SYLLABUS
DIPLOMA IN COMPUTER ENGINEERING
(DAY COURSES)
w.e.f. - 2025

UNIVERSITY POLYTECHNIC
FACULTY OF ENGINEERING AND TECHNOLOGY
JAMIA MILLIA ISLAMIA, NEW DELHI

Index

Programme Educational Objectives (PEOs)

PEO-1	Provide students with a solid foundation in Computer Engineering principles and practices, enabling them to design, implement, and manage computer-based systems.
PEO-2	Equip students with the essential technical, practical, and interpersonal skills needed to thrive in Information Technology (IT) industry.
PEO-3	Enhance critical thinking and problem-solving abilities, allowing them to assess complex Computer Engineering challenges and create innovative solutions in practical situations.
PEO-4	Promote a culture of lifelong learning, ensuring students stay informed about emerging technologies and adapt to evolving trends, so their skills remain relevant throughout their careers.
PEO-5	Develop entrepreneurial skills and leadership qualities, empowering students to take advantage of opportunities in the tech industry, drive innovation, and contribute to the growth of organizations and communities.

Programme Outcomes (POs)

PO-1	Address complex challenges in the design, development, and maintenance of computer-based systems by applying principles of Computer Engineering, Applied Sciences and Mathematics.
PO-2	Provide students with the fundamental technical, practical, and interpersonal skills required to succeed in the IT industry and make meaningful contributions to teams, projects, and professional settings.
PO-3	Develop critical thinking and problem-solving skills in students, enabling them to analyze and assess complex challenges in Computer Engineering and devise innovative, practical solutions in real-world scenarios.
PO-4	Adopt a lifelong learning approach, staying updated on emerging technologies and adapting to changing trends to ensure their skills remain relevant and effective throughout their careers.
PO-5	Nurture entrepreneurial thinking and leadership abilities in students, equipping them to identify and capitalize on opportunities, drive innovation, and contribute to the sustainable growth and success in Software Development, Hardware Manufacturing, Telecommunications, and IT services.

Course Structure of Diploma in Computer Engineering Program

S. No.	Category of Courses	Category Code of Courses	Breakup of Credits
1	Humanities & Social Science Courses	HS	8
2	Basic Science Courses	BS	14
3	Engineering Science Courses	ES	21
4	Program Core Courses (Branch specific)	PC	50
5	Program Elective Courses (Branch specific)	PE	10
6	Open Elective Courses (from other technical and/or emerging subjects)	OE	6
7	Project	PR	11
	Seminar	SE	
	Summer Internship (in industry or elsewhere)	SI	
8	Audit Courses	AU	Nil
		Total	**120**

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING- I YEAR (DAY COURSE)

FIRST SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	COHS101	Communication Skills	HS	2	1	0	3	60	90	150
2	COBS102	Applied Physics	BS	2	1	0	3	60	90	150
3	COES103	IT Systems and Computer Programming	ES	2	0	0	2	40	60	100
4	ECES104	Fundamentals of Electronics Engineering	ES	2	0	0	2	40	60	100
5	COBS105	Applied Mathematics-I	BS	2	1	0	3	60	90	150
Practical Courses										
1	COHS111	Communication Skills Lab	HS	0	0	2	1	30	20	50
2	COBS112	Applied Physics Lab	BS	0	0	2	1	30	20	50
3	COES113	IT Systems and Computer Programming Lab	ES	0	0	4	2	60	40	100
4	ECES114	Fundamentals of Electronics Engineering Lab	ES	0	0	2	1	30	20	50
5	MEES116	Engineering Graphics	ES	0	0	4	2	60	40	100
						Total	**20**	**470**	**530**	**1000**

HS: Humanities and Social Science Courses
BS: Basic Science Courses
ES: Engineering Science Courses

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING – I YEAR (DAY COURSE)

