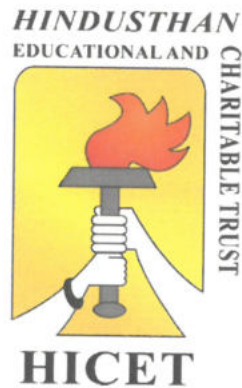# HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(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

2018-2019

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

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 a member 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 and receive 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

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, Tamil Nadu.

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 2018-2019 and onwards

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	50	50	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 Lab	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	325	675	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	25	75	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

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8	16IT2002	Programming in C and C++ Laboratory	0	0	4	2	50	50	100
9	16GE2001	Value Added Course: Language Competency Enhancement Course-II	0	0	2	1	0	100	100
		Total Credits:	17	2	12	25	275	625	900

For the students admitted during the academic year 2017-2018 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

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

		SEMESTER-V							
S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
1	16IT5201	Computer Networks	3	0	0	3	25	75	100
2	16IT5202	Web Technology	3	0	0	3	25	75	100
3	16IT5203	Information Security	3	0	0	3	25	75	100
4	16IT5204	Theory of Computation	3	0	0	3	25	75	100
5	16IT53XX	**Professional Elective-I**	3	0	0	3	25	75	100
6	16IT5001	Network Laboratory	0	0	4	2	50	50	100
7	16IT5002	Web Technology Laboratory	0	0	4	2	50	50	100
8	16IT5701	Technical Seminar	0	0	4	2	50	50	100
		Total	**15**	**0**	**12**	**21**	**275**	**525**	**800**

		SEMESTER VI							
S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
1	16IT6201	Mobile Computing	3	0	2	4	50	50	100
2	16IT6202	Microcontrollers and Embedded Systems	3	0	0	3	25	75	100
3	16IT6203	Software Testing and Quality Assurance	3	0	0	3	25	75	100
4	16IT6204	Professional Ethics	3	0	0	3	25	75	100
5	16IT63XX	**Professional Elective II**	3	0	0	3	25	75	100
6	16XX64XX	**Open Elective I**	3	0	0	3	25	75	100
7	16IT6001	Embedded Systems Laboratory	0	0	4	2	50	50	100
8	16IT6002	Open Source Software Laboratory	0	0	4	2	50	50	100
9	16IT6801	Mini Project	0	0	6	3	50	50	100
		Total	**18**	**0**	**16**	**26**	**325**	**575**	**900**

		PROFESSIONAL ELECTIVE-I							
1	16IT5301	Graphics and Multimedia	3	0	0	3	25	75	100
2	16IT5302	Soft Computing	3	0	0	3	25	75	100
3	16IT5303	System Software	3	0	0	3	25	75	100

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4	16IT5304	High Speed Networks	3	0	0	3	25	75	100
5	16IT5305	Data Warehousing and Data Mining	3	0	0	3	25	75	100
6	16IT5306	Software Design Patterns	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE – II									
1	16IT6301	Multimedia Communications	3	0	0	3	25	75	100
2	16IT6302	Artificial Intelligence	3	0	0	3	25	75	100
3	16IT6303	Compiler Design	3	0	0	3	25	75	100
4	16IT6304	Cryptography and Network Security	3	0	0	3	25	75	100
5	16IT6305	Business Intelligence	3	0	0	3	25	75	100
6	16IT6306	Human Computer Interface	3	0	0	3	25	75	100

OPEN ELECTIVE									
1	16IT6401	Cyber Security and Forensics	3	0	0	3	25	75	100

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

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Principal PRINCIPAL
Hindusthan College of Engineering & Technology
COIMBATORE - 641 032

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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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1

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.						
	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 RaiPublications (P) Ltd., New Delhi, 2013.

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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.,NewDelhi 2014

R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

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Programme B.TECH.	Course Code 16CY1101	Name of the Course ENGINEERING CHEMISTRY	L 3	T 0	P 0	C 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 from understanding the mechanism involved. 5. Describe the basic properties and application of nanomaterials.

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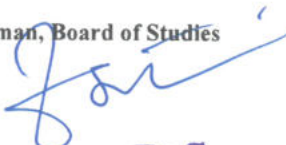
TEXT BOOKS

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 BOOKS

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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5

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 Learning press 2013.
REFERENCE BOOKS :
R1 - Meenakshi Raman and Sangeetha Sharma. "Technical Communication-Principles and Practice", 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
		PROBLEM SOLVING AND PYTHON				
B.TECH.	16GE1103	PROGRAMMING	3	0	0	3
		(COMMON TO ALL BRANCHES)				

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
I	**ALGORITHMIC PROBLEM SOLVING** 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: To find the greatest among three numbers, prime numbers ,find minimum in a list.	9
II	**DATA, EXPRESSIONS, STATEMENTS** 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, compute Simple interest for a given amount, Factorial of a given number.	9
III	**CONTROL FLOW, FUNCTIONS** 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
IV	**LISTS, TUPLES, DICTIONARIES** 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
V	**FILES, MODULES, PACKAGES** 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 WebApplications, PEARSON,2017

REFERENCE BOOKS: R1 - Reema Thareja " Python Programming Using Problem Solvimg 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 THE EXPERIMENTS	TOTAL PRACTICAL HOURS

I CIVIL ENGINEERING PRACTICE

Study of plumbing and carpentry components of Residential and Industrial buildings.

(A) PLUMBING WORKS:

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 TOOLS ONLY:

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

2. Hands-on-exercise in wood works by sawing, planning and cutting.

II MECHANICAL ENGINEERING

(A) Welding:

1.   Preparation of arc welding of Butt joints, Lap joints and Tee joints

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

CourseOutcome

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) PrivateLtd.,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, Pearsonpublishing, 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. |

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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HUMAN POPULATION AND THE ENVIRONMENT

V 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	Course Code	Name of the Course	L	T	P	C
B.TECH.	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 to it.
✓ 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 PublishersR2 - 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", 5thEdition 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

<table>
<tr><td rowspan="5">Course Objective</td><td>1.</td><td>Learn the basic of C programming.</td></tr>
<tr><td>2.</td><td>Gain knowledge in functions and pointers.</td></tr>
<tr><td>3.</td><td>Be familiar with the C++ concepts of abstraction, encapsulation, constructor.</td></tr>
<tr><td>4.</td><td>To understand the concepts of polymorphism, overloading and Inheritance</td></tr>
<tr><td>5.</td><td>To learn the concept of file and exception handling and use built classes from STL.</td></tr>
</table>

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 directed graphs.	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.
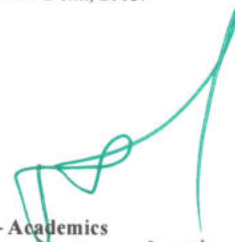
R2 - Kenneth H.Rosen, "Discrete Mathematics and its Applications", seventh Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2013.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
		DIGITAL PRINCIPLES AND SYSTEM				
B.TECH.	16IT3201	DESIGN	3	0	2	4
		(CSE & IT)				

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	**BOOLEAN ALGEBRA 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.	10
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.	10
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.	7
	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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	CO1: Simplify boolean functions using different methods.
Course Outcome	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",SecondEdition, 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 (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	CO1: Understand the concepts basic data structures and apply it in implementing linked list. CO2: Understand the implementation of Stack and Queue CO3: Understand the concepts of different Non-Linear Data Structures tree and apply it to design algorithms for various applications trees CO4: Understand the Graph algorithms and apply it to finding shortest path and Minimum spanning Tree CO5: Understand sorting, searching and hash functions.

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

<table>
<tr><td rowspan="5">Course Objective</td><td>1. Learn the basic file systems and database design.</td></tr>
<tr><td>2. Acquire knowledge about ER diagrams and Normalization.</td></tr>
<tr><td>3. Gain knowledge about various SQLs and optimization techniques</td></tr>
<tr><td>4. Familiarize with the concepts of transactions and concurrency control.</td></tr>
<tr><td>5. Acquire knowledge about various storage media and databases.</td></tr>
</table>

Unit	Description	Instructional Hours
I	**INTRODUCTION TO DBMS** Purpose of Database System - Database characteristics - Views of data –Data models – Types of data models – 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

<table>
<tr><td rowspan="7">Course Outcome</td><td>Upon completion of this course, the students will be able to</td></tr>
<tr><td>CO1: Able to design a data model.</td></tr>
<tr><td>CO2: Apply ER diagrams and normalization concepts for real time applications.</td></tr>
<tr><td>CO3: Apply SQL queries and optimization techniques in real time.</td></tr>
<tr><td>CO4: Apply transactions and concurrency mechanisms for real time applications.</td></tr>
<tr><td>CO5: Evaluate the performance of various storage media.</td></tr>
</table>

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, Tata McGraw Hill, 2011.

REFERENCE BOOKS :

R1- C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 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 (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 File systems. 5. Learn the Distributed operating systems

Unit	Description	Instructional hours
I	**OPERATING SYSTEMS OVERVIEW** Introduction –operating systems overview- Evolution of Operating System.- Computer System Organization-Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.	7
II	**PROCESS MANAGEMENT** Processes-Process Concept, Process Scheduling, Inter-process Communication; Threads-Overview, Multicore Programming, Multithreading Models. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and Deadlocks	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 implementation, Allocation Methods, Free Space Management	9
V	**CASE STUDY: LINUX** Linux system – History- Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Input and output – Inter-process Communication- Network Structure – Security- Virtualization- Basic Concepts,	9
	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome	CO1: Understand and gain knowledge about the basic structure of OS and system calls. CO2: Understand the concepts of CPU scheduling, deadlock and analyze it with various process management techniques. CO3: Apply and analyze the page replacement algorithm with various memory management schemes CO4: Understand the Mass Storage Structure and File system Structure to apply a prototype file system.. CO5: Understand the virtualization concept in Linux operating system.

