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.E. COMPUTER SCIENCE AND ENGINEERING

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST
HICET

Curriculum & Syllabus

2017-2018

CHOICE BASED CREDIT SYSTEM

VISION AND MISSION OF THE INSTITUTION

VISION

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

MISSION

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

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

IM3: To produce dedicated professionals with social responsibility.

Chairman - BoS
CSE - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
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VISION AND MISSION OF THE DEPARTMENT

VISION

To provide an excellence for individuals to develop technologically superior, socially conscious and nationally responsible citizens.

MISSION

DM1: To develop competent Computer Science and Engineering professionals with knowledge in current technology.

DM2: To mould them to attain excellent leadership qualities there by making them excel in their careers.

DM3: To inspire and nurture students to come out with innovation and creativity solutions meeting the societal needs.

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

	Graduate attributes	Descriptions
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, 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, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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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.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	An ability to apply, design and develop principles of software engineering, networking and database concepts for computer-based systems in solving engineering problems.
PSO2	An ability to understand, design and code engineering problems using programming skills.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To acquire knowledge in the latest technologies and innovations and an ability to identify, analyze and solve problems in computer engineering.

PEO2: To be capable of modeling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.

PEO3: To possess critical thinking, communication skills, teamwork, leadership skills and ethical behavior necessary to function productively and professionally.

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CURRICULUM

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. COMPUTER SCIENCE AND ENGINEERING (UG)

REGULATION-2016

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

SEMESTER I

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
1	16MA1101	Engineering Mathematics I	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers – I	3	1	0	4	25	75	100
5	16GE1101	Computer Programming	3	0	0	3	25	75	100
6	16EC1202	Basics of Electronics Engineering	3	1	0	4	25	75	100
7	16PS1001	Physical Science Lab - I	0	0	2	1	50	50	100
8	16GE1001	Computer 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 I: Language Competency Enhancement Course-I	0	0	2	1	0	100	100
		TOTAL CREDITS	**18**	**3**	**12**	**27**	**300**	**700**	**1000**

SEMESTER II

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
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	25	75	100
5	16GE2102	Engineering Graphics	2	0	4	4	25	75	100
6	16CS2201	Object Oriented Programming With C++	3	0	0	3	25	75	100
7	16PS2001	Physical Sciences Lab - II	0	0	2	1	50	50	100
8	16CS2001	Object Oriented Programming Laboratory	0	0	4	2	50	50	100
9	16GE2001	Value Added Course II: Language Competency Enhancement Course-II	0	0	2	1	0	100	100
		TOTAL CREDITS	**17**	**2**	**12**	**25**	**250**	**650**	**900**

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

SEMESTER III

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
1	16MA3105	Discrete Mathematics and Graph Theory	3	1	0	4	25	75	100
2	16CS3201	Digital Principles and System Design	3	0	2	4	25	75	100
3	16CS3202	Data Structures	3	0	0	3	25	75	100
4	16CS3203	Software Analysis and Design	3	0	0	3	25	75	100
5	16CS3204	Operating Systems	3	0	0	3	25	75	100
6	16CS3205	Professional Ethics	3	0	0	3	25	75	100
7	16CS3001	Data Structures Laboratory	0	0	4	2	50	50	100
8	16CS3002	Operating Systems Laboratory	0	0	4	2	50	50	100
		TOTAL CREDITS	**18**	**1**	**10**	**24**	**250**	**550**	**800**

SEMESTER IV

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
1	16MA4108	Probability and Queuing Theory	3	1	0	4	25	75	100
2	16CS4201	Java Programming	3	0	0	3	25	75	100
3	16CS4202	Microprocessors and Microcontrollers	3	0	0	3	25	75	100
4	16CS4203	Database Management Systems	3	0	0	3	25	75	100
5	16CS4204	Computer Graphics	3	0	0	3	25	75	100
6	16CS4205	Fundamentals of Algorithms	3	0	0	3	25	75	100
7	16CS4001	Java Programming Laboratory	0	0	4	2	50	50	100
8	16CS4002	Database Management and Systems Laboratory	0	0	4	2	50	50	100
9	16CS4003	Microprocessors and Micro controllers Laboratory	0	0	4	2	50	50	100
		TOTAL CREDITS	**18**	**1**	**12**	**25**	**300**	**600**	**900**

Credit Distribution

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	24	25	21	25	22	18	**187**

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SYLLABUS

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16MA1101	ENGINEERING MATHEMATICS I (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, sinax or cosax , $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is sinbx or cosbx – 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**

Course Outcome

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 and evaluation 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, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH1101	ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)	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 sub atomic particles.

Unit	Description	Instructional Hours
I	**PROPERTIES OF MATTER AND THERMAL PHYSICS** Elasticity – Hooke's law – Stress-strain diagram - Relation between three modulii of elasticity (qualitative) — Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material 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, laser cutting, 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. Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Non destructive 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**

Course Outcome

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 ultrasonics and its applications in NDT.
CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS:

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

REFERENCE BOOKS:

R1 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi, 2014
R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY1101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

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

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

Course Outcome

CO1: Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries.
CO2: Knowledge on basic properties and application of various polymers and composites as an engineering material.
CO3: Summarize the various energy sources and energy storage devices
CO4: Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved.
CO5: Describe the basic properties and application of nano materials.

