented system development-Object basics-The Unified Process-Modeling concepts- Modeling as a design technique-Analysis and Modeling-UML diagrams-Use case Modeling-Class Modeling-State Modeling-Interaction Modeling.	10
V	**REQUIREMENTS & MORE MODELING** Object Constraint Language- Inception- Evolutionary Requirements- Domain Models-System Sequence Diagrams-Operation Contracts.	7
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to

CO1: Understand the qualifications of systems analysts and project managers to design better information systems.

CO2: Discuss the aims and objectives of information systems in the context of a human activity system for better systems development.

CO3: Understand analysis and design techniques and methods to meet the special needs of current information systems.

CO4: Analyze and design with Object-oriented method in UML.

CO5: Describe constraints and introduce OCL.

TEXT BOOKS:

T1-Roger S.Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Seventh edition, 2009.

T2-Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Prentice- Hall of India, 2005.

REFERENCE BOOKS :

R1- Stephan Schach, Software Engineering, Tata McGraw Hill, 2007.

R2-O'Docherty , Mike. Object-Oriented Analysis & Design.Wiley.2005.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4204	COMPUTER ARCHITECTURE	3	0	0	3

Course Objective

1. To make students understand the basic structure and operation of digital computer.
2. To familiarize the students with arithmetic and logic unit and implementation of fixed pointand floating-point arithmetic operations.
3. To expose the students about the concept of pipelining.
4. To familiarize the students with hierarchical memory system including cache memories andvirtual memory.
5. To expose the students with different ways of communicating with I/O devices and standard I/Ointerfaces.

Unit	Description	Instructional Hours
I	**OVERVIEW & INSTRUCTIONS** Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes- Basic I/O operations – Stacks and queues- Memory-Reference Instructions	9
II	**ARITHMETIC OPERATIONS** ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub wordparallelism., Design of Accumulator Logic	7
III	**PROCESSOR AND CONTROL UNIT** Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined data path and control – Handling Data hazards & Control hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation-Exceptions.	11
IV	**PARALLELISM** Introduction to Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Introduction to Multicore processors.	9
V	**MEMORY AND I/O SYSTEMS** Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory- Memory Management requirements – Secondary storage, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able toCO1: Apply the basic instructions and addressing modes. CO2: Design arithmetic and logic unit.
CO3: Design and analyze pipelined control units
CO4: Compare the parallel processing architectures.
CO5: Evaluate performance of memory systems.

TEXT BOOKS:

T1 - David A. Patterson and John L. Hennessey, "Computer organization and design', Morgan Kauffman / Elsevier,Fifth edition, 2014.
T2- V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw-HillInc, 2012.

REFERENCE BOOKS :

R1 - William Stallings "Computer Organization and Architecture" , Seventh Edition , Pearson Education, 2006.
R2- Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.R3-Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
R4- John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4205	INFORMATION THEORY AND CODING TECHNIQUES	3	0	0	3

Course Objective

1. To understand the information theory fundamental
2. To characterize the different compression techniques used for sending the text and images
3. To analyze the coding methods for audio and video coding
4. To get a clear view of different error detection methods
5. To get a clear view of different error control methods

Unit	Description	Instructional Hours
I	**INFORMATION THEORY** Uncertainty, Information and Entropy – Source coding Theorem – Data Compaction – Shannon Fano coding, Huffman coding – Discrete Memory less channels-Mutual Information – channel capacity – channel coding Theorem – Channel capacity Theorem	9
II	**SOURCE CODING: TEXT, AUDIO AND SPEECH** Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 – Speech: Channel Vocoder, Linear Predictive Coding	9
III	**SOURCE CODING: IMAGE AND VIDEO** Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG –Video Compression: Principles–I, B, P frames, Motion estimation, Motion compensation, H.261, MPEG standard.	9
IV	**ERROR CONTROL CODING: BLOCK CODES** Definitions and Principles: Hamming weight, hamming distance, Minimum distance decoding – Single parity codes, Hamming codes, Repetition codes – Linear block codes, Cyclic codes – Syndrome calculation, Encoder and decoder – CRC	9
V	**ERROR CONTROL CODING: CONVOLUTIONAL CODES** Convolutional codes – code tree – trellis - state diagram - Encoding – Decoding - Maximum likelihood decoding, Sequential decoding and Viterbi algorithm – Principle of Turbo coding	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to
CO1: Apply the principles of Information theory
CO2: Implement the source coding methods for text and Audio and
Speech CO3: Analyze the source coding methods for Image and Video
CO4: Detect and correct the errors using linear block codes
CO5: Detect and correct the errors using cyclic codes and Convolutional codes.