SECOND SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	CEES201	Engineering Mechanics	ES	2	1	0	3	60	90	150
2	COBS202	Applied Chemistry	BS	2	1	0	3	60	90	150
3	MEES203	Fundamentals of Mechanical Engineering	ES	2	1	0	3	60	90	150
4	EEES204	Fundamentals of Electrical Engineering	ES	2	0	0	2	40	60	100
5	COBS205	Applied Mathematics-II	BS	2	1	0	3	60	90	150
Practical Courses										
1	CEES211	Engineering Mechanics Lab	ES	0	0	2	1	30	20	50
2	COBS212	Applied Chemistry Lab	BS	0	0	2	1	30	20	50
3	EEES214	Fundamentals of Electrical Engineering Lab	ES	0	0	2	1	30	20	50
4	MEES216	Engineering Workshop Practice	ES	0	0	4	2	60	40	100
5	COHS217	Sports and Yoga	HS	0	0	2	1	30	20	50
Audit Courses										
1	COAU200	Environmental Science	AU	2	0	0	0			
						Total	**20**	**460**	**540**	**1000**

HS: Humanities and Social Science Courses
BS: Basic Science Courses
ES: Engineering Science Courses
AU: Audit Courses
Note: Summer Internship-I of 4 weeks after 2nd semester

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING – II YEAR (DAY COURSE)

THIRD SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	COPC301	Computer Oriented Numerical Methods	PC	2	1	0	3	60	90	150
2	COPC302	Operating System	PC	2	1	0	3	60	90	150
3	COPC303	Object Oriented Programming	PC	2	1	0	3	60	90	150
4	COPC304	Cyber Security	PC	2	1	0	3	60	90	150
5	ECPC 305	Digital Electronics and Microprocessors	PC	2	0	0	2	40	60	100
Practical Courses										
1	COPC311	Computer Oriented Numerical Methods Lab	PC	0	0	2	1	30	20	50
2	COPC312	Operating System Lab	PC	0	0	2	1	30	20	50
3	COPC313	Object Oriented Programming Lab	PC	0	0	2	1	30	20	50
4	ECPC 315	Digital Electronics and Microprocessors Lab	PC	0	0	2	1	30	20	50
5	COSI316	Summer Internship-I	SI	0	0	0	2	100	--	100
						Total	**20**	**500**	**500**	**1000**

PC: Program Core Courses
SI: Summer Internship Courses

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING – II YEAR (DAY COURSE)

FOURTH SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	COPC401	Data Structures and Algorithms	PC	2	1	0	3	60	90	150
2	COPC402	Database Management System	PC	2	1	0	3	60	90	150
3	COPC403	Computer Networks	PC	2	1	0	3	60	90	150
4	COPE404	Artificial Intelligence	PE	2	1	0	3	60	90	150
5	COPC405	Computer Organization and Architecture	PC	2	0	0	2	40	60	100
Practical Courses										
1	COPC411	Data Structures and Algorithms Lab	PC	0	0	2	1	30	20	50
2	COPC412	Database Management System Lab	PC	0	0	2	1	30	20	50
3	COPC413	Computer Networks Lab	PC	0	0	2	1	30	20	50
4	COPC415	Computer Hardware Lab	PC	0	0	2	1	30	20	50
5	COPR416	Minor Project	PR	0	0	4	2	60	40	100
Audit Courses										
1	COAU400	Indian Knowledge and Tradition	AU	2	0	0	0	--	--	--
						Total	**20**	**460**	**540**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
PR: Project Courses
AU: Audit Courses
Note: Summer Internship-II of 4 weeks after 4th semester

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING – III YEAR (DAY COURSE)