TEXT BOOKS

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

REFERENCES

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

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. It fulfills the necessary skills needed in today's global workplaces.
2. Student will be able to interpret and illustrate formal communication.
3. It empowers students in choosing right lexical techniques for effective presentation
4. It equips the learner to analyze and list out things in logical order
5. 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**

Course Outcome

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
B.E.	16GE1101	COMPUTER PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Learn the fundamentals of computers.
2. Learn the basics of C programming
3. Learn the basics of Arrays and String
4. Learn the uses of functions and pointers.
5. Learn the basics of structures and unions.

Unit	Description	Instructional Hours
I	**BASICS OF COMPUTER** Generation and Classification of Computers- Basic Organization of a Computer –Input and Output Devices–Hardware and Software definitions- Categories of Software- Number System Conversion and problems. Need for logical analysis and thinking – Algorithm -Pseudo code – Flow Chart.	9
II	**BASICS OF 'C' PROGRAMMING** Fundamentals of ' C' programming – Structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types –Expressions using operators in 'C' – Managing Input and Output operations-Decision making-Branching and Looping-Case study	9
III	**ARRAYS AND STRINGS** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String Library functions – String Arrays. Matrix operations-Addition-Subtraction-Multiplication-Transpose-Case study.	9
IV	**FUNCTIONS AND POINTERS** Function – definition – Declaration – Types of Function definition – call by value-call by reference- Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-Case study.	9
V	**STRUCTURES AND UNIONS** Structure- data type – definition – declaration –Nesting of structure - Union – Storage classes, Pre-processor directives-Case study.	9
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1:Use computers at user level, including operating systems, programming environments and differentiate between basic concepts of computer hardware and software.
CO2: Analyze problems, design and implementing algorithmic solutions.
CO3:Use data representation for the fundamental data types, read, understand and trace the execution of programs written in C language.
CO4: Write the C code using a modular approach and recursive concepts.
CO5: Explain the use of pointers, Structures and union.

TEXT BOOKS:

T1 – Balagurusamy "Programming in ANSI C", Seventh Edition, McGraw-Hill, 2016.
T2 - Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCE BOOKS:

R1 - Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.
R2- M.Rajaram and P.Uma maheswari, "Computer Programming with C" Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2014.
R3 - Dr.N.Sengottaiyan and K.Ramya, "Computer Programming",Cengage Learning (India) Pvt. Ltd.,2016.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16EC1202	BASICS OF ELECTRONICS ENGINEERING (CSE.& IT)	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,RLC Circuits.	15
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 Configurations and Characteristics, UJT -Characteristics.	15
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)	15
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)	15
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).	15
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

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.E.	16PS1001	PHYSICAL SCIENCES LAB – I (COMMON TO ALL BRANCHES) PHYSICS LAB - 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 aperature 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

CO1: Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
CO2: Assess the Young's modulus of a beam using non uniform bending methods.
CO3: Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum
Using spectrometer.
CO4: Identify the velocity of ultrasonic's in the given liquid.
CO5: Illustrate phenomena of thermal conductivity of a bad conductor.

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).
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.E.	16GE1001	COMPUTER PROGRAMMING LAB (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective

1. Be familiar with Microsoft office software.
2. Be exposed to role of constants, variables, identifiers, operators and other building blocks of C Language.
3. Be familiar with the use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. Be familiar with the concept of Array and pointers dealing with memory management.
5. Be exposed to Structures and unions.

S.No	Description of the Experiments	Total Practical Hours
1.	**a. Word Processing:** 1. Document creation, Text manipulation with Scientific notations 2. Table creation, Table formatting and conversion 3. Mail merge and Letter preparation 4. Flow Chart	3
2.	**b. Spread Sheet:** 1. Chart - Line, XY, Bar and Pie. 2. Formula - formula editor. 3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet. 4. Sorting and Import / Export features.	6
3.	**c. Basic C programming:** C program using I/O Statements	3
4.	C program using arithmetic operations	3
5.	Decision making statement & Looping Concepts • Designing a simple arithmetic calculator. (Use switch statement) • Performing the following operations: (Use loop statement) • Generate Pascal's triangle. • Construct a Pyramid of numbers.	6
6.	**d. Arrays and Strings** C program using one dimensional arrays	3
7.	C program using two dimensional arrays	3
8.	C program using string functions	3
9.	**e. Functions and pointers** Perform the following operations: (Use recursive functions) i. Find the factorial of a given integer. ii. Find the GCD (Greatest Common Divisor) of two given integers. iii. Solve Towers of Hanoi problem.	6
10.	Program to swap two numbers using pointers - call by reference.	3
11.	**f. Structures and Unions** C Program using Structures	3
12.	C Program using Unions	3
	TOTAL PRACTICAL HOURS	**45**

Course Outcome

CO1: Use office packages for documentation and presentation.
CO2: Implement program using control structures.
CO3: Handle arrays and strings.
CO4: Handle functions and pointers.
CO5: Form heterogeneous data using structure and union.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	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:	
1	Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.	
2	Study of pipe connection requirements for pumps.	
3	Preparation of plumbing line sketches for water supply and sewage works.	
4	Hands-on-exercise: ➢ 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.	