TEXT BOOKS:

T1 - R Bose, "Information Theory, Coding and Cryptography", 2nd Edition, TMH, 2008-

T2 - Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards",Pearson Education Asia, 2002.

REFERENCE BOOKS:

R1 - K Sayood, "Introduction to Data Compression", 3rd Edition, Elsevier, 2006.
R2 - S Gravano, "Introduction to Error Control Codes", Oxford University Press, 2007.
R3 - Amitabha Bhattacharya, "Digital Communication", TMH, 2006.
R4 - Simon Haykin, "Communication Systems", 4th Edition, Wiley India,
R5 -Watkinson J, "Compression in Video and Audio", Focal Press, London, 2001

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4001	JAVA PROGRAMMING LABORATORY (COMMON TO CSE & IT)	0	0	4	2

Course Objective

1. To practice implementing Object Oriented Concepts, Package creation in Java using appropriate coding standards
2. To practice writing generic programs and collection classes in Java
3. To explore exception handling techniques.
4. To practice concurrency programming.
5. To develop simple applications using Object Oriented concepts.

Expt. No.	Description of the Experiments
1.	Develop Rational number class in Java. Use JavaDoc comments for documentation. Your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (½).
2.	Develop Date class in Java similar to the one available in java.util package. Use JavaDoc comments.
3.	Implement Lisp-like list in Java. Write basic operations such as 'car', 'cdr', and 'cons'. If L is a list [3, 0, 2, 5], L.car() returns 3, while L.cdr() returns [0,2,5].
4.	Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both theimplementations.
5.	Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism
6.	Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, and while leave the value as it is if it reads a Rupee.
7.	Design a scientific calculator using event-driven programming paradigm of Java.
8.	Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both.
9.	Develop a simple OPAC system for library using even-driven and concurrent programming paradigms of Java. Use JDBC to connect to a back-end database
10.	Develop multi-threaded echo server and a corresponding GUI client in Java
11.	[Mini-Project] Develop a programmer's editor in Java that supports syntax highlighting, compilation support, debugging support, etc.
12.	Write a java program that prints the meta-data of a given table.

Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Apply good programming design methods for program development.
CO2: Apply the different event driven programming for implementing solutions to practical problems.
CO3: Design and implement polymorphism, exception handling and multi-threading in java.
CO4: Ability to access data from a DB with Java programs.
CO5: Able to create client server communications for data sharing using java.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server
HARDWARE Standalone desktops 30Nos

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4002	ALGORITHMS LAB	0	0	4	2

Course Objective

1. To understand variety of advanced abstract data type (ADT) and data structures and their implementations
2. To build a solid foundation in algorithms and their applications
3. Employ various design strategies for problem-solving.
4. Measure and compare the performance of different algorithms.
5. Learn how to analyze and design solution to the problem.