TEXT BOOK:

T1:Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

T2: Tom Adelstein, Bill Lubanovic , "Linux System Administration Solve Real-life Linux ProblemsQuickly", O'Reilly Media.

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: Harvey M.Deitel-Operating systems,Third Edition,Pearson/Prentice Hall,2004.

R4: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 LAB(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

Database Design and implementation (Mini Project)
a) Inventory Control System.
b) Material Requirement Processing.
c) Hospital Management System.

12. 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 Java Language, 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 Container Listener 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 algorithmsCO5: 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, "Introduction to the Design and Analysis of Algorithms",Pearson Publications, 3rd Edition, 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 EngineeringProcess-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 abehavior 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-Usecase Modeling-Class Modeling-State Modeling-Interaction Modeling.	10
V	**REQUIREMENTS & MORE MODELING** Object Constraint Language- Inception- Evolutionary Requirements- Domain Models-SystemSequence 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 betterinformation systems.
CO2: Discuss the aims and objectives of information systems in the context of a human activity systemfor better systems development.
CO3: Understand analysis and design techniques and methods to meet the special needs of currentinformation 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, Seventhedition, 2009.
T2-Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Prentice- Hall ofIndiaIndia, 2005.
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 and virtual memory. 5. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

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 word parallelism., 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 to CO1: 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.
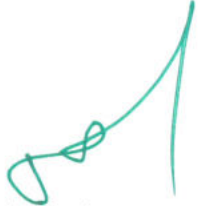
REFERENCE BOOKS :

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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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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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5201	COMPUTER NETWORKS (COMMON TO CSE &IT)	3	0	0	3

Course
Objective

1. Understand the functionalities into layers and networking devices.
2. Understand the techniques of channel access and data communication
3. Be expose to methods used for routing and concepts of Subnetting
4. Learn the flow control and congestion control algorithms
5. Have knowledge in different application protocols used in computer networks

Unit	Description	Instructional hours
I	**INTRODUCTION &DATA LINK LAYER** Building a network – Requirements – Layering and protocols – Internet Architecture – networking devices – modems, routers, switches, gateways; Link layer Services – Framing – Error Detection – Flow control- media access control.	10
II	**DATA COMMUNICATION** Signal characteristics – Data transmission – Physical links and transmission media – Signal encoding techniques - Channel access techniques – TDM – FDM-CDM	8
III	**NETWORK AND ROUTING** Circuit switching – packet switching – virtual circuit switching – Routing— RIP – OSPF - – IPv6-Metrics- IP – Global Address — Subnetting – CIDR - ARP – DHCP.	9
IV	**TRANSPORT LAYER** Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements	9
V	**APPLICATION LAYER** Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP	9

Total Instructional Hours 45

Course
Outcome

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

CO1: Identify the components required to build different types of networks and aware of mediaaccess control

CO2: Understand the data communication system and the purpose of layered architectureCO3: Understand the concepts of Routing methods and Subnetting.

CO4: Apply the Congestion control mechanism and Connection methods

CO5: Identify protocols used for various Application

TEXT BOOK:

T1: Larry L. Peterson, Bruce S. Davie, "Computer Networks: A SystemsApproach",Fifth Edition, Morgan Kaufmann Publishers,2011.

T2:Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw – Hill, 2012.

REFERENCES:

R1: James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Seventh Edition, Pearson Education, 2017.

R2: Nader. F. Mir, "Computer and Communication Networks", Second Edition Pearson Prentice Hall Publishers, 2015.R3: Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

R4: Andrew S Tanenbaum, David J. Wetherall "Computer Networks", Prentice Hall of India Pearson Education, NewDelhi, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5202	WEB TECHNOLOGY	3	0	0	3

Course Objective

1. Understand the basics of HTML and CSS.
2. Familiar about client side scripting JavaScript
3. Learn about the Server side scripting language–Servlet
4. Learn about the Server side scripting language–PHP
5. Aware of XML and web services.

Unit	Description	Instructional Hours
I	**UNIT I HTML AND CSS** Web essentials -Basics of HTML, formatting and fonts, color, hyperlink, lists, tables, images, forms, frames and frame sets – HTML5 – CSS ,syntax and selectors, Inline, Embedded and External style sheet- background images, colors and properties, manipulating texts, using fonts, borders and boxes, positioning using CSS.	10
II	**UNIT II CLIENT SIDE TECHNOLOGY –Java script** Introduction to JavaScript, variables, conditions and loops, functions, Arrays- Built – in objects- DOM -Element access in java Script- Modifying Element Style- Event handling.	9
III	**UNIT III SERVER SIDE TECHNOLOGY : Servlet** Servlet Overview - Life cycle of a Servlet - – Generating Dynamic Content -Handling HTTP GET and POST request - parameter data-Using Cookies - Session tracking.-url rewriting.	8
IV	**UNIT IV SERVER SIDE TECHNOLOGY : PHP** Introduction and basic syntax of PHP, decision and looping, Arrays, Functions, String, file handling, PHP form handling-PHP Sessions.	9
V	**UNIT V XML and WEB SERVICES** Xml basics-Xml DTD – Xml scheme - XSL – XSLT- Web services-UDDI-WSDL- Case studies: creating a web application for online book store/online voting system for your own district.	9

Total Instructional Hours 45

Course Outcome

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

CO1: Apply the basic knowledge of HTML and CSS in designing web pages.
CO2: Create an application using client side scripting language.
CO3: Create an application using server side scripting language-servlet
CO4: Create an application using server side scripting language-PHP
CO5: knowledge about the XML and web services

TEXT BOOK:

T1 Deitel H.M., Deitel P.J , "Internet & World Wide Web How To Program", Fourth Edition, Pearson Education, 2012.
T2 Robert. W. Sebesta, "Programming the World Wide Web", Eighth Edition, Pearson Education, 2014.

REFERENCES:

1. Marty Hall and Larry Brown, "Core Servlets And Javaserver Pages", SecondEdition
2. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education,2011
3. Gopalan N.P. and Akilandeswari J., "Web Technology" Prentice Hall of India,2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5203	**INFORMATION SECURITY**	3	0	0	3

Upon completion of this course, the students will be familiar with

<table>
<tr><td rowspan="5">Course
Objectives</td><td>1.</td><td>Basics of Information Security</td></tr>
<tr><td>2.</td><td>Legal, ethical and professional issues in Information Security</td></tr>
<tr><td>3.</td><td>Risk Management</td></tr>
<tr><td>4.</td><td>Various standards in this area</td></tr>
<tr><td>5.</td><td>Technological aspects of information security</td></tr>
</table>

Unit	Description	Instructional Hours
I	**INTRODUCTION** Content History-Critical Characteristic of Information-CNSS Security Model-Components of an Information Systems-Securing the components-Balancing security and Access-The SDLC-The Security SDLC, Security Professional and the Organization, communities of Interest.	9
II	**SECURITY INVESTIGATION** Need for security-Business needs-Threats-Attacks-secure Software development-Legal-Ethical and professional issues-Law and Ethics in Information Security-Relevant U.S. Laws-International Laws and Legal Bodies-Ethics and Information Security-codes of ethics and professional Organizations	9
III	**RISK MANAGEMENT** Risk Management: An Overview of Risk Management, Risk Identification, Risk Assessment, Risk control strategies, selecting a Risk Control Strategy, Quantitative verses Qualitative-Risk control Practices, Risk Management Discussion Points	9
IV	**SECURITY STANDARDS AND PRACTICES** Database Security -Introduction, Problems in Databases Security, Controls -OWASP Secure Coding Standards -VISA International Security Model-Design of Security Architecture-Planning for Continuity	9
V	**SECURITY TECHNOLOGY** Security Technology : Access control, Firewalls, Protecting remote connections, Security technology: Intrusion detection and Prevention Systems and other security tools: Honeypots, Honeynets, and padded cell Systems ,IDPS, Scanning and Analysis Tools, Cryptography ,Access Control devices, Physical Security, and security and personnel.	9

Total Instructional Hours 45

<table>
<tr><td rowspan="6">Course
Outcome</td><td>Upon completion of this course, the students will be able to</td></tr>
<tr><td>CO1: Gain some basic knowledge about information security</td></tr>
<tr><td>CO2: Solve the legal, ethical and professional issues in information security</td></tr>
<tr><td>CO3: Understand Risk management</td></tr>
<tr><td>CO4: Construct Security architecture and understand various standards in this area.</td></tr>
<tr><td>CO5: Understand the technological aspects of Information security.</td></tr>
</table>

Text Books:

T1.Michal E Whitman and Herbert J Mattord," Principles of Information Security " vikas Publishing House ,NewDelhi2012

Reference Books:

R1. Micki Krause, HaroldF. Tipton," Handbook of Information Security Management", Vol 1-3 CRC Press LLC,2004.R2. Stuart McClure, Joel Scrambray George Kurtz," Hacking Exposed " Tata McGraw-Hill 2003.