Gas welding

Foundry Tools and operations.

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	10
3	Stair case wiring.	
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	
5	Measurement of energy using single phase energy meter.	
ELECTRONICS ENGINEERING PRACTICES		
1	Study of Electronic components and equipments – Resistors - colour coding	
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.	
3	Study of logic gates AND, OR, NOT and NAND .	13
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.	
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

At the end of the course the students shall be able to

CO1: Fabricate wooden components and pipe connections including plumbing works.
CO2: Fabricate simple weld joints.
CO3: Fabricate electrical and electronics circuits.

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

Course Objective

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

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

Course Outcome

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

REFERENCE BOOKS :

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

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16MA2102	ENGINEERING MATHEMATICS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

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

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

Course Outcome

CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluid flow, electricity and magnetism.
CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane 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 linear differential equations using Laplace transform technique.
CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

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

REFERENCE BOOKS :

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

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH2102	PHYSICS OF MATERIALS (COMMON TO ALL BRANCHES)	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 nano technology.

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 – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors –direct and indirect band gap of semiconductors- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi 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 nanoparicles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every day life
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 ideas to synthesis Nano materials.

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011
T2- 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.E.	16CY2102	ENVIRONMENTAL SCIENCES (B.E., B.TECH., AERO, AUTO, CSE, ECE, EEE, EIE, IT, MECH, MECT)	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

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

Course Outcome

CO1: Understand the natural environment and its relationships with human activities.
CO2: Characterize and analyze human impacts on the environment
CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes
CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors in 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 Age International 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, Enviro Media.
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, Pearson Education, 2004

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. The learner will be introduced to global corporate culture and professional communication.
2. It helps the students to focus on organizing professional event and documentation.
3. The student will be able to describe the events and process in an effective way.
4. It trains the student to analyze the problems and to find solution to it.
5. 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, Replying for 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 way
CO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

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

REFERENCE BOOKS :

R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	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 inclined to 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 perpendicular and 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:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.

T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1. Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited,New Delhi 2008.

R2. K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.

R3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.

R4. N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS2201	OBJECT ORIENTED PROGRAMMING WITH C++ (CSE & IT)	3	0	0	3

Course Objective

1. Be familiar with the C++ concepts of abstraction, encapsulation, constructor,
2. To understand the concepts of polymorphism, overloading and Inheritance
3. To learn the concept of file handling
4. To study the concept of generic programming
5. Learn to apply exception handling and use built classes from STL

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OBJECT –ORIENTED PROGRAMMING** Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – arrays – structures and unions- functions- Storage Class	9
II	**CONSTRUCTORS AND OPERATOR OVERLOADING** Defining a Class – creating objects - access specifiers – function and data members default arguments – function overloading – friend functions – const with class – static member of a class – nested classes – local classes - Constructors – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor	9
III	**TEMPLATES AND EXCEPTION HANDLING** Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and Unexpected functions – Uncaught exception.	9
IV	**INHERITANCE AND POLYMORPHISM** Inheritance – public, private, and protected derivations – multiple inheritance – virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions	9
V	**FILE HANDLING** File Streams and formatted I/O – I/O manipulators - file handling – File Pointes-random access – standard template library – STL Component	9
	TOTAL INSTRUCTIONAL HOURS	45

Course Outcome

CO1: Differentiate between structures oriented programming and object oriented programming.
CO2 : Design problem solutions using Object Oriented Techniques.
CO3: Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions.
CO4: Apply concepts of operator overloading, constructors and destructors
CO5: Apply exception handling and use built -in classes from STL.

TEXT BOOKS:

T1. Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing; 4 edition
T2. Rohit Khrana, "Object Oriented Programming with C++",Vikas Publishing, 2 edition

REFERENCE BOOKS:

R1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint 2004
R2. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", Fourth Edition, Pearson Education, 2005.
R3. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
		PHYSICAL SCIENCES LAB – II (COMMON TO ALL BRANCHES)				
B.E.	16PS2001		0	0	2	1

PHYSICS LAB-II

Course Objective

1. Evaluate the band gap of a 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

CO1: Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO2: Determine the band gap of a semiconductor and variation of Energy Gap (E_g) with temperature.
CO3: Assess the Young's modulus of a beam using non uniform bending method.
CO4: Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO5: Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

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
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	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS2001	OBJECT ORIENTED PROGRAMMING LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. Understand the basic concepts of object oriented Programming
2. Understand concepts of class and objects in C++
3. Design the software using Inheritance and exception handling.