Expt. No.	Description of the Experiments
1.	Write Program to perform Binary Search using Divide & Conquer.
2.	Use divide and conquer method to recursively implement and to find the maximum and minimum in a given list of n elements.
3.	Sort a given set of elements using the Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
4.	Write a Program to implement Quick sort using divide and Conquer technique.
5.	Write program to find Topological ordering of nodes in a DAG.
6.	Write program to sort an array using Insertion Sort, Selection sort.
7.	a. Write program to find all nodes reachable from a given node using DFS b. Write Program to find all nodes reachable from a given node using BFS
8.	Write program to solve 0/1 Knapsack problem using dynamic programming.
9.	a. Write program to find transitive closure of a given directed graph using Warshall's algorithm. b. Write program to Implement All Pair Shortest paths problem using Floyd's algorithm.
10.	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
11.	Find Minimum Cost Spanning Tree of a given undirected graph using Prims algorithm.
12.	Implement N Queen's problem using Back Tracking.

Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to
CO1 :Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2: To compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem.
CO3: To Identify and analyze criteria and specifications appropriate to new problems.
CO4: To develop the efficient algorithms for the new problem with suitable designing techniques.
CO5: To design algorithms using the dynamic programming, greedy method, Backtracking, Branch and Bound strategy, and recite algorithms that employ this strategy

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT4003	CASE TOOLS LAB	0	0	4	2

Course Objective

1. To Learn the basics of OO analysis and design skills.
2. To learn how to identify objects, relationships, services and attributes through UML.
3. To build a conceptual model during analysis and design.
4. To evaluate existing CASE Tools
5. Learn to map design to code

Expt. No.	Description Of The Experiments
1.	To develop a problem statement and Statement of Work.
2.	Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3.	Identify Use Cases and develop the Use Case model.
4.	Identify the business activities and develop an UML Activity diagram.
5.	Identity the conceptual classes and develop a domain model with UML Class diagram.
6.	Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7.	Draw the State Chart diagram
8.	Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation and patterns
9.	Draw Component and Deployment diagrams.
10.	Practice forward engineering and reverse engineering

Suggested List of Applications

1. Student Marks Analyzing System
2. Online Quiz System
3 Online Railway Ticket Reservation Systems
4. Payroll System
5. Course Registration System
6. Expert System for Medical Diagnosis System
7. ATM Systems
8. Stock Maintenance
9. Library Management System
10. Passport Automation System Design
11. 11.Foreign Trading system.
12. BPO Management System.

Total Practical Hours 45

Course Outcome

Upon completion of this course, the students will be able to

CO1: Develop a knowledge on the basics of object-oriented software development and its life cycle models.

CO2: Analyze and design software requirements in efficient manner

CO3: Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation using the Rational Software Suite.

CO4: Recognize the role and function of each UML model in developing object-oriented software.

CO5: Work with object oriented CASE tools

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CO'S, PO'S & PSO'S MAPPING

Semester – I

Course Code & Name: 16MA1101 Engineering Mathematics-I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2	2	-	-	-	-	-	-	2	2	2

Course Code & Name: 16PH1101 Engineering Physics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	3	3							1	1
CO2	3	2	3	3	3								1	1
CO3	3	2	3	3	3	3							1	2
CO4	3	2	3	1	2		2						1	1
CO5	3	2		1	2								2	1
Avg	3	2	3	2	2.6		2						1.2	1.2

Course Code & Name: 16CY1101 Engineering Chemistry

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	-
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	1
Avg	3	2	2	2	2	1	-	-	-	-	-	1	1	1

Course Code & Name: 16HE1101 English for Engineers - I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1					1	1			3		1		
CO2	1	1		2		2	1		2	3		2		1
CO3	1		1			3			2	3		1		1
CO4	1	1	1	1		1	1		2	3		2		
CO5	1		1	1		2	1			3		2	1	1
Avg	1	1	1	1.3		1.8	1		2	3		1.6	1	1

Course Code & Name: 16GE1103 Problem Solving and Python Programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	2	2	-	-	-	-	-	-	1	1	1
CO2	2	3	-	2	2	-	-	-	-	-	-	1	1	1
CO3	2	3	-	2	2	-	-	-	-	-	-	1	1	1
CO4	2	3	-	2	2	-	-	-	-	-	-	1	1	1
CO5	2	3	2	2	2	-	-	-	-	-	-	1	1	1
Avg	2	3	2	2	2	-	-	-	-	-	-	1	1	1