R3. Matt Bishop," Computer Security art and Science", Pearson/PHI,2002

R4. Hassan A. Afyouni , "Database Security and Auditing: Protecting Data Integrity and Accessibility", 1st Edition, Cengage Learning Publishers, 2013

R5. https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_Guide

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5204	**THEORY OF COMPUTATION** **(COMMON TO CSE & IT)**	3	0	0	3

Course Objective	1. To understand and design various Computing models in Finite State Machines
	2. To learn about regular expression and its equivalence with Finite Automata.
	3. To recognize about the concepts of Pushdown Automata
	4. To be aware of the concepts of Turing Machine
	5. To analyze and aware of Decidability and Un-decidability of various problems

Unit	Description	Instructional Hours
I	**FINITE AUTOMATA** Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves- Equivalence o DFA anNFA- NFA to DFA conversion-Applications of finite automata.	9
II	**REGULAR EXPRESSIONS** Regular Languages- Regular Expression- Converting Regular Expression to FA- Converting FA to Regular Expression - Equivalence of finite Automata and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.	9
III	**GRAMMARS AND PUSHDOWN AUTOMATA** Chomsky hierarchy of languages-Context-Free Grammar (CFG) - Parse Trees - Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata- Normal forms for CFG – Chomsky Normal Form (CNF) – Greibach Normal Form (GNF) - PumpingLemma for Context Free Language (CFL) - Closure Properties of CFL.	9
IV	**TURING MACHINE** Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem –Partial Solvability – Problems on Turing machine.	9
V	**COMPUTATIONAL COMPLEXITY** Undecidability- Basic definitions- Decidable and undecidable problems-Properties of Recursive and Recursively enumerable languages – PCP – MPCP. Introduction to Computational Complexity: Definitions-Time and Space complexity of TMs–Complexity classes – Introduction to NP-Hardness and NP-Completeness	9
	Total Instructional Hours	45

Course Outcome	Upon completion of this course, the students will be able toCO1:
	Design finite state machine using basic concepts.
	CO2: Prove the equivalence between regular expression and finite automata
	CO3: Derive a grammar for the given language and to design pushdown automata for given language.CO4: Design Turing machine for given language.
	CO5: Apply the concepts of Decidability and Un-decidability for real time problems.

TEXT BOOKS:

T1- Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations",Third Edition, Pearson Education
T2- John C Martin, "Introduction to Languages and the Theory of Computation", Fourth Edition, Tata Mc GrawHill Publishing Company, New Delhi, 2011.
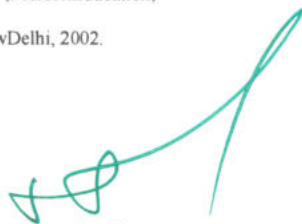
REFERENCE BOOKS :

R1 - Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation",Third Edition, Prentice Hall of India, 2004.
R2- Kamala Krithivasan, R Rama," Introduction to Formal Languages, Automata Theory and Computation. ",PearsonEducation, New Delhi,2009
R3- Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, NewDelhi, 2002.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5001	NETWORK LABORATORY (COMMON TO CSE & IT)	0	0	4	2

Course Objective	1.Be familiar with simulation tools 2.Learn socket programming 3.Have hands on experience on various networking protocols 4.Learn about the network simulation

Expt. No.	Description of the Experiments
1.	Implementation of Stop and Wait Protocol and Sliding Window Protocol
2.	Study of Socket Programming and Client – Server model
3.	Write a code simulating ARP /RARP protocols
4.	Write a code simulating PING and TRACEROUTE commands
5.	Create a socket for HTTP for web page upload and download
6.	Write a program to implement RPC (Remote Procedure Call)
7.	Implementation of Subnetting
8.	Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
9.	Applications using TCP and UDP Sockets like a. DNS b. SNMP c. File Transfer
10.	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS
11.	Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and plot congestion window for different source / destination.
12.	Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. a. Link State routing b. Flooding c. Distance vector

Total Practical Hours   45

Course Outcome	Upon completion of this course, the students will be able to CO1:Use simulation tools CO2: Implement the various protocols CO3: Analyze the performance of the protocols in different layers CO4: Analyze various routing algorithms CO5: Learn about the network simulation

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5002	WEB TECHNOLOGY LABORATORY	0	0	4	2

Course Objective

1. Familiar with Web page design using HTML and stylesheets.
2. Learn to write scripting language.
3. Learn to create dynamic web pages using server side scripting.
4. Familiar with PHP
5. Learn to write XML document and create a web services

Expt. No.	Description of the Experiments	Hours
1.	Create the personal home page using HTML which has properly aligned paragraphs with images along with it	
2.	Implement a website for Information Technology department using i)Frameset ii)Tables iii)List iv)Internal linking v)Hyperlink	
3	Create a web page using CSS i. Text properties ii. Background images, colors iii. CSS positioning and borders	
4.	Create a Course Registration form with validation	
5	Develop a Java script program to get Register number and mark as input and print the student total mark and grades	
6	Create a sever side program to invoke servlet from HTML forms	
7	Create a server side program for session handling	
8	Create a web program using AJAX	
9	File handling using PHP	
10	Design and implementation of any one application using PHP connecting to the database.	
11	Write a Programs using XML – Schema – XSLT/XSL	
12	Write a program to implement web service for calculator application	
Total Practical Hours		**45**

Course Outcome

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

CO1: Design Web pages using HTML and CSS.
CO2: Apply and implement scripting languages in web pages using DOM.
CO3: Create dynamic web pages using server side scripting.
CO4: Implement applications using PHP.
CO5: Creating web services for an application

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5701	TECHNICAL SEMINAR	0	0	4	2

Course Objective

1. To encourage the students to study advanced technology developments.
2. To prepare and present technical reports.
3. To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative model.
4. To promote and develop presentation skills
5. To set the stage for future recruitment by potential employers.

Expt. No.	Description of the Experiments
1.	During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. Mock interview and GD Practices will be conducted and evaluation is based on performance. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Total Practical Hours   45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Review, prepare and present technological developments
CO2: Gain confidence to face the placement interviews
CO3: Develops Communication Confidence skills
CO4: Present technical material using audiovisual aids.
CO5: Determine and develop personal presentation style.

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Programme B.TECH.	Course Code 16IT6201	Name of the Course MOBILE COMPUTING	L 3	T 0	P 2	C 4

Course Objective
1. Explain the basic concepts of mobile computing.
2. Explain the architecture and components of Mobile Operating Systems
3. 3.Describe the various schemes in MAC protocols.
4. Explain the functionalities of Mobile IP protocols
5. Discuss on routing and security issues in Ad hoc and Sensor networks.

Unit	Description	Instructional Hours
I.	**CELLULAR TECHNOLOGY** Mobile Computing – Mobile Computing Vs Wireless Networking- Mobile Computing Applications – Characteristics of Mobile computing – Structure of Cellular Mobile Communication –GSM – services – Architecture – GPRS – services – Architecture services – UMTS	9
II.	**MOBILE APPLICATION DEVELOPMENT AND OPERATING SYSTEMS** Responsibilities of OS in Mobile device – Mobile O/S-Windows Mobile-PalmOS-Symbian OS Android and Blackberry OS-Mobile Devices as Web clients-WAP-Android Software Development Kit-M-Commerce-B2C and B2B applications-Security Issues	9
III.	**MAC PROTOCOLS** Properties – Wireless MAC – Taxonomy – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes – 802.11 MAC standards, MAC protocols for AdHoc networks, Cognitive Radio ad-Hoc networks	8
IV.	**MOBILE INTERNET PROTOCOL AND MOBILE DATABASE** Mobile IP – Terminologies of Mobile IP – Packet Delivery – Features of Mobile IP – Key Mechanism– Route optimization DHCP – Significance of DHCP, Transaction Processing in mobile Environment, Mobile Transaction models.	9
V.	**MOBILE ADHOC NETWORKS &WIRELESS SENSOR NETWORKS** MANET : Characteristics – Routing Protocols- VANET –Security issues in MANET – Attacks on Adhoc Networks – Sensor Networks: Characteristics -Routing Protocols.	9

	Total Instructional Hours	44

EXP. NO	MOBILECOMPUTING LAB	Practical Hours
	LIST OF EXPERIMENTS	
1	Develop an application that uses GUI components, Font and Colors	2
2	Develop an application that uses Layout Managers and eventlisteners.	2
3	Develop a native calculator application.	2
4	Write an application that draws basic graphical primitives on the screen.	2
5	Develop a native application that uses GPS location information.	2
6	Implement an application that creates an alert upon receiving a message.	2
7	Write a mobile application that creates alarm clock	2
8	Develop an application that makes use of database.	2
	Total Practical Hours	16

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	Upon completion of this course, the students will be able to
Course Outcome	CO1: To learn the basic concepts of mobile computing and its applications.
	CO2: Execute and analyse the components of Mobile Operating Systems
	CO3 Understand the various schemes in MAC protocols.
	CO4: Understand and demonstrate the functionalities of Mobile IP protocols
	CO5: Understand the routing and security issues in Ad hoc and Sensor networks

TEXT BOOKS:

T1- Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, Second Edition, New Delhi ,2015.
T2 - Jochen H. Schller, "Mobile Communications", Pearson Education, Second Edition, New Delhi, 2007

REFERENCE BOOKS:

R1 - Raj Kamal, "Mobile Computing", Oxford University Press, New Delhi, 2012.
R2- Asoke K Talukder, Hasan Ahmed and Roopa R Yavagal, "Mobile Computing – Technology, Applications and Service Creation", Tata McGraw Hill, New Delhi, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	**16IT6202**	**MICROCONTROLLERS AND EMBEDDED SYSTEMS**	**3**	**0**	**0**	**3**

<table>
<tr><td rowspan="5">Course Objective</td><td>1. To conceptualize the basics of organizational and architectural issues of microcontroller.</td></tr>
<tr><td>2. To learn programming techniques used in microcontroller.</td></tr>
<tr><td>3. To understand the basic concepts of ARM processor.</td></tr>
<tr><td>4. To understand the fundamentals of embedded computing and memory mechanisms.</td></tr>
<tr><td>5. To learn the software development tools.</td></tr>
</table>