Expt. No.	Description of the Experiments
1.	Functions with default arguments, call by value, address, reference
2.	Primitive data members and arrays as data members in class
3.	Pointers as data members, constant data members and static member functions in class
4.	Constructors & destructors, copy constructor.
5.	Dynamic memory allocation methods
6.	Friend function & friend class.
7.	Inheritance.
8.	Polymorphism & function overloading.
9.	Virtual functions & dynamic polymorphism and RTTI
10.	Overload unary & binary operators both as member function & non member function
11.	Class templates & function templates.
12.	Exception Handling Mechanism
13.	Standard Template Library concept
14.	File Stream classes

TOTAL PRACTICAL HOURS **45**

Course Outcome

CO1: Learn to write, compiling & execute basic C++ program.
CO2: Able to create classes and objects and use them in their program
CO3: Able to design software using inheritance concept.\
CO4: Able to identify the exception in program and handle them .
CO5::Able to model and implement software solutions with object oriented design concepts

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	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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SYLLABUS

SEMESTER III

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	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
B.E.	16CS3201	DIGITAL PRINCIPLES AND SYSTEM DESIGN (CSE & IT)	3	0	2	4

Course Objective

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

Unit	Description	Instructional Hours
I	**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**

Course Outcome

CO1: Simplify boolean functions using different methods.
CO2: Design and implement combinational logic circuits.
CO3: Design and implement various sequential logic circuits.
CO4: Design using PLD.
CO5: Write HDL code for digital circuits.

TEXT BOOKS:

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

REFERENCE BOOKS :

R1-.S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design",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.E.	16CS3202	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	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS3203	SOFTWARE ANALYSIS AND DESIGN	3	0	0	3

Course Objective

1. To understand the basic concepts of software engineering, life cycle models and project management concepts.
2. To understand in detail about the requirement analysis and requirement engineering processes.
3. Learn the basics of OO analysis and design skills.
4. Learn the UML design diagrams.
5. Learn to map design to code.

Unit	Description	Instructional Hours
I	**SOFTWARE PROCESS AND PROJECT MANAGEMENT** Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis - Risk Management.	9
II	**REQUIREMENTS ANALYSIS AND SPECIFICATION** Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary.	9
III	**UML DIAGRAMS** Introduction to OOAD – Unified Process – UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams	9
IV	**DESIGN PATTERNS** GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller – Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer.	9
V	**CASE STUDY** Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – Elaboration – Domain Models – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand and gain knowledge to implement projects using OO concepts
CO2: Understand the functional requirements of UML analysis and design diagrams.
CO3: Apply the UML diagrams to understand the conceptual classes and class hierarchies
CO4: Apply appropriate design patterns..
CO5: Understand the concepts of use case modeling.

TEXT BOOKS:

T1 - Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition,Mc Graw-Hill International Edition, 2010.
T2 - Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

REFERENCE BOOKS :

R1 - Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
R2 - Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
R3 - Erich Gamma, and Richard Helm, Ralph Johnson, John Glissades, "Design patterns-Addison-Wesley, 1995.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS3204	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.E.	16CS3205	PROFESSIONAL ETHICS	3	0	0	3

Course Objective

1. To understand the importance of engineering ethics in an organizational setting.
2. To learn the various ethics and human values in workplace.
3. To understand the features of moral reasoning, moral explanations and the role of moral theories.
4. Understand the features of moral reasoning, moral explanations and the role of moral theories
5. Develop a case resolution model for resolving moral dilemmas faced by professionals

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 –Co-operation –Commitment –Empathy –Self-Confidence –Character –Spirituality	9
II	**ENGINEERING ETHICS** Senses of Engineering Ethics' -variety of moral issued -types of inquiry -moral dilemmas – moral autonomy -Kohlberg's theory -Gilligan's theory -consensus and controversy –Models of Professional Roles -theories about right action -Self-interest -customs and religion -uses of ethical theories.	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as experimentation -engineers as responsible experimenters -codes of ethics –a balanced outlook on law -the challenger case study	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** Safety and risk -assessment of safety and risk -risk benefit analysis and reducing risk -the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - 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-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE) ,India, etc	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the core values that shape the ethical behavior of an engineer and expose awareness on professional ethics and human values.
CO2: Understand the basic perception of profession, professional ethics, various moral issues, dilemmas and uses of ethical theories.
CO3: Apply professional engineering ethical theories, models and emphasize engineers' responsibility.
CO4: Understand and implement the laws, recalling the facts on case studies and practice professional safety responsibilities and rights.
CO5: Understand the sample code of ethics given by ASME, ASCE, IEEE, IETE and apply them in real environment.