Course Code & Name: 16EC1202 Basics of Electronics Engineering

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2					2	3	3	2		2	2	2	1
CO2	2	1	1			2	3	3	2		2	2	2	1
CO3	2					2	3	3	2		2	2	2	1
CO4	2	1	2			2	3	3	2		2	2	2	2
CO5	2	1	2			2	3	3	2		2	2	2	2
Avg	2					2	3	3	2		2	2	2	1

Course Code & Name: 16PS1001 Physical Sciences Laboratory - I

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	3	3							1	1
CO2	3	2	3	3	3								1	1
CO3	3	2	3	3	3	3							1	2
CO4	3	2	3	1	2		2						1	1
CO5	3	2		1	2								2	1
Avg	3	2	3	2	2.6		2						1.2	1.2

Course Code & Name: 16GE1004 Problem Solving and Python Programming Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	1
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	3
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	1	2	2	-	-	-	-	-	2	2	2
CO5	3	3	3	2	1	1	-	-	-	-	-	2	2	3
Avg	3	2	3	1	2	-	-	-	-	-	-	2	3	1

Course Code & Name: 16GE1002 Engineering Practices Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1			1	3	3	2		2	2	2	1
CO2	2	1	1			1	3	3	2		2	2	2	1
CO3	2	1	1			1	3	3	2		2	2	2	1
CO4	2	1	2			1	3	3	2		2	2	2	2
CO5	2	1	2			1	3	3	2		2	2	2	2
Avg	2	1	1			1	3	3	2		2	2	2	1

Semester – II

Course Code & Name: 16MA2102 Engineering Mathematics-II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	1	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	1	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	1	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	1	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	1	2
Avg	3	3	3	2	2	-	-	-	-	-	-	2	1	2

Course Code & Name: 16PH2102 Physics of Materials

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**2**	**1**	**1**	**1**	**1**							1	1
CO2	**3**	**3**	**1**	**1**	**2**								2	1
CO3	**3**	**2**	**1**	**2**	**2**								3	2
CO4	**3**	**3**	**1**	**2**	**2**	**1**							1	1
CO5	**3**	**2**	**2**	**3**	**2**	**1**	**2**						2	2
Avg	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4

Course Code & Name: 16CY2102 Environmental Sciences

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2		1	1		2	3	3	2		2	2	2	1
CO2	2		1	1		2	3	3	2		2	2	2	1
CO3	2		1	1		2	3	3	2		2	2	2	1
CO4	2		2	1		2	3	3	2		2	2	2	2
CO5	2		2	1		2	3	3	2		2	2	2	2
Avg	2		1	1		2	3	3	2		2	2	2	1

Course Code & Name: 16HE2102 English for Engineers - II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1									1	3			1	
CO2	2	2				2			3	3		2		1
CO3	2		2						2	3			1	
CO4		1		1					1	2		2	1	1
CO5	2	1	2		1				1	3			2	1
Avg	2	1.3	2	1	1	2			1.6	2.8		2	1.25	1

Course Code & Name: 16GE2102 Engineering Graphics

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	3	3							1	1
CO2	3	2	3	3	3								1	1
CO3	3	2	3	3	3	3							1	2
CO4	3	2	3	1	2		2						1	1
CO5	3	2		1	2								2	1
Avg	3	2	3	2	2.6		2						1.2	1.2

Course Code & Name: 16IT2202 Programming in C and C++

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	1	0	1	0	1	1	3	0	0
CO2	3	3	2	2	2	2	0	1	0	1	0	1	0	2
CO3	3	3	2	2	2	2	0	1	0	1	0	2	0	1
CO4	3	3	2	2	2	2	0	1	0	1	1	1	0	1
CO5	3	3	2	2	2	2	0	1	0	1	1	1	0	2
Avg	**3**	**3**	**2**	**2**	**2**	**2**	**0**	**1**	**0**	**1**	**1**	**2**	**0**	**1**