Unit	Description	Instructional Hours
I	**THE MICROCONTROLLER ARCHITECTURE** Introduction to 8051 Microcontroller- Pin configuration -Architecture- Input /Output Ports-Addressing modes.	9
II	**INTERFACING MICROCONTROLLER** Timers- Serial Port - Interrupts - LCD & Keyboard Interfacing- ADC,DAC & Sensor Interfacing- External Memory Interface- Stepper Motor	9
III	**ADVANCED RISC MACHINES** ARM Embedded Systems- ARM Processor: Architecture, Registers, CPSR,Processor Operating modes-Brief introduction to Exceptions, Interrupts and Vector Table-Instruction set: Data processing, Load-Store, Branch-Addressing modes.	9
IV	**EMBEDDED COMPUTING AND MEMORY MANAGEMENT** Characteristics of Embedded Computing- Challenges of Embedded Systems- Embedded system design process-Memory System Mechanisms: Caches, Memory System Performance, MMU and Address Translation-Interrupts Handling.	9
V	**EMBEDDED SYSTEM DEVELOPMENT** Embedded software development tools-Emulators and debuggers. Design issues-Design methodologies-Case studies- Digital Camera, Smart card, Mobile phone software.	9
	Total Instructional Hours	**45**

<table>
<tr><td rowspan="6">Course Outcome</td><td>Upon completion of this course, the students will be able to</td></tr>
<tr><td>CO1: Ability to understand basic structure microcontroller.</td></tr>
<tr><td>CO2: Ability to program microcontroller.</td></tr>
<tr><td>CO3: Ability to understand ARM Processor architecture.</td></tr>
<tr><td>CO4: Ability to understand memory system mechanisms</td></tr>
<tr><td>CO5: Ability to design conceptual embedded system.</td></tr>
</table>

TEXT BOOKS:

T1-Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, "The 8051Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011.
T2-Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCE BOOKS :

R1-ARM System Developer's Guide: Designing and Optimizing System Software,Elsevier,2004.
R2- Rajkamal,"Embedded Systems Architecture, Programming and Design",Second Edition,2011.
R3-Daniel W Lewis, "Fundamentals of Embedded Software", Pearson Education Asia, 2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6203	SOFTWARE TESTING AND QUALITY ASSURANCE	3	0	0	3

Course Objectives

1. Understand basic concepts of software testing.
2. Understand the levels of testing and types of testing.
3. Learn the testing and debugging policies with the types of review.
4. Study about basics of software quality.
5. Learn various metrics of software quality.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**INTRODUCTION** Testing as an Engineering activity -Testing as process- Testing Principles- Testing axioms, The tester's role in software development organization- Origins of Defects- Costs of defects- defect classes- defect prevention strategies.	8
II	**SOFTWARE TESTING METHODS AND TESTING LEVELS** Testing Fundamentals - White box and its types -Black box and its types-Need for levels of testing-unit testing- Integration testing- system testing-acceptance testing- performance testing-regression testing -alpha and beta testing	9
III	**VERIFICATION, VALIDATION AND REVIEWS** Verification Testing - Requirement phase Testing – Design phase testing – Programming phase testing – Test during requirement- Design and Programming Phase - Validation Testing - Build test data – Execute Results - Record Test Results. Measurement and milestones for controlling and monitoring-Reports and control issues-criteria for test completion-SCM-Reviews-Testing Tools- Load Runner-Win Runner.	10
IV	**INTRODUCTION TO SOFTWARE QUALITY** Basis for Software quality-Quality attribute-quality assurance-TQM principles – software processes and methodologies-Quality standards, practices and convention- improving quality with methodologies-measuring customer satisfaction-software quality engineering-defining quality requirements-management issues for software quality-data quality control-bench marking and certification.	9
V	**SOFTWARE QUALITY METRICS AND RELIABILITY** Writing software requirements and design specification-analyzing software documents using inspections and walkthroughs-software metrics-lines of code, Cyclomatic complexity, function points, Feature points-software cost estimation-Reliability models- OO Metrics.	9
	TOTAL INSTRCTIONAL HOURS	45

COURSE OUTCOME

Upon completion of this course, the students will be able to
CO1: Describe the basic principles and techniques of software testing.CO2: Apply the right testing methods for various applications.
CO3: Assess the design using verification and validation testing.
CO4: Analyse software quality using inspections and walkthrough.CO5: Relate various software metrics to context.

TEXT BOOKS:

T1. Srinivasan Desikan and Gopalaswamy Ramesh,"software Testing–Principles and practices", Pearson education,2007.
T2. Stephen Kan, "Metrics and Models in Software Quality", Addison-Wesley, Second Edition, 2004.

REFERENCE BOOKS:

R1. Ron Patton, *Software Testing*, second edition. Pearson Education.ISBN-13:978-0-672-32798-8.2007.R2. Ilene Burnstein, "Practical Software Testing", Springer International Edition, Chennai, 2003.
R3. Milind Limaye, "Software Quality Assurance", McGraw Hill, 2011.
R4. M G Limaye, "Software Testing – Principles, Techniques and Tools", McGraw Hill,2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6204	PROFESSIONAL ETHICS	3	0	0	3

Course Objective

1. To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
2. To provide basic familiarity about Engineers as responsible Experimenters, Codes of Ethics.
3. To provide basic knowledge on Industrial Standards, Exposure to Safety, Risk Benefit Analysis.
4. To have an idea about the Collegiality and Loyalty, Confidentiality, Occupational Crime, Professional,Employee, Intellectual Property Rights.
5. To have an adequate knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty,Moral Leadership, sample Code of Conduct.

Unit	Description	Instructional Hours
I	**HUMAN VALUES** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management	9
II	**ENGINEERING ETHICS** Senses of „Engineering Ethics" – Variety of moral issues – Types of inquiry – Moral dilemmas – MoralAutonomy–Kohlberg"stheory–Gilligan"stheory–ConsensusandControversy–Modelsof professionalroles-Theoriesaboutrightaction–Self-interest–CustomsandReligion–Usesof Ethical Theories	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – ABalanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination	9
V	**GLOBAL ISSUES** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility	9
	Total Instructional Hours	**45**

Course Outcome

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

CO1: The students will understand the basic perception of profession, professional ethics, various moralissues & uses of ethical theories.

CO2: The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO3: The students will be aware of responsibilities of an engineer for safety and risk benefit analysis.CO4: The students will be aware of professional rights and responsibilities of an engineer.

CO5: The students will acquire knowledge about various roles of engineers in variety of global issuesand able to apply ethical principles to resolve situations that arise in their professional lives

TEXT BOOKS:

T1 - Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS :

R1 - Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
R2 – Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases",Cengage Learning, 2009.
R3 - John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6001	EMBEDDED SYSTEMS LABORATORY	0	0	4	2

Course Objective	1. Study the architecture of 8051microcontroller.
	2. Write ALP for arithmetic and logical operations in 8051.
	3. Provide in depth knowledge of 8051 Assembly Language Programming.
	4. Learn the design aspects of interfacing circuits.
	5. Give the knowledge and practical exposure on connectivity and execute of interfacing devices with ARM kit like LED displays, ADC/DAC and various other devices.

Expt. No.	Description of the Experiments
	8051 Programs using Kits
1.	Basic Arithmetic and Logical operations in 8051.
2.	Square and Cube of a number in 8051.
3.	1's and 2's complement of a number in 8051.
4.	Unpacked BCD to ASCII in 8051.
	Interfacing Experiments in 8051
5.	DAC Interfacing with 8051.
6.	Stepper motor interfacing with 8051
7.	Parallel Communication Interface with 8051.
	ARM Processor Experiments
8.	Flashing of LEDS.
9.	Interfacing ADC
10.	Interfacing LED and PWM.
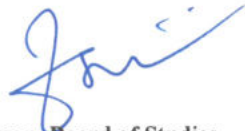
Total Practical Hours   **45**

Course Outcome	Upon completion of this course, the students will be able to
	CO1: Develop ALP for fixed point and Arithmetic operations using 8051 Microcontroller.
	CO2: Work with standard 8051 real time interfaces including DAC and Stepper motor.
	CO3: Model parallel interfacing of 8051 Microcontroller.
	CO4: Become familiar with programming environment used to develop embedded systems.
	CO5: Know functioning of hardware devices and interfacing them with ARM processor.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6002	OPEN SOURCE SOFTWARE LABORATORY	0	0	4	2

Course Objective
1. Learn to write small programs using PHP and PYTHON
2. Be Create User defined functions in PHP programming.
3. Have hands on experience on a Open source software Installation.
4. Have a good understanding of error handling techniques of PHP.
5. Learn to Use GitHub tool to communicate with Open source community.

Expt. No.	Description of the Experiments
	Basic PHP Program:
1.	a) Write a PYTHON script to display Welcome message
	b) Write a PYTHON script for simple calculator
	c) Write PYTHON Script to print Fibonacci series
2.	a) Write PHP Script to find maximum number out of three given numbers.
	b) Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page
	c) Write a PHP Program to find the Sum and Average of five subject marks and display the result
3.	a) Write a PHP Program to find the biggest of n numbers using arrays
	b) Write a PHP Program to calculate factorial of a given number using function
	c) Write a PHP program to print prime number up to n numbers
4.	Write a server side PHP program that displays marks, total, grade of a student in tabular format by accepting user inputs for name, number and marks from a HTML form.
5.	Write a PHP script to connect MySQL server from your website and access the data stored in a table
6.	a) Write a PHP program using classes to create a table
	b) Write a PHP program to upload a file to the server.
7.	Write a PHP program to create a directory, and to read contents from the directory.
8.	Install Open source software- Linux OS, GitHub
9.	a) Write a shell program to find the details of user session.
	b) Write a shell program to change the extension of a given file.
10.	Create a MySQL table and execute queries to read, add, remove and modify a record from that table.
11.	Design student online application form and store in database and display
12.	Using GitHub tool to download a file, modify and upload the file.