TEXT BOOKS:

T1 - Mike Martin and Roland Schinzinger, —Ethics in Engineering‖, McGraw - Hill, New York, 2005
T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS :

R1 - Charles D. Fleddermann, —Engineering Ethics‖, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
R2 - Charles E Harris, Michael S. Protchard and Michael J Rabins, —Engineering Ethics–Concepts and Cases‖, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available).
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.E.	16CS3001	DATA STRUCTURES LABORATORY (CSE & IT)	0	0	4	2

Course Objective

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.

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. Traverse the above Binary search tree recursively in Postorder.
6.	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of integers. Traverse the above Binary search tree non recursively in inorder.
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 b)
8.	Write C++ programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selection sort
9.	Write C++ programs to perform the following searching i. Linear search ii) Binary Search ii.
10	i) write a C++ program to perform the following operation: A) Insertion into a B-tree ii) 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	CO1 : Understand the appropriate data structure for a given problem. CO2 : Understand different data structures for implementing solutions to practical problems. CO3 : Understand various tree operations. CO4 : Apply data set to solve problems using graphs. CO5: Apply the concepts of sorting and searching techniques to solve the problems.

REFERENCE:

R1 - R. Gilberg, B. Forouzan, "Data Structures: A pseudo Code Approach with C++", Cengage Learning, ISBN 9788131503140. 2. E. Horowitz, S. Sahni, D. Mehta, "Fundamentals of Data Structures in C++", Galgotia Book Source, New Delhi, 1995, ISBN 16782928.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE

- Turbo C++ Compiler
- Operating System (Windows, UNIX, Linux...)

HARDWARE

Standalone desktops 30 Nos

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS3002	OPERATING SYSTEMS LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. Learn shell programming and the use of filters in the UNIX environment.
2. Be familiar with implementation of CPU Scheduling Algorithms and file allocation strategies.
3. Gain knowledge in page replacement algorithms.
4. Acquire the knowledge about Deadlock detection and avoidance algorithms.
5. Learn to use the paging techniques in memory management.

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 strategies a. Sequential b. Indexed c. Linked
5	Implement Semaphores
6	Implement all File Organization Techniques a. Single level directory b. Two level c. Hierarchical d. DAG
7	Implement Bankers Algorithm for Dead Lock Avoidance
8	Implement an Algorithm for Dead Lock Detection
9	Implement e 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 INSTRUCTIONAL HOURS 45

Course Outcome

CO1: Understand the basic UNIX commands and apply the concept in shell programming.
CO2: Apply scheduling algorithms and analyze it with various process management techniques.
CO3: Apply the conceptual knowledge of various page replacement algorithms
CO4: Implement deadlock avoidance and Detection Algorithms
CO5: Compare the paging techniques of memory management..

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	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 Markov 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 Outcome

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 analyze 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.E.	16CS4201	JAVA PROGRAMMING (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 ContainerListener Interface-Using the Delegation Event Model-adapter class-inner classes.	9
V	**FRAMES AND WINDOWS** Window Fundamentals-Working with Frame Windows-Creating a Frame Window in an Applet-Displaying Information Within a Window-Working with Graphics-Drawing Lines-Drawing Rectangles-Drawing Ellipses and Circles-Working with Color-Working with Fonts.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Understand the fundamentals of Java Programming
CO2: Implementation of 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.E.	16CS4202	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3

Course Objective

1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller
5. Study the concepts of microcontroller interfacing

Unit	Description	Instructional Hours
I	**THE 8086 MICROPROCESSOR** Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.	9
II	**8086 SYSTEM BUS STRUCTURE** 8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.	9
III	**I/O INTERFACING** Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.	9
IV	**MICROCONTROLLER** Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming	9
V	**INTERFACING MICROCONTROLLER** Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation..	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Design and implement programs on 8086 microprocessor.
CO2: Design I/O circuits.
CO3 Design Memory Interfacing circuits.
CO4: Design and implement 8051 microcontroller based systems.
CO5: Design various interfacing and its programming methodologies

TEXT BOOKS:

T1- Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Prentice Hall of India, 2011.
T2- Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011

REFERENCE BOOKS :

R1 - Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4203	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Course Objective

1. To learn the data models, conceptualize and depict a database system using E-R diagram.
2. To learn SQL and relational database design.
3. To understand various normal forms
4. To understand the internal storage structures using different file and indexing techniques.
5. To know the concepts of transaction processing, concurrency control techniques and recovery procedure