FIFTH SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	COPE501	Computer Graphics	PE	2	1	0	3	60	90	150
2	COPC502	Web Technologies	PC	2	1	0	3	60	90	150
3	COPE503	Java Programming	PE	2	0	0	2	40	60	100
4	EEOE504	Soft Computing Techniques	OE	2	1	0	3	60	90	150
5	COHS505	Entrepreneurship and Start-up	HS	2	1	0	3	60	90	150
Practical Courses										
1	COPE511	Computer Graphics Lab	PE	0	0	2	1	30	20	50
2	COPC512	Web Technologies Lab	PC	0	0	2	1	30	20	50
3	COPE513	Java Programming Lab	PE	0	0	2	1	30	20	50
4	COSI516	Summer Internship-II	SI	0	0	0	2	60	40	100
5	COPR517	Major Project-I	PR	0	0	2	1	50		50
						Total	**20**	**480**	**520**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
OE: Open Elective Courses
HS: Humanities & Social Science Courses
SI: Summer Internship Courses
PR: Project Courses

EVALUATION SCHEME FOR THREE YEAR DIPLOMA COURSE IN COMPUTER ENGINEERING – III YEAR (DAY COURSE)

SIXTH SEMESTER

S. No	Code No	Subject	Course Type	Periods / Week			Credits	Distribution of Marks		
				L	T	P		IA	UE	Total
Theory Courses										
1	COPC601	Software Engineering	PC	2	1	0	3	60	90	150
2	COPC602	Visual Programming	PC	2	1	0	3	60	90	150
3	COPC603	Introduction to E-Governance	PC	2	1	0	3	60	90	150
4	ECOE604	Microcontroller and Embedded System	OE	2	1	0	3	60	90	150
Practical Courses										
1	COPC611	Software Engineering Lab	PC	0	0	4	2	60	40	100
2	COPC612	Visual Programming Lab	PC	0	0	4	2	60	40	100
3	COSE616	Seminar	SE	0	0	2	1	50	--	50
4	COPR617	Major Project-II	PR	0	0	6	3	90	60	150
Audit Courses										
1	COAU600	Indian Constitution	AU	2	0	0	0	--	--	--
						Total	**20**	**500**	**500**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
OE: Open Elective Courses
SE: Seminar Courses
PR: Project Courses
AU: Audit Courses

Course Code	:	COHS101
Course Title	:	**Communication Skills**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	HS

Course Objectives

1. To develop confidence and proficiency in spoken English with correct pronunciation, while strengthening the four key communication skills.
2. To enhance public speaking, group discussions and presentation skills, enabling students to express their ideas effectively, and succeed academically, professionally and socially.
3. To foster personality development by cultivating self-confidence, adaptability, emotional intelligence, and resilience.
4. To strengthen leadership and teamwork abilities through collaboration, efficient team management and proactive decision-making.
5. To align communication and interpersonal skills with professional ethics and career aspirations and goals for long-term success.

Course Content

Unit-I: Basics of Communication Skills in English

Introduction to Communication: Meaning, definition and process of communication; Types of Communication: Formal and informal; verbal, non-verbal and written; Barriers to Effective Communication: Physical, linguistic, psychological, cultural, organizational, semantic and technical barriers; 7 Cs of Effective Communication: Considerate, Concrete, Concise, Clear, Complete, Correct, Courteous; Art of Effective Communication: Choosing words, voice modulation, clarity, time management and simplification of words; and Technical Communication.

Unit-II: Soft Skills and Life Skills for Personal Excellence

Soft Skills: Personal attributes and interpersonal abilities that enhance job performance and career prospects and interpersonal interactions. Soft skills help build effective relationships, clear communication, and adaptability in professional environments. Life Skills: Tools for managing personal and professional challenges, developing self-awareness and self-analysis, understanding one's strengths and weaknesses.

Life skills also encompass adaptability with a positive attitude, resilience to overcome setbacks and stress; emotional intelligence to recognize, understand and manage one's emotions while responding to others, and empathy which promotes better relationships by understanding and sharing others' feelings.