Course Code & Name: 16PS2001 Physical Sciences Laboratory - II

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**2**	**1**	**1**	**1**	**1**							1	1
CO2	**3**	**3**	**1**	**1**	**2**								2	1
CO3	**3**	**2**	**1**	**2**	**2**								3	2
CO4	**3**	**3**	**1**	**2**	**2**	**1**							1	1
CO5	**3**	**2**	**2**	**3**	**2**	**1**	**2**						2	2
Avg	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4

Course Code & Name: 16IT2002 Programming in C and C++ Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	1	0	1	1	0	1	0	1	1	3	0	0
CO2	2	3	1	0	2	2	0	1	0	1	0	1	0	2
CO3	2	3	1	0	2	2	0	1	0	1	0	2	0	1
CO4	2	3	1	0	2	2	0	1	0	1	1	1	0	1
CO5	2	3	1	0	2	2	0	1	0	1	1	1	0	2
Avg	**2**	**3**	**1**	**0**	**2**	**2**	**0**	**1**	**0**	**1**	**1**	**2**	**0**	**1**

Semester – III

Course Code & Name: 16MA3105 Discrete Mathematics and Graph Theory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	1	0	1	0	1	1	3	0	0
CO2	3	3	2	2	2	2	0	1	0	1	0	1	0	2
CO3	3	3	2	2	2	2	0	1	0	1	0	2	0	1
CO4	3	3	2	2	2	2	0	1	0	1	1	1	0	1
CO5	3	3	2	2	2	2	0	1	0	1	1	1	0	2
Avg	**3**	**3**	**2**	**2**	**2**	**2**	**0**	**1**	**0**	**1**	**1**	**2**	**0**	**1**

Course Code & Name: 16IT3201 Digital Principles and System Design

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	0	0	0	1	0	0	0	0	0	1	1	1	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0
Avg	**3**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**

Course Code & Name: 16IT3202 Data Structures

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	0	0	2	0	0	0	0	0	1	2	3	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0
Avg	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**

Course Code & Name: 16IT3203 Database Management Systems

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	0	0	0	0	0	0	0	0	1	3	3	2
CO2	2	1	1	0	0	0	0	0	0	0	0	1	2	2
CO3	2	1	2	0	0	0	0	0	0	1	0	2	0	2
CO4	3	3	1	0	0	0	0	0	0	0	1	1	0	2
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	2
Avg	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**2**

Course Code & Name: 16IT3204 Operating System

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	1	0	1	0	1	1	3	0	0
CO2	3	3	2	2	2	2	0	1	0	1	0	1	0	2
CO3	3	3	2	2	2	2	0	1	0	1	0	2	0	1
CO4	3	3	2	2	2	2	0	1	0	1	1	1	0	1
CO5	3	3	2	2	2	2	0	1	0	1	1	1	0	2
Avg	**3**	**3**	**2**	**2**	**2**	**2**	**0**	**1**	**0**	**1**	**1**	**2**	**0**	**1**

Course Code & Name: 16IT3001 Data Structures Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	0	0	0	1	0	0	0	0	0	1	1	1	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0
Avg	**3**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**

Course Code & Name: 16IT3002 Operating Systems Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	0	0	2	0	0	0	0	0	1	2	3	0
CO2	3	2	1	0	1	0	0	0	0	0	0	3	2	0
CO3	3	2	0	0	3	0	0	0	0	1	0	2	0	0
CO4	3	3	1	0	0	0	0	0	0	0	1	2	0	0
CO5	3	3	0	0	0	0	0	0	0	1	1	3	1	0
Avg	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**0**

Course Code & Name: 16IT3003 Database Management Systems Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	0	0	0	0	0	0	0	0	1	3	3	2
CO2	2	1	1	0	0	0	0	0	0	0	0	1	2	2
CO3	2	1	2	0	0	0	0	0	0	1	0	2	0	2
CO4	3	3	1	0	0	0	0	0	0	0	1	1	0	2
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	2
Avg	**2**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**2**