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction: Database system application, purpose of database system - View of Data –Database Languages- Data Storage and Querying-Database Architecture – Database design and E-R model: Overview of the design process- The Entity – Relationship Model-Constraints- Removing redundant attributes in Entity Sets- Entity – Relationship Diagram- Reduction to Relational Schemas-Entity Relationship Design Issues.	9
II	**RELATIONAL MODEL AND DATABASE DESIGN** Introduction to Relational Model – Formal Relational Query Languages - Introduction to SQL: Data definition Basic structure of SQL Queries-Additional Basic operations - Set operations-Aggregate functions-Nested sub queries- Intermediate SQL: Joins- Views – Integrity Constraints.	9
III	**DATABASE DESIGN AND NORMAL FORMS** Functional Dependencies – Normal Forms Based on primary Keys- General Definition of Second and Third Normal Form - Boyce Codd Normal Form – Algorithms for relational database schema design - Multivalued dependencies and Fourth Normal Form.	9
IV	**DATA STORAGE AND QUERY PROCESSING** Overview of Physical Storage Media – Magnetic disk Flash storage- RAID - File and Record Organization –Indexing and Hashing: Ordered Indices – B + Tree Index File- Static Hashing – Dynamic Hashing- Query Processing: Overview - measures of Query Cost.	9
V	**TRANSACTION MANAGEMENT** Transactions: Transaction concept– Transaction Atomicity and Durability- Transaction Isolation – Serializability -Transaction Isolation and Atomicity - Transaction Isolation levels- Implementation of Isolation Levels – Concurrency Control: Lock based protocols - Deadlock handling - Multiple Granularity - Time stamp based protocols – Recovery system: Failure classification – Storage - Recovery and atomicity – Recovery Algorithms.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Able to design an Entity Relationship (ER) diagram for an application
CO2: Apply Relational queries and SQL queries in real time
CO3: Apply normalization concepts for real time applications.
CO4: Evaluate the performance of various storage media and query processing
CO5: Apply various protocols and algorithms to manage the transactions and concurrency control

TEXT BOOKS:

T1- Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata Mc Graw Hill, 2011.
T2- Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2008.

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 Mc Graw Hill, 2010.
R3- Rob Cornell, "Database Systems Design and Implementation", Cengage Learning, 2011.
R4- Atul Kahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4204	COMPUTER GRAPHICS	3	0	0	3

Course Objective

1. Acquire knowledge about graphics devices, software and basic algorithms for geometric objects.
2. Understand the two dimensional graphics with their transformations and clipping techniques.
3. Understand the three dimensional graphics with their transformations and clipping techniques.
4. Gain knowledge about illumination methods, rendering and color models.
5. Understand the design of animations and its realistic features.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**BASIC OF COMPUTER GRAPHICS** Basic of Computer Graphics-Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards. Scan conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; Fill area primitives: scan-line polygon filling, inside-outside test, Scan-Line fill of Curved Boundary Areas boundary and flood-fill, line attributes, area-fill attributes, character attributes.	9
II	**2DTRANSFORMATION&VIEWING** Basic transformations: translation, rotation, scaling, matrix representation, homogeneous coordinates, composite transformations, reflection and shearing transformation. Viewing: viewing pipeline and coordinates system, window-to-viewport transformation, two dimensional viewing functions. Clipping: point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping, curve clipping & text clipping.	9
III	**THREE DIMENSIONAL CONCEPTS** Three dimensional display methods, Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces, Blobby objects, spline representations, Bezier curves and surfaces -B-Spline curves and surfaces. 3D transformation: translation, scaling and rotation, composite transformation, viewing pipeline and coordinates, projection, visible surface detection methods.	11
IV	**OBJECT RENDERING, ILLUMINATION & COLOR MODELS** Basic illumination methods - ambient, diffuse reflection, specular reflection and the phong model, warn model, Surface-rendering- gouraurd shading, phong shading, constant intensity shading, Color models-properties of light, XYZ, RGB, YIQ and CMY color models	7
V	**COMPUTER ANIMATIONS & REALISM** ANIMATION: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. REALISM: Recursively defined curves – Koch curves – C curves – Dragons – space filling curves –-fractals-Mandelbrot sets – Julia Sets – Random Fractals –overview of ray tracing.	9
	TOTAL INSTRCTIONAL HOURS	45

Course Outcome

CO1. To understand the Design and manipulate graphical objects.
CO2. To apply and understand two dimensional transformations and clipping techniques to graphics.
CO3. To understand and design three dimensional graphics and apply three dimensional transformations.
CO4. To understand and remember the concepts for Illumination, shading and colors to objects.
CO5. To understand and design animation sequences and various curves.

TEXT BOOKS:

T1. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007.
T2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.

REFERENCE BOOKS :

R1. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
R2. Hill F S Jr., "Computer Graphics", Maxwell Macmillan" , 1990.
R3. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.
R4. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", Mc Graw Hill 1978.
R5. http://nptel.ac.in

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4205	FUNDAMENTALS OF ALGORITHMS	3	0	0	3

Course Objective

1. Learn the algorithm analysis techniques.
2. Become familiar with the different algorithm design techniques
3. Learn greedy technique to solve problems
4. Understand backtracking and iterative development of algorithms
5. Understand the limitations of Algorithm power