Unit-III: Reading Comprehension

Comprehension, Vocabulary Enrichment, Grammar Exercises based on reading of the following texts:
Section-1 (Stories): (a) Sparrows by K. A. Abbas, (b) The Gift of the Magi by O. Henry, (c) The Happy Prince by Oscar Wilde, and (d) Games at Twilight by Anita Desai
Section-2 (Poems): (a) Night of the Scorpion by Nissim Ezekiel, (b) Stopping by Woods on a Snowy Evening by Robert Frost, (c) Where the Mind is Without Fear by Rabindranath Tagore, and (d) My Mother at Sixty-Six by Kamla Das

Unit-IV: Professional Writing

The Art of Paragraph Writing, Letters: Business and Personnel, Drafting notices, minutes of a meeting, etc.

Unit-V: Vocabulary and Grammar

Commonly used words: Word Meaning and Usage, Synonyms and Antonyms, Dictionary skills, Contextual Vocabulary; Glossary of Official Correspondence; One-word substitution, Idioms and Phrases; Tenses and Verbs Usage (Through Translation between English and Hindi); Transformation of sentences: Interchange of Degrees of Comparison, Active and Passive Voice, Direct and Indirect Speech; Common errors: Grammatical errors, Pronunciation errors, Vocabulary errors, Wrong use of Idiomatic Expressions, etc.

References

1. Anjana Tiwari, Communication Skills in English. Khanna Book Publishing Co. (P) Ltd. Delhi, 2022.
2. O'Connor, J. D. Better English Pronunciation. Cambridge University Press, 1980.
3. Murray, Lindley. An English Grammar: Comprehending Principles and Rules. Wilson and Sons, 1980.
4. Tiwari, Anjana. Communication Skills in English. Khanna Book Publishing Co. (P) Ltd., 2022.
5. Kumar, Kulbhushan. Effective Communication Skills. Khanna Publishing House, 2018.
6. Maison, Margaret M. Examine Your English. Orient Longman, 1964.

7. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill, 2002.
8. Nielson, John. Effective Communication Skills. Xlibris, 2008.
9. Cambridge Advanced Learner's Dictionary. 4th ed., Cambridge University Press, 2018.
10. Roget, Peter Mark. Roget's Thesaurus of English Words and Phrases. Edited by George Davidson, Penguin Books, 2004.
11. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principles and Practice. 2nd ed., Oxford University Press, 2011.
12. Swan, Michael. Practical English Usage. 4th ed., Oxford University Press, 2016.
13. Balasubramanian, T. A Textbook of English Phonetics for Indian Students. Macmillan, 1981.
14. Murphy, Raymond. Intermediate English Grammar. Cambridge University Press, 1994.
15. https://wordpowermadeeasy.files.wordpress.com/2007/12/gre_wordlist.pdf

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Develop conceptual clarity on communication and its components, identify and overcome barriers to effective communication, apply the 7 Cs for clarity and precision; refine verbal and non-verbal skills through word choice, voice modulation and master technical communication for professional excellence.
CO-2	Acquire essential soft and life skills to enhance personal and professional effectiveness, foster strong interpersonal relationships, cultivate adaptability and resilience, apply and demonstrate emotional intelligence and empathy for meaningful interactions and career success.
CO-3	Enhance reading comprehension through diverse literary texts, enrich vocabulary, strengthen grammar, and develop critical thinking and analytical skills for deeper textual interpretation. Foster a lifelong learning mindset, develop and promote empathy, resilience, cultural awareness and values such as patriotism, familial bonds, scientific attitude and self-awareness, logic and rationality.
CO-4	Attain proficiency in professional writing by mastering paragraph structuring, composing effective business and personal letters and drafting formal documents such as notices and meeting minutes with clarity and precision.
CO-5	Strengthen vocabulary and grammar skills through word usage, synonyms, antonyms, and contextual vocabulary, master official correspondence terminology, enhance accuracy in sentence transformation, tense usage and translation and rectify common errors in grammar, pronunciation, and idiomatic expressions for effective communication.