Semester – IV

Course Code & Name: 16MA4108 Probability and Queuing Theory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
Avg	3	3	3	2	2	-	-	-	-	-	-	2	2	2

Course Code & Name: 16IT4201 Java Programming

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	0	0	3	0	0	0	0	0	2	2	1	2
CO2	3	1	3	0	3	0	0	0	1	0	0	1	1	2
CO3	3	3	2	0	3	0	0	0	0	1	0	3	0	1
CO4	1	1	3	0	0	0	0	0	1	0	1	1	0	1
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	1
Avg	**3**	**2**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**1**

Course Code & Name: 16IT4202 Design and Analysis of Algorithm

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	0	2	0	0	1	0	1	1	3	1	0
CO2	3	2	2	0	1	0	0	1	0	1	0	1	0	0
CO3	3	2	1	0	3	0	0	1	0	1	0	2	1	0
CO4	3	2	3	0	2	0	0	1	0	1	1	1	1	1
CO5	3	2	3	0	1	0	0	1	0	1	1	1	1	0
Avg	**3**	**2**	**2**	**0**	**2**	**0**	**0**	**1**	**0**	**1**	**1**	**2**	**1**	**0**

Course Code & Name: 16IT4203 Software Analysis and Design

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	3	0	3	0	1	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0
Avg	**3**	**2**	**2**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**

Course Code & Name: 16IT4204 Computer Architecture

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	0	2	0	0	1	0	1	1	3	1	0
CO2	3	2	2	0	1	0	0	1	0	1	0	1	0	0
CO3	3	2	1	0	3	0	0	1	0	1	0	2	1	0
CO4	3	2	3	0	2	0	0	1	0	1	1	1	1	1
CO5	3	2	3	0	1	0	0	1	0	1	1	1	1	0
Avg	**3**	**2**	**2**	**0**	**2**	**0**	**0**	**1**	**0**	**1**	**1**	**2**	**1**	**0**

Course Code & Name: 16IT4205 Information Theory and Coding Techniques

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	0	0	3	0	0	0	0	0	2	2	1	2
CO2	3	1	3	0	3	0	0	0	1	0	0	1	1	2
CO3	3	1	2	0	3	0	0	0	0	1	0	3	0	1
CO4	1	1	3	0	0	0	0	0	1	0	1	1	0	1
CO5	3	1	1	0	0	0	0	0	0	1	1	1	1	1
Avg	**3**	**1**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**1**	**1**

Course Code & Name: 16IT4001 Java Programming Laboratory

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	0	0	0	1	0	0	0	0	0	1	1	1	0
CO2	3	2	1	1	1	0	0	0	1	0	0	1	1	0
CO3	3	2	1	1	1	0	0	0	1	1	0	1	0	1
CO4	3	2	1	1	0	0	0	0	1	0	1	1	0	1
CO5	3	0	0	0	0	0	0	0	0	1	1	1	1	0
Avg	**3**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**

Course Code & Name: 16IT4002 Algorithms Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	3	0	3	0	1	0
CO2	3	1	2	2	2	3	0	1	2	0	3	2	1	0
CO3	3	3	2	2	2	3	0	1	2	0	2	2	1	0
CO4	3	1	2	2	0	3	0	1	0	0	2	2	1	0
CO5	3	1	2	1	2	0	0	0	0	0	2	3	1	0
Avg	**3**	**2**	**2**	**2**	**2**	**2**	**0**	**1**	**1**	**0**	**2**	**2**	**1**	**0**

Course Code & Name: 16IT4003 Case Tools Lab

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	0	3	0	0	0	0	0	3	0	3	0	1	0
CO2	3	0	2	0	0	3	0	1	2	0	3	0	1	0
CO3	3	0	2	0	0	3	0	1	2	0	2	0	1	0
CO4	3	0	2	0	0	3	0	1	0	0	2	0	1	0
CO5	3	0	2	0	0	0	0	0	0	0	2	0	1	0
Avg	**3**	**0**	**2**	**0**	**0**	**2**	**0**	**1**	**1**	**0**	**2**	**0**	**1**	**0**