Total Practical Hours   45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Create small programs using basic PHP and PYTHOIN languages. CO2: Apply In-Built and Create User defined functions in PHP programming.
CO3: Design and develop a Web site using form controls for presenting web based content.
CO4: Debug the Programme by applying concepts and error handling techniques of PHP.
CO5: Create dynamic Website/ Web based Applications, using PHP, MySQL database

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5301	GRAPHICS AND MULTIMEDIA	3	0	0	3

Course Objective	1. To understand the basics of computer graphics system and line drawing algorithms, 2. To understand two dimensional transformations and clipping algorithms. 3. Students familiar with three dimensional graphics and three dimensional transformations. 4. To implement activities involving in design, development and testing 5. Learn Multimedia and various compression techniques.

Unit	Description	Instructional Hours
I	**Introduction:** Raster scan displays, Pixels, frame buffer, Vector & Character generation, random scan systems, Graphics Primitives, Display devices, Display file structure, Scan Conversion techniques, line drawing: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms. Scan line polygon fill algorithm, boundary-fill and flood-fillalgorithms	9
II	**2D transformation:** Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogenous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping, Cohen Sutherland, Midpoint Line clipping algorithms, Polygon Clipping: Sutherland –Hodgeman, Weiler-Atherton algorithms.	9
III	**3D transformations:** translation, rotation, scaling. Parallel & Perspective Projection, Types of Parallel & Perspective Projection. Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painters algorithm, Z-buffer algorithm. Curve generation, Bezier and B-spline methods.	9
IV	**Reflections and Shading:** Diffuse reflection, Specular reflection, Phong Shading Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV.	9
V	**Multimedia System:** An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards. i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP,MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring.	9
	Total Instructional Hours	**45**

Course Outcome	Upon completion of this course, the students will be able to CO1: Understand about computer graphics system, and Line drawing algorithms two dimensional transformations. CO2: familiar with techniques of clipping, Two dimensional transformation graphics CO3: The computer graphics course prepares students for activities involving in design, development and testing of modeling, rendering, shading and animation. CO4: To understand about various latest interactive multimedia devices, the basic concepts about images and image format. CO5: To understand about data, image and video compression techniques and animation.

TEXT BOOKS:

T1 - Donald Hearn and M.P. Becker "Computer Graphics" Second Edition, Pearson Publications, 2008.

T2- Rogers, "Procedural Elements of Computer Graphics", new Edition, Tata McGraw Hill.

REFERENCE BOOKS:

R1 -FolayVandam, Feiner, Hughes "Computer Graphics Principle & Practice", new Edition, Pearson Publications.

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Programme B. TECH.	Course Code 16IT5302	Name of the Course SOFT COMPUTING	L 3	T 0	P 0	C 3

Course Objective	1. To introduce the ideas of Neural networks and use of heuristics based on human experience. 2. Toprovidethemathematicalbackgroundforcarryingouttheoptimizationassociated with neuralnetwork learning 3. To Understand basics of Fuzzy Set. 4. To introduce the concepts of Genetic algorithm and its applications 5. To introduce case studies utilizing the all the soft computing techniques

Unit	Description	Instructional Hours
I	**Introduction** Introduction – Fundamental concept – Evolution of Neural Networks and Fuzzy Logic– Basic Models of ArtificialNeural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Reparability – Herb Network.	9
II	**Artificial Neural Network** Supervised Learning Network: Perceptron Networks – Adaline – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network. Unsupervised Learning Networks: Fixed weight Competitive Nets – Kohonen Self-Organizing Feature Maps – Learning VectorQuantization – Counter propagation Networks – Adaptive Resonance Theory Networks	9
III	**Fuzzy Set Theory** Introduction to Classical Sets and Fuzzy sets – Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Noninteractive Fuzzy sets – Membership Functions: Fuzzification – Methods of Membership Value Assignments – Defuzzification – Lambda-Cuts for Fuzzy sets and Fuzzy Relations – Defuzzification Methods	9
IV	**Genetic Algorithm** Introduction – Basic Operators and Terminologies in GAs – Traditional Algorithm vs. Genetic Algorithm – Simple GA – General Genetic Algorithm – The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems – Genetic Programming. Optimization of Travelling Salesman Problem using Genetic Algorithm Approach	9
V	**Applications of Computational Intelligence** Printed Character Recognition - Inverse Kinematics Problems - Automobile Fuel Efficiency Prediction - Soft Computing for Color Recipe Prediction.	9
	Total Instructional Hours	45

Course Outcome	Upon completion of the course, you should be able to: CO1: Identify and describe soft computing techniques and their roles in building intelligent machinesCO2: Apply neural networks to pattern classification and regression problems. CO3: Understand fuzzy logic and reasoning to handle uncertainty and solve engineering problems.CO4: Apply genetic algorithms to combinatorial optimization problems. CO5: Understand the applications to solve real problems using a soft computing approach.

TEXT BOOKS:

T1 - S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2011. ISBN: 10: 81-265-1075-7. T2 - J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004

REFERENCE BOOKS:

R1 - Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 3rd edition 2016.
R2 – S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
R3 - R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5303	SYSTEM SOFTWARE	3	0	0	3

Course Objective	1. To understand about the basics of system software and machine architecture 2. To know the design and implementation of assemblers 3. To know the design and implementation of linkers and loaders. 4. To have an understanding of microprocessors. 5. To have an understanding of system software tools.

Unit	Description	Instructional Hours
I	**INTRODUCTION** System software and machine architecture–The Simplified Instructional Computer (SIC)- Machine architecture-Data and instruction formats- addressing modes- instruction sets- I/O and programming.	8
II	**ASSEMBLERS** Basicassemblerfunctions-AsimpleSICassembler–Assembleralgorithmanddata structures-Machine dependent assembler features-Instruction formats and addressing modes–Program relocation- Machine independent assembler features-Literals– Symbol-defining statements–Expressions-One pass assemblers and Multi pass assemblers- Implementation example- MASM assembler.	10
III	**LOADERSAND LINKERS** Basic loader functions-Design of an Absolute Loader–A Simple Bootstrap Loader- Machine dependent loader features -Relocation–Program Linking–Algorithm and Data Structures for Linking Loader- Machine-independent loader features-Automatic Library Search –Loader Options-Loader design options-Linkage Editors–Dynamic Linking–Bootstrap Loaders- Implementation example- MSDOS linker.	9
IV	**MACRO PROCESSORS** Basic macro processor functions-Macro Definition and Expansion–Macro Processor Algorithm and data structures-Machine-independent macro processor features- Concatenation of Macro Parameters–Generation of Unique Labels –Conditional Macro Expansion– Keyword Macro Parameters-Macro within Macro-Implementation example- MASM Macro Processor–ANSIC Macro language.	9
V	**SYSTEMSOFTWARETOOLS** Text editors- Overview of the Editing Process-User Interface –Editor Structure- Interactive debugging systems-Debugging functions and capabilities–Relationship with other parts of the system – User-Interface Criteria	9
	Total Instructional Hours	45

Course Outcome	Upon completion of this course, the students will be able to CO1: Familiarize about the basics of system software and machine architectureCO2: Analyze the assemblers CO3: Design of linkers and loaders. CO4: Work with the macro processors. CO5: understand the system software tools

TEXT BOOKS:

T1 – Leland L.Beck, "System Software–An Introduction to Systems Programming" , 3rd Edition Pearson Education, Asia 2000.

REFERENCE BOOKS:

R1 - D.M.Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill,1999.
R2 – John J.Donovan "SystemsProgramming", Tata McGraw-Hill Edition,2001.
R3 – John R.Levine, Linkers & Loaders– Harcourt India Pvt.Ltd.,Morgan Kaufmann Publishers, 2000.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5304	**HIGH SPEED NETWORKS**	3	0	0	3

Course Objective

1. To understand the need for high speed networks
2. To explain QoS requirements and compare different approaches to QoS
3. To Compare various Virtual Private Network
4. To learn advantages and operations of Optical networks.
5. To provide students an exposure to software defined networking

Unit	Description	Instructional Hours
I	**UNIT I INTERNETWORKING:** IPv6 - Design issues - Scalability - Addressing - Headers -Routing - Auto configuration - Transition from IPv4 to IPv6 - Interoperability - QoS in IPv6 - Multicast support - ICMPv6 - Security in IPv6	9
II	**UNIT II QUALITY OF SERVICE:** QoS taxonomy - Resource allocation - Scheduling - Queuing disciplines - Delay Analysis -Integrated services - Differentiated services - RSVP.	9
III	**UNIT III MPLS AND VPN:** MPLS Architecture - MPLS to GMPLS - Traffic engineering with MPLS - QoS -Network recovery and restoration with MPLS – VPN L2 – VPN L3 .	9
IV	**UNIT IV OPTICAL NETWORKS:** Photonic Packet switching - WDM network design - Introduction to optical networks -optical layer - SONET/SDH - Optical packet switching - Client layers - Signaling protocols and network operation	9
V	**UNIT V SOFTWARE DEFINED NETWORKING**: Introduction to SDN - Network Function Virtualization - Data Plane- Control Plane - SDN software stack - Data center Traffic Management	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Students able to differentiate IPV4 and IPV6 and security

CO2: Students can Allocate resources and schedule efficiently

CO3: Work with various Virtual Private Networks

CO4: Determine the various issues of Optical Networks

CO5: Student can Experience the function of Software Defined Networking.