Unit	Description	Instructional Hours
I	**ANALYSIS OF ALGORITHM** Introduction – Algorithms- Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving- Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms	9
II	**BRUTE FORCE AND DIVIDE-AND-CONQUER** Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem- Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers- Single Source Shortest Path Algorithm	9
III	**DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE** Computing a Binomial Coefficient – All Pairs Shortest Path Algorithm -Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique–MST- Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees	9
IV	**BACKTRACKING AND ITERATIVE IMPROVEMENT** The Simplex Method-The Maximum-Flow Problem – maximum Matching in Bipartite Graphs- The Stable marriage Problem- The General Method – 8-Queens Problem- Sum of Subsets – Graph Coloring- Hamiltonian Cycle	9
V	**P AND NP COMPLETENESS** Decision Trees -Polynomial time – Nondeterministic Algorithms and NP – Reducibility and NP completeness – NP complete Problems – Approximation Algorithms for NP- More on NP completeness	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Design algorithms for various computing problems
CO2: Analyze the time and space complexity of algorithms
CO3: Critically analyze the different algorithm design techniques for a given problem
CO4: Modify existing algorithms to improve efficiency
CO5: Apply algorithm techniques for real time applications

TEXT BOOKS:

T1- Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
T2- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012

REFERENCE BOOKS :

R1 - Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education,Reprint 2006.
R2- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
R3- E.Horowitz , Sahni & Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications,1997.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4001	JAVA PROGRAMMING LABORATORY (CSE & IT)	0	0	4	2

Course Objective

1. Be familiarized with good programming design methods
2. Study the basic object oriented concepts of Java
3. Develop a system using event driven programming paradigm
4. Learn about the database connectivity using Java and client server communications
5. Getting exposure in implementing the different applications using java

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 the implementations.
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

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 communication for data sharing using Java

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4002	DATABASE MANAGEMENT AND SYSTEMS LABORATORY	0	0	4	2

Course Objective

1. To learn the fundamental concepts of SQL queries.
2. To understand the concept of designing a database with the necessary attributes.
3. To know the methodology of Accessing, Modifying and Updating data and information from the relational databases.

Expt. No.	Description of the Experiments
1.	Working with SQL commands like DDL, DML, TCL, DCL
2.	forming Single-row functions and group functions in SQL.
3.	Execute simple queries using joins and Integrity constraints
4.	Creation and manipulation of database objects (Views, Synonyms, Sequence, Indexes, Save point).
5.	Simple programs using PL/SQL block.
6.	Implementation of cursor in PL/SQL block.
7.	Generate trigger in PL/SQL block.
8.	Write PL/SQL block Programs using exception handling.
9.	Design PL/SQL blocks using subprograms namely functions and procedures.
10.	Mini project.
	TOTAL PRACTICAL HOURS **45**

Course Outcome

CO1: Design and implement a database schema for a given problem-domain.
CO2: Populate and query a database
CO3: Create and maintain tables using PL/SQL.
CO4: Prepare reports for maintaining databases
CO5: Utilize various constraints for managing database

Chairman, Board of Studies

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean – Academics

Chairman - BoS
CSE - HiCET

Dean (Academics)
HiCET

PROGRAMME	COURSECODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CS4003	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	0	0	4	2

Course Objective

1. Introduce ALP concepts and features
2. Write ALP for arithmetic and logical operations in 8086 and 8051
3. Differentiate Serial and Parallel Interface
4. Interface different I/Os with Microprocessors
5. Be familiar with MASM

Expt. No.	Description of the Experiments
1.	Basic arithmetic and Logical operations.
2.	Code conversion, decimal arithmetic and Matrix operations.
3.	Floating point operations, string manipulations, sorting and searching
4.	Counters and Time Delay
	Peripherals and Interfacing Experiments
5.	Traffic light control
6.	Stepper motor control
7.	Key board and Display
8.	Serial interface and Parallel interface
9.	A/D and D/A interface and Waveform Generation
	8051 Experiments using kits and MASM
10.	Basic arithmetic and Logical operations.
11.	Square and Cube program, Find 2"s complement of a number
12.	Unpacked BCD to ASCII

TOTAL PRACTICAL HOURS **45**

Course Outcome

CO1: Write ALP Programmes for fixed and Floating Point and Arithmetic
CO2: Interface different I/Os with processor
CO3: Generate waveforms using Microprocessors.
CO4: Execute Programs in 8051
CO5: Explain the difference between simulator and Emulator

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CSE - HiCET

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CO'S, PO'S & PSO'S MAPPING - ACADEMIC YEAR – (2017-2018)

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 Essential English for Engineers– I

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

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

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

Course Code & Name: 16EC1202 Basics of Electronics Engineering

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

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

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

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

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

Course Code & Name: 16GE1002 Engineering Practices Laboratory

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

Semester – II

Course Code & Name: 16MA2102 Engineering Mathematics-II

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

Course Code & Name: 16PH2102 Physics of Materials

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

Course Code & Name: 16CY2102 Environmental Sciences

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

Course Code & Name: 16HE2102 Essential 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: 16CS2202 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: 16CS2002 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: 16CS3201 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: 16CS3202 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: 16CS3203 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	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: 16CS3204 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: 16CS3001 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: 16CS3002 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: 16CS3205 Professional Ethics