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I	I	**16MA1101**	Engineering Mathematics-I	3	3	3	2	2	-	-	-	-	-	-	2	2	2
		16PH1101	Engineering Physics	3	2	3	2	2.6		2						1.2	1.2
		16CY1101	Engineering Chemistry	3	2	2	2	2	1	-	-	-	-	-	1	1	1
		16HE1101	English for Engineers -I	1	1	1	1.3		1.8	1		2	3		1.6	1	1
		16GE1103	Problem Solving and Python Programming	2	3	2	2	2	-	-	-	-	-	-	1	1	1
		16EC1202	Basics of Electronics Engineering	2	0	0	0	0	2	3	3	2		2	2	2	1
		16PS1001	Physical Sciences Laboratory - I	3	2	3	2	2.6		2						1.2	1.2
		16GE1004	Problem Solving and Python Programming Lab	3	2	3	1	2	-	-	-	-	-	-	2	3	1
		16GE1002	Engineering Practices Laboratory	2	1	1			1	3	3	2		2	2	2	1
	II	**16MA2102**	Engineering Mathematics-II	3	3	3	2	2	-	-	-	-	-	-	2	1	2
		16PH2102	Physics of Materials	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4
		16CY2102	Environmental Sciences	2		1	1		2	3	3	2		2	2	2	1
		16HE2102	Essential English for Engineers - II	2	1.3	2	1	1	2			1.6	2.8		2	1.25	1
		16GE2102	Engineering Graphics	3	2	3	2	2.6		2						1.2	1.2
		16IT2202	Programming in C and C++	3	3	2	2	2	2	0	1	0	1	1	2	0	1

		16PS2001	Physical Sciences Laboratory - II	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4
		16IT2002	Programming in C and C++ Laboratory	2	3	1	0	2	2	0	1	0	1	1	2	0	1
II	**III**	**16MA3105**	Discrete Mathematics and Graph Theory	3	3	2	2	2	2	0	1	0	1	1	2	0	1
		16IT3201	Digital Principles And System Design	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16IT3202	Data Structures	3	2	0	0	1	0	0	0	0	0	1	2	1	0
		16IT3203	Database Management Systems	2	2	1	0	0	0	0	0	0	0	1	2	1	2
		16IT3204	Operating System	3	3	2	2	2	2	0	1	0	1	1	2	0	1
		16IT3001	Data Structures Laboratory	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16IT3002	Operating Systems Laboratory	3	2	0	0	1	0	0	0	0	0	1	2	1	0
		16IT3003	Database Management Systems Laboratory	2	2	1	0	0	0	0	0	0	0	1	2	1	2
	IV	**16MA4108**	Probability And Queuing Theory	3	3	3	2	2	-	-	-	-	-	-	2	2	2
		16IT4201	Java Programming	3	2	2	0	2	0	0	0	0	0	1	2	1	1
		16IT4202	Design and Analysis of Algorithm	3	2	2	0	2	0	0	1	0	1	1	2	1	0
		16IT4203	Software Analysis and Design	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT4204	Computer Architecture	3	2	2	0	2	0	0	1	0	1	1	2	1	0

		16IT4205	Information Theory and Coding Techniques	3	1	2	0	2	0	0	0	0	0	1	2	1	1
		16IT4001	Java Programming Laboratory	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16IT4002	Algorithms Lab	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT4003	Case Tools Lab	3	0	2	0	0	2	0	1	1	0	2	0	1	0

1-Low, 2-Medium, 3-High, - No Correlation

Chairman, Board of Studies

Chairman - BoS
IT - HiCET

Dean – Academics

Dean (Academics)
HiCET