TEXT BOOKS:

T1-LarryL.Peterson,BruceS.Davie,—ComputerNetworks:ASystemsApproach‖,FifthEdition,Elsevier/ Morgan Kaufmann Publishers, 2011.
T2-BruceS.Davie,AdrianFarrel,—MPLS:NextSteps‖,MorganKaufmannPublishers,2011.
T3- Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks A Practical Perspective " ,Third Edition, Morgan Kaufmann,2010.
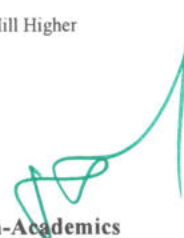
REFERENCE BOOKS:

R1 - William Stallings, " High-speed networks and internets ", Second Edition Pearson Education India, 2002.
R2 - "MPLS Configuration Examples and TechNotes " , www.cisco.com.
R3 - Ying-Dar Lin , Ren-Hung Hwang , Fred Baker , "Computer Networks: An Open Source Approach", McGraw-Hill Higher Education, 2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5305	DATA WAREHOUSING AND DATA MINING	3	0	0	3

Course Objective	1. Study the concept of data ware housing architecture and Business Analysis 2. Be acquainted with the tools and techniques used for Knowledge Discovery in Databases. 3. Learn to use Association rule mining for handling large data 4. Study Classification and Clustering for better Organization and retrieval of data 5. Expose the business applications and advanced topics in datamining

Unit	Description	Instructional hours
I	**INTRODUCTION TO DATA WAREHOUSING :** Need for Data warehousing - Operational database systems vs Data warehouses - Data warehouse architecture – Data warehousing components –Building a Data warehouse — Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support	8
II	**DATA WAREHOUSING AND BUSINESS ANALYSIS :** Data Extraction, Cleanup, and Transformation Tools –Metadata.– Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi relational OLAP – Categories of Tools – OLAP Tools and the Internet.	9
III	**DATA MINING** Introduction to KDD process - Knowledge discovery from databases - Data mining functionalities - Technologies used - Applications - Issues - Knowing Data: Data objects and attributes - Statistical description of data - Data visualization - Data preprocessing: Data cleaning - Data integration and transformation - Data reduction	9
IV	**ASSOCIATION RULE MINING AND CLASSIFICATION** Introduction - Association rule mining -Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction-BasicConcepts-DecisionTreeInduction-BayesianClassification–Rule Based Classification – Classification by Back propagation.	10
V	**CLUSTERING AND ADVANCED DATA MINING** Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods – Outlier Analysis – Data Mining Applications. Advanced topics –Web mining-web content mining-Structure and Usage mining-Time series and sequence mining.	9
	Total Instructional Hours	45

Course Outcome	CO1: Identify the components of data warehousing architecture CO2:Implement data preprocessing for mining applications CO3:Apply the association rules for mining the data CO4:Deploy appropriate classification and clustering techniques CO5: Use Advanced Topics of Data mining in business applications

TEXT BOOK:

T1: Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition,21st Reprint 2011.T2: Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
REFERENCES:

R1:.DunhamM."Data mining: Introductory andAdvancedTopics",Prentice Hall, New Delhi,2002.
R2: Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction toDataMining",   Person Education, 2007.
R3.K.P.Soman,ShyamDiwakarandV.Aja,"InsightintoDataMiningTheoryandPractice",EasternEconomyEdition, Prentice Hall of India,2006.
R4: G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2014.
R5: Ian Witten, EibeFrank,"Data mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann, Third edition,2011

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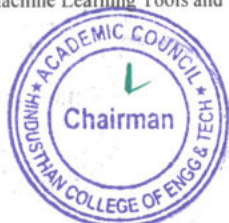
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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT5306	SOFTWARE DESIGN PATTERNS	3	0	0	3

Course Objective	1.	How to add functionality to designs while minimizing complexity?
	2.	What code qualities they need to maintain to keep code flexible.
	3.	Understanding the common design patterns.
	4.	Identifying the appropriate patterns for design problems.
	5.	Refactoring the badly designed program properly using patterns.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction–Design Patterns in Smalltalk MVC–Describing Design patterns–Catalog of Design Patterns–Organizing the Catalog–How Design Patterns Solve Design Problems–How to select a Design Pattern–How to use a Design Pattern–What makes a pattern?–Pattern Categories–Relationship between Patterns–Patterns and Software Architecture	9
II	**DESIGN PATTERNS FROM POSA1** Whole Part–Master Slave–Command Processor–View Handler–Forward Receiver– Client Dispatcher Server	9
III	**CREATIONAL AND STRUCTURAL DESIGN PATTERNS** Abstract Factory-Factory Method–Prototype-Singleton–Builder Adapter Pattern–Decorator–Façade– Proxy-Bridge	9
IV	**BEHAVIORAL DESIGN PATTERNS AND IDIOMS** Chain of Responsibility–Mediator–Observer–Strategy–Memento Idioms–Pattern Systems	9
V	**CASE STUDY** Case Study Designing a Document Editor-What to expect from Design Patterns–A brief History of Design Patterns–The Pattern Community–Where will Patterns Go?–The Past, Present and the Future of Patterns-Anti Patterns	9
	Total Instructional Hours	45

Course Outcome	Upon completion of this course, the students will be able to CO1: Design and implement codes with higher performance and lower complexityCO2: Be aware of code qualities needed to keep code flexible CO3: Understand core design principles and be able to assess the quality of a design with respect tothese principles. CO4: Demonstrate an understanding of a range of design patterns. Be capable of comprehending adesign presented using this vocabulary. CO5: Understand and apply refactoring techniques in the context of design patterns.

TEXT BOOKS:

T1- Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable object-oriented software", Pearson, 2002.

T2- Frank Bachmann, Regine Meunier, Hans Rohnert "Pattern Oriented Software Architecture"–Volume 1, 1996.

REFERENCE BOOKS:

R1- William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley,1998.

R2- Eric Braude, Software Design: From Programming to Architecture, Wiley, 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6301	MULTIMEDIA COMMUNICATION	3	0	0	3

Course Objective
1. To develop, design and implement two and three dimensional graphical structures
2. To enable students to acquire knowledge Multimedia compression and animations
3. To learn about various data file formats
4. To learn about various protocols
5. To learn Creation, Management and Transmission of Multimedia objects

Unit	Description	Instructional Hours
I	**MULTIMEDIA BASICS** Introduction and definitions elements – text- images-animation audio-video- Encoding & Decoding- Moving graphics and images. Multimedia applications – Multimedia System Architecture Multimedia Data interface standards – Multimedia Databases	9
II	**MULTIMEDIA COMPRESSION** Compression – Types of Compressions: Lossless – Lossy compression– Binary ImageCompression Schemes – Color, Gray Scale, And Still-video Image compression – Video Image Compression – Audio Compression	9
III	**MULTIMEDIA DATA & FILE FORMAT STANDARDS** Rich-Text Format – TIFF - RIFF – MIDI – JPEG – AVI – MPEG- TWAIN- Multimedia I/O technologies - Digital voice and audio –Video image and animation – Full motion video – Storage and retrieval Technologies.	9
IV	**PROTOCOLS** Traditional protocols: Problems with traditional protocols-protocols for multimedia- multicast protocols throughput of reliable protocols - Protocol implementation- scaling and efficiencyissues.	9
V	**MULTIMEDIA AUTHORING AND APPLICATIONS** Creating interactive multimedia – Multimedia Authoring Systems – Multimedia Authoring Software Applications – Video On demand – Virtual Reality – Augmented Reality – Contentbased retrieval in digital libraries	9
	Total Instructional Hours	45

Course Outcome
Upon completion of this course, the students will be able toCO1: Explain fundamentals of concepts of Multimedia
CO2: Understanding audio and video data compression techniques
CO3: Describe different multimedia data in digital formats and compare text, audio, image and video data.CO4: Summarize protocols for interconnection technologies
CO5: Explain the various multimedia application and their authentications

TEXT BOOKS:

T1 - Prabhat K Andleigh, KiranThakrar, "Multimedia systems design", First Edition, PHI, 2007.

T2 - Fred Halsall, Multimedia Communications: Applications, Networks, Protocols and Standards", Addison- WesleyPublishing, Edition,2009.

REFERENCE BOOKS:

R1 - John F Koegel Buford, "Multimedia Systems", Addison-Wesley, USA, 2003.

R2 - Judith Jeffcoate, "Multimedia in practice technology and Applications", Prentice Hall of India, New Delhi, 2009.R3 - Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6302	ARTIFICIAL INTELLIGENCE	3	0	0	3

Course
Objective

1. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
2. Study the concepts of Artificial Intelligence.
3. Learn the methods of solving problems using Artificial Intelligence.
4. Implement a small AI system in a team environment.
5. Introduce the concepts of Expert Systems and Machine learning.

Unit	Description	Instructional Hours

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

I   Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. Add Constraint satisfaction and Heuristics   9

REPRESENTATION OF KNOWLEDGE

II   Game playing- Knowledge representation-Knowledge representation using propositional andpredicate logic-   9

Comparison of propositional and predicate logic-Resolution, Refutation.

KNOWLEDGE INFERENCE

III   Knowledge representation-Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning – Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory   9

PLANNINGAND MACHINE LEARNING

IV   Basic plan generation systems – Strips - Strategic explanations -Why, Why not and howexplanations.   9

Learning- Machine learning, adaptive Learning.

EXPERT SYSTEMS

V   Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition   9

–Meta knowledge. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

Total Instructional Hours   45

Course
Outcome

CO1: Analyze problems that are amenable to solution by AI methods.
CO2: Analyze appropriate AI methods to solve a given problem.
CO3: Apply a given problem in the language/framework of different AI methods.
CO4: Apply basic AI algorithms.
CO5: Analyze an evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

TEXT BOOKS:

T1-Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill- 2008.(Units-,II,VI&V)T2-Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.(Unit-III).

REFERENCE BOOKS :

R1-Deepak Khemani "Artificial Intelligence", Tata McGraw Hill Education 2013.