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	2	3	2	1	1	-	-	-	-	-	1	2	2	2
CO2	2	3	2	1	1	-	-	-	-	-	1	2	2	2
CO3	2	2	2	2	1	-	-	-	-	-	1	2	2	2
CO4	2	2	3	1	2	-	-	-	-	-	2	2	3	3
CO5	2	3	3	2	2	-	-	-	-	-	3	2	3	3
Avg	2	2.6	2.4	1.4	1.4	-	-	-	-	-	1.6	2	2.4	2.4

Course Code & Name: 16CS4201 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: 16CS4202 Microprocessors and Microcontrollers

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: 16CS4203 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	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: 16CS4204 Computer 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	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: 16CS4205 Fundamentals of Algorithms

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: 16CS4001 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: 16CS4002 Database Management and 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: 16CS4003 Microprocessors and Microcontrollers 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	3	0	0	0	0	0	3	0	3	0	1	0
CO2	3	0	2	0	0	3	0	1	2	0	3	0	1	0
CO3	3	0	2	0	0	3	0	1	2	0	2	0	1	0
CO4	3	0	2	0	0	3	0	1	0	0	2	0	1	0
CO5	3	0	2	0	0	0	0	0	0	0	2	0	1	0
Avg	**3**	**0**	**2**	**0**	**0**	**2**	**0**	**1**	**1**	**0**	**2**	**0**	**1**	**0**

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I	I	**16MA1101**	Engineering Mathematics-I	3	3	3	2	2	-	-	-	-	-	-	2	2	2
		16PH1101	Engineering Physics	3	2	3	2	2.6		2						1.2	1.2
		16CY1101	Engineering Chemistry	3	2	2	2	2	1	-	-	-	-	-	1	1	1
		16HE1101	English for Engineers -I	1	1	1	1.3		1.8	1		2	3		1.6	1	1
		16GE1103	Problem Solving and Python Programming	2	3	2	2	2	-	-	-	-	-	-	1	1	1
		16EC1202	Basics of Electronics Engineering	2	0	0	0	0	2	3	3	2		2	2	2	1

		16PS1001	Physical Sciences Laboratory - I	3	2	3	2	2.6		2						1.2	1.2
		16GE1004	Problem Solving and Python Programming Lab	3	2	3	1	2	-	-	-	-	-	-	2	3	1
		16GE1002	Engineering Practices Laboratory	2	1	1			1	3	3	2		2	2	2	1
	II	**16MA2102**	Engineering Mathematics-II	3	3	3	2	2	-	-	-	-	-	-	2	1	2
		16PH2102	Physics of Materials	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4
		16CY2102	Environmental Sciences	2		1	1		2	3	3	2		2	2	2	1
		16HE2102	Essential English for Engineers - II	2	1.3	2	1	1	2			1.6	2.8		2	1.25	1
		16GE2102	Engineering Graphics	3	2	3	2	2.6		2						1.2	1.2
		16CS2202	Programming in C and C++	3	3	2	2	2	2	0	1	0	1	1	2	0	1
		16PS2001	Physical Sciences Laboratory - II	3	2.4	1.2	1.8	1.8	1	2						1.8	1.4
		16CS2002	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
		16CS3201	Digital Principles And System Design	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16CS3202	Data Structures	3	2	0	0	1	0	0	0	0	0	1	2	1	0
		16CS3203	Software Analysis and Design	2	2	1	0	0	0	0	0	0	0	1	2	1	2
		16CS3204	Operating System	3	3	2	2	2	2	0	1	0	1	1	2	0	1
		16CS3001	Data Structures Laboratory	3	1	1	1	1	0	0	0	1	0	1	1	1	0

		16CS3002	Operating Systems Laboratory	3	2	0	0	1	0	0	0	0	0	1	2	1	0
		16CS3205	Professional Ethics	2	2	1	0	0	0	0	0	0	0	1	2	1	2
	IV	**16MA4108**	Probability And Queuing Theory	2	2.6	2.4	1.4	1.4	-	-	-	-	-	1.6	2	2.4	2.4
		16CS4201	Java Programming	3	2	2	0	2	0	0	0	0	0	1	2	1	1
		16CS4202	Microprocessors and Microcontrollers	3	2	2	0	2	0	0	1	0	1	1	2	1	0
		16CS4203	Database Management Systems	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16CS4204	Computer Graphics	3	2	2	0	2	0	0	1	0	1	1	2	1	0
		16CS4205	Fundamental of Algorithms	3	1	2	0	2	0	0	0	0	0	1	2	1	1
		16CS4001	Java Programming Laboratory	3	1	1	1	1	0	0	0	1	0	1	1	1	0
		16CS4002	Database Management and Systems Laboratory	3	2	2	2	2	2	0	1	1	0	2	2	1	0
		16CS4003	Microprocessors and Microcontrollers Laboratory	3	0	2	0	0	2	0	1	1	0	2	0	1	0

Chairman, Board of Studies

Chairman - BoS
CSE - HiCET

Dean – Academics

Dean (Academics)
HiCET