R2-Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6303	COMPILER DESIGN	3	0	0	3

Course Objective

1. Learn the design principles of a Compiler.
2. Understand about the automata concepts and symbol table generations.
3. Learn the various parsing techniques in syntax analysis.
4. Gain knowledge about different levels of translation and storage allocations.
5. Learn how to optimize and effectively generate machine codes.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMPILERS** Loaders and Linkers-Basic Loader functions- A Simple Bootstrap Loader -Compilers and translators- Why do we need translators? The structure of a compiler, The Grouping of Phases - The Phases of Compiler-Errors Encountered in Different Phases- Compiler Construction Tools - Programming Language basics.	7
II	**LEXICAL ANALYSIS** Need and Role of Lexical Analyzer-Specification and Recognition of Tokens-Expressing Tokens by Regular Expressions-Finite Automata- Converting Regular Expression to DFA-MinimizationofDFA-LexicalErrors-TheLexical-AnalyzerGeneratorLEX-CaseStudy: Design of a Lexical-Analyzer Generator	9
III	**SYNTAX ANALYSIS** Need and Role of the Parser-Context Free Grammars -Writing a Grammar-Top Down Parsing - Recursive-Descent parsing-Non recursive Descent parsing-Bottom up parsing-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Case Study: Design of a syntax Analyzer for a Sample Language	10
IV	**SYNTAX DIRECTED TRANSLATION AND RUN TIME ENVIRONMENT** **Syntax – Directed Translation**: Syntax – directed translation schemes, Implementation ofSyntax-directed translators, Intermediate code, Postfix notation, Parse trees and syntax trees, **Run – time Storage Administration**: – Storage Organization- Static Versus Dynamic StorageAllocation-Stack Allocation of Space- Heap Management-Introduction to Garbage and Tree-based collection	10
V	**CODE OPTIMIZATION AND CODE GENERATION** **Code optimization:** Introduction, The principle sources of optimization, Loop optimization, andPeephole optimization, optimization of basic blocks. **Code generation:** Design issues, object code forms, A simple code generator, Register allocation and assignment, DAG representation of Basic Blocks , Code generation using DAG.	9

	Total Instructional Hours	45

Course Outcome

Upon completion of this course, the students will be able toCO1:
Learn the basic concepts in phases of compiler
CO2: Create lexical rules and grammars for a programming language. CO3:
Implement a parser such as a Top-Down and bottom-up SLR parsers.
CO4: Learn the new code optimization techniques to improve the performance of a program in terms ofspeed & space.
CO5: Design a compiler for a concise programming language

TEXT BOOKS:

T1 - Aho, Ravi Sethi, JD Ullman, 'Compilers Principles, Techniques and Tools', Pearson Education/Prentice Hall ofIndia, 2nd Edition, 2008

REFERENCE BOOKS: R1 - Leland.L.Beck, 'System Software', 3rd Edition, Addison-Wesley, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6304	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

Course Objective

1. Understand OSI security architecture and classical encryption techniques.
2. Acquire fundamental knowledge on the concepts of finite fields and number theory.
3. Describe the principles of public key cryptosystems, hash functions and digital signature.
4. Describe symmetric and asymmetric algorithms related to cryptography.
5. Explain the purpose of security mechanism for different computing environment and information systems

Unit	Description	Instructional hours
I	**INTRODUCTION** OSI Security Architecture - Classical Encryption Techniques – Classical Encryption techniques - Symmetric cipher model, substitution techniques, transposition techniques, and steganography. **FINITE FIELDS AND NUMBER THEORY**: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms	9
II	**ASYMMETRIC CIPHERS** Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public Key Cryptography and RSA Algorithm - Diffie-Hellman Key Exchange – Elliptic Curve Architecture and Cryptography.	9
III	**AUTHENTICATIONAND HASH FUNCTION** Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS .	9
IV	**SECURITY PRACTICE AND SYSTEM SECURITY** Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Asymmetric Encryption - Distribution of Public Keys - X.509 Certificates - Public Key Infrastructure User Authentication Protocols: Remote User Authentication Principles – Kerberos	9
V	**NETWORK AND INTERNET SECURITY PROTOCOLS**: Basic Concepts, Secure Sockets Layer (SSL), - Transport Layer Security (TLS) - HTTPS - Secure Shell (SSH) –Electronic mail Security: Pretty Good Privacy (PGP)-S/MIME-IP SECURITY	9
	Total Instructional Hours	45

Course Outcome

Upon completion of this course, the students will be able to CO1:
Introduce fundamental concepts and techniques in Cryptography
CO2: Understand the basic knowledge on the concepts of finite fields and number theory.
CO3: Study the principles of public key cryptosystems, hash functions and digital signature.
CO4: Outline the symmetric and asymmetric algorithms related to cryptography.
CO5: Study the Network and Internet security protocols

TEXT BOOKS:

T1: William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall of India/Pearson Education, New Delhi, 2010

T2: Atul Kahate, "Cryptography and Network Security", Tata McGrawHillPublishing   Company, New Delhi,2007.

REFERENCES:

R1:. Behrouz Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill Publishing Company, New Delhi, 2010

R2: Roberta Bragg, Mark Rhodes Ousley, Keith Strassberg, "Network Security: The Complete Reference", McGraw Hill Publishing Company, Singapore, 2004.

R3: Kaufman, Perlman and Speciner, "Network Security: Private Communication inapublic   world", Prentice Hall of India/ Pearson Education, NewDelhi,2004.

R4. Charles P Pfleeger, "Security in computing", Pearson Education, New Delhi, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6305	BUSINESS INTELLIGENCE	3	0	0	3

Course Objective	
	1. Knowledge and understanding of decision-making, practices of business intelligence.
	2. Ability to design and build BI applications based on users 'needs
	3. Demonstrate the limitations and possibilities of BI Technology
	4. To understand the concept of business Intelligent Models.
	5. To analyze the business environment with related tools.

Unit	Description	Instructional Hours
I	**Business Intelligence an Introduction:** Introduction, Definition, History and Evolution, Business Intelligence Segments, Difference between Information and Intelligence, Defining Business Intelligence Value Chain, Factors of Business Intelligence System, Real time Business Intelligence, Business Intelligence Applications, Types of Business Intelligence, Business Intelligence Platform, Dynamic roles in Business Intelligence, Roles of Business Intelligence in Modern Business-Challenges of BI.	9
II	**Architecting the Data:** Introduction, Enterprise Data and Subject Area Model, Enterprise Conceptual Model, Total Data Quality Management (TDQM). Definition of Data Mining, Data mining parameters, Statistical Perspective on Data Mining, Statistics-need, Similarity Measures, Decision Tree-Illustrations, Neural Network, Neural Network versus Conventional Computers, Data Warehouse, Data Mart, Aspects of Data Mart, Online Analytical Processing, Characteristics of OLAP, OLAP Tools, Data Modeling using Star Schema and Snowflake Schema.	9
III	**Types of Business Models:** B2B Business Intelligence Model, Electronic Data Interchange & E-Commerce Models, Systems for Improving B2B E-Commerce, B2C Business Intelligence Model, Need of B2C model in Data warehousing, Different types of B2B intelligence Models Knowledge Management: Characteristics of Knowledge Management, Knowledge assets, Generic Knowledge Management Process, Essentials of Knowledge Management Process.	9
IV	**Data Extraction:** Introduction, Data Extraction, Role of ETL process, Importance of source identification, Various data extraction techniques, Change data capture Business Intelligence Life Cycle: Introduction, Business Intelligence Lifecycle, Enterprise Performance Life Cycle (EPLC) Framework Elements, Life Cycle Phases, Human Factors in BI Implementation, BI Development Stages and Steps, Parallel Development Tracks, BI Framework.	9
V	**Business Intelligence User Model:** Business Intelligence Opportunity Analysis Overview, Content Management System, End User Segmentation, Basic Reporting and Querying, Online Analytical Processing, OLAP Techniques, Benefits of using OLAP, Dashboard, Advanced/Emerging BI Technologies, Organization Culture, Managing Total Cost of Ownership for Business Intelligence, Total Cost of Ownership and Business Intelligence, Managing the TCO of the Business Intelligence, Factors that Affect Total Cost of Ownership.	9

	Total Instructional Hours	45

Course Outcome	
	Upon completion of this course, the students will be able to
	CO1: Demonstrate knowledge about and understanding of organizational and individual decision-making and future trends of BI.
	CO2: Implement the concept of big data and analytics, data visualization techniques.
	CO3: Demonstrate the ability to use BI systems and technology to design and build BI applicationsbased on users' needs
	CO4: Apply relevant theories, concepts and techniques to solve real-world BI problems
	CO5: Critically evaluate the limitations and possibilities of BI technology

TEXT BOOKS:

T1 - Jena R K,"IT & Business Intelligence" 1st Edition, Excel Books-2015.
T2- Mike Davis, Patrick LeBlanc," Knight's Microsoft Business Intelligence 24-Hour Trainer" john Wiley & Sons,2011.

REFERENCEBOOKS:

R1 - Ramesh Sharda, DursunDelen,"Business Intelligence: A Managerial Perspective on Analytics", 3rdEdition,Pearson Education,2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B. TECH.	16IT6306	HUMAN COMPUTER INTERFACE	3	0	0	3

Course Objective

The student should be made to:

1. Understand the concept of usability, design principles, guidelines, heuristics and other fundamentals of Human-Computer Interaction.
2. Describe and explain the user interface design process
3. Learn how to design Screen
4. Learn various theories and models used to design interface.
5. Understand Web interface with virtual reality.

Unit	Description	Instructional Hours
I	**INTRODUCTION :** Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. **The graphical user interface** – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	9
II	**DESIGN PROCESS** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions- Business Definition and Requirements Analysis- Design Standards or Style Guides- SYSTEM Training and Documentation Needs	9
III	**SCREEN DESIGNING :** Interface Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	9
IV	**MODELS AND THEORIES :** Cognitive Models : Goal And Task Hierarchies, Linguistic Models: The Challenge Of Display-Based Systems, Physical And Device Models, Cognitive Architectures, Communication And Collaboration Models:: Face-To-Face Communication, Conversation, Text-Based Communication, Group Working.	9
V	**VIRTUAL REALITY AND WEB INTERFACE** Ubiquitous computing applications research, Virtual and augmented reality, Information and data visualization, WEB INTERFACE :Understanding hypertext, Finding things, Web technology and issues, Static web content , Dynamic web content	9
	Total Instructional Hours	45

Course Outcome

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

CO1: Apply design principles, guidelines and heuristics to create a user-interaction strategy that solves a real-world problem.

CO2: Design a usable and compelling user-interface given a set of requirements and available technologies.

CO3: Communicate effectively the designed user-interface

CO4: Understand the various theories and models used to design interface.

CO5: Design Web interface with virtual reality .

TEXT BOOKS:

T1 - The Essential guide to User Interface Design, Wilbert O Galitz, Wiley Dreama Tech. 2007

T2 - Human Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Beale, Pearson. ThirdEdition 2009

REFERENCE BOOKS :

R1 – NPTEL : http://nptel.ac.in

R2 - User Interface Design, Soren Lauesen Pearson Education, 2005

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Programme	Course Code	Name of the Course	L	T	P	C
B.TECH.	16IT6401	CYBER SECURITY AND FORENSICS	3	0	0	3

The student should be made to:

Course Objective
1. Learn the security issues Cryptographic Techniques.
2. Be exposed to security issues of the MALICIOUS Code.
3. Learn Cyber forensics.
4. Be familiar with forensics tools.
5. Learn to analyze and validate forensics data

Unit	Description	Instructional Hours
I	**INTRODUCTION: Cyber Security Fundamentals:** Network and Security Concepts, Basic Cryptography, Symmetric Encryption, Firewalls, Virtualization, Microsoft Windows Security Principles **Attacker Techniques and Motivations:** Proxies, Tunneling Techniques, Fraud Techniques, and Threat Infrastructure.	9
II	**MALICIOUS CODE: Malicious Code:** Self-Replicating Malicious Code, Evading Detection and Elevating Privileges, Stealing Information and Exploitation Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Intrusion Detection Systems.	9
III	**INTRODUCTION TO CYBER FORENSICS:** The Goal of the Forensic Investigation: Why Investigate, Internet Exceeds Norm, How to Begin a Non–Liturgical Forensic Examination: Isolation of Equipment, Cookies, Cache, How to Correlate the Evidence, The Liturgical Forensic Examination: Tracing Activity on a Windows–Based Desktop, The Microsoft Windows–Based Computer.	9
IV	**EVIDENCE COLLECTION AND FORENSICS TOOLS:** Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.	9
V	**ANALYSIS AND VALIDATION:** Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.	9
	Total Instructional Hours	45

Course Outcome

Upon completion of this course, the students will be able to
CO1: Understand the security issues in Cryptographic Techniques.
CO2: Apply security principles in the MALICIOUS Code.
CO3: Gain knowledge about cyber forensics.
CO4: To analyze digital evidence and use forensics tools.
CO5: Explain the principle of Network Forensics.

TEXT BOOKS:
T1 - James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials" CRC Press, Taylor and Francis Group,2011.
T2 - Albert J. Marcella, Robert S. Greenfield "Cyber Forensics—A Field Manual for Collecting, Examining, andPreserving Evidence of Computer Crimes, AUERBACH Publications, 2002
REFERENCE BOOKS:
R1 - John R.Vacca, "Computer Forensics", Cengage Learning, 2005
R2 - Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
R3 - Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall,2013.
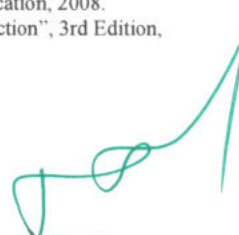
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CO'S, PO'S & PSO'S MAPPING

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

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

Semester – V

Course Code & Name: 16IT5201   Computer Networks

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	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	2	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	1	2	2	2	2	0	1	1	0	2	2	1	0

Course Code & Name: 16IT5202   Web Technology

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

Course Code & Name: 16IT5203   Information Security

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: 16IT5204   Theory Of Computation

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

Course Code & Name: 16IT5001   Network Laboratory

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

Course Code & Name: 16IT5002   Web Technology Laboratory

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: 16IT5301   Graphics and Multimedia

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

Course Code & Name: 16IT5302   Soft Computing

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: 16IT5303   System Software

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: 16IT5304   High Speed Networks

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: 16IT5305   Data Warehousing and Data Mining

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: 16IT5306   Software Design Patterns

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	0	0	0	0	0	2	3	3	2	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0

Semester – VI

Course Code & Name: 16IT6201   Mobile Computing

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

Course Code & Name: 16IT6202   Microcontrollers and Embedded Systems

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: 16IT6203   Software Testing and Quality Assurance

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	0	0	0	0	0	2	3	3	2	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0

Course Code & Name: 16IT6204   Professional Ethics

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	1	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	1	0	2	0	0	1	0	1	1	1	1	1
CO5	3	2	1	0	1	0	0	1	0	1	1	1	1	0
Avg	3	2	1	0	2	0	0	1	0	1	1	2	1	0

Course Code & Name: 16IT6001   Embedded 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	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: 16IT6002   Open Source Software Laboratory

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

Course Code & Name: 16IT6301   Multimedia Communications

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

Course Code & Name: 16IT6302   Artificial Intelligence

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: 16IT6303   **Compiler 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: 16IT6304   **Cryptography and Network Security**

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	0	0	0	0	0	2	3	3	2	1
CO2	3	2	1	2	1	0	0	0	0	1	3	1	3	0
CO3	3	2	1	1	1	0	0	0	0	2	0	2	1	0
CO4	3	2	1	0	0	0	0	0	0	1	1	1	2	1
CO5	3	2	1	0	0	0	0	0	0	2	1	1	1	0
Avg	3	2	1	1	0	0	0	0	0	2	2	2	2	0

Course Code & Name: 16IT6305   **Business Intelligence**

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: 16IT6306   Human Computer Interface

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

Course Code & Name: 16IT6401   Cyber Security and Forensics

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	0	0	0	0	0	2	3	3	2	1
CO2	3	1	0	2	1	0	0	0	0	1	3	1	3	0
CO3	3	1	0	1	1	0	0	0	0	2	0	2	1	0
CO4	3	1	0	0	0	0	0	0	0	1	1	1	2	1
CO5	3	1	0	0	0	0	0	0	0	2	1	1	1	0
Avg	3	1	0	1	0	0	0	0	0	2	2	2	2	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

		Code	Course														
		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

		Code	Course	C													
		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
III	V	16IT5201	Computer Networks	3	1	2	2	2	2	0	1	1	0	2	2	1	0
		16IT5202	Web Technology	3	2	1	3	2	2	0	1	2	0	0	1	1	1
		16IT5203	Information Security	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT5204	Theory Of Computation	3	2	1	3	2	2	0	1	2	0	0	1	1	1
		16IT53XX	**Professional Elective-I**														
		16IT5001	Network Laboratory	3	1	2	0	2	0	0	1	0	1	1	2	1	0
		16IT5002	Web Technology Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0

19IT53XX Professional Elective - I

		Code	Course	C													
III	V	16IT5301	Graphics and Multimedia	3	2	1	3	2	2	0	1	2	0	0	1	1	1
		16IT5302	Soft Computing	3	2	2	0	2	0	0	1	0	1	1	2	1	0
		16IT5303	System Software	3	1	2	0	2	0	0	0	0	0	1	2	1	1
		16IT5304	High Speed Networks	3	2	2	0	2	0	0	0	0	0	1	2	1	1
		16IT5305	Data Warehousing and Data Mining	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16IT5306	Software Design Patterns	3	2	1	1	0	0	0	0	0	2	2	2	2	0
III	VI	6IT6201	Mobile Computing	3	1	1	0	2	0	0	1	0	1	1	2	1	0
		16IT6202	Microcontrollers and Embedded Systems	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT6203	Software Testing and Quality Assurance	3	2	1	1	0	0	0	0	0	2	2	2	2	0
		16IT6204	Professional Ethics	3	2	1	0	2	0	0	1	0	1	1	2	1	0

		16IT63XX	**Professional Elective II**														
		16XX64XX	**Open Elective I**														
		16IT6001	Embedded Systems Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT6002	Open Source Software Laboratory	3	3	1	1	0	0	0	0	0	2	2	2	2	0
		16IT6801	Mini Project														
19IT63XX Professional Elective - II																
III	VI	16IT6301	Multimedia Communications	3	2	1	3	2	2	0	1	2	0	0	1	1	1
		16IT6302	Artificial Intelligence	3	2	2	0	2	0	0	1	0	1	1	2	1	0
		16IT6303	Compiler Design	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT6304	Cryptography and Network Security	3	2	1	1	0	0	0	0	0	2	2	2	2	0
		16IT6305	Business Intelligence	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16IT6306	Human Computer Interface	3	2	1	3	2	2	0	1	2	0	0	1	1	1
19ITXX64XX Open Elective - I																
III	VI	16IT6401	Cyber Security and Forensics	3	1	0	1	0	0	0	0	0	2	2	2	2	0

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

Chairman, Board of Studies

Chairman - BoS
IT - HiCET

Dean – Academics

Dean (Academics)
HiCET