Course Code	:	COBS102
Course Title	:	**Applied Physics**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	High School Physics Course
Course Category	:	BS

Course Objectives

1. Develop a foundational understanding of concepts of physics.
2. Utilize theoretical concepts to solve real-world physics problems.
3. Improve analytical, mathematical, and problem-solving skills in physics.
4. Analyze physical phenomena and interpret the results.
5. Introduce practical applications of physics in engineering and technology.

Course Content

Unit-I: Physical World, Units, and Measurements

Physical Quantities: Fundamental and derived units, Systems of units (FPS, CGS, SI). Dimensions: Dimensional formulae, principle of homogeneity, derivation of simple equations and correctness of physical equations; Measurements: Least count, significant figures, error analysis and measuring instruments.

Unit-II: Vectors and Mechanics

Scaler and vector quantities: Addition and subtraction of vectors, scaler and vector product, resolution of vector; Conservation of momentum, Work and energy, kinetic and potential energy, work-energy theorem.

Unit-III: Electromagnetism

Electric Field: Coulomb’s law, electrostatic field, Gauss's law, and its applications (charged sheet, sphere etc.), electrostatic potential; Capacitance: parallel plate capacitor, series and parallel combinations, energy stored in capacitor; Electric Current: Resistance, Kirchhoff’s laws and their applications; Generation of Magnetic Field: Biot-Savart law, magnetic field due to current carrying straight wire and circular loop. Permanent magnets; Effect of Magnetic Field: Force on current-carrying wires, torque on current-carrying loop; Devices: Moving coil galvanometer and its conversion to ammeter and voltmeter.

Unit-IV: Heat and Thermal properties:

Heat, modes of heat transfer, specific heat (C_p and C_v), Scales of temperature and thermometer, thermocouple and Seebeck effect. Thermal conductivity, thermal expansion, engineering applications.

Unit-V: Waves and Optics

Simple Harmonic Motion: Time period, frequency, amplitude, transverse and longitudinal waves, superposition, principle of interference; Reflection and Refraction: Total internal reflection and its application in fiber optics. Lens formula, magnification, optical instruments: simple microscope, compound microscope and astronomical telescope. LASER and applications.

References

1. Physics Textbook for Class XI (Part 1 and Part 2) & XII (Part 1 and Part 2), NCERT.
2. David Halliday, Robert Resnick & Jearl Walker, Principles of Physics, John Wiley and Sons.
3. Vivek Talati & Vinod Kumar Yadav, Applied Physics-I (with Lab manual), Khanna Book Publishing Co. (P) Ltd.
4. Hussain Jeevakhan, Applied Physics-II (with lab manual), Khanna Book Publishing Co. (P) Ltd.
5. A Manual of Higher Secondary Physics Laboratory Kit, NCERT.
6. M. Mudassir Husain & M. Rafat, An Experience of Physics, Cadplan Publishers.
7. e-books/e-tools/learning physics software/YouTube videos/websites etc.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Identify dimensions of physical quantities and correctness of physical equations, use accurate units, apply rules of errors propagation and significant figures.
CO-2	Perform vector operations and analyze vectors to apply them in the problems related to principles of mechanics.
CO-3	State key concepts of electrostatics, current electricity and electromagnetism and derive standard results and solve problems based on these concepts.
CO-4	Demonstrate understanding of the concepts of heat and thermal properties and identify their applications in real world scenarios.
CO-5	Recall the fundamental principles of simple harmonic motion and wave motion and describe the working of optical devices along with their applications.

Course Code	:	COES103
Course Title	:	**IT Systems and Computer Programming**
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	Nil
Course Category	:	ES

Course Objectives

1. To understand the fundamentals of computers, information technology and data representation
2. To analyze computer system based on hardware, software, and different types of memories
3. To apply algorithms and flowchart for writing programs using C language
4. To understand C programming using arrays and functions
5. To apply structures and pointers for writing programs using C language

Course Content

Unit-I: Information Technology System and Data Representation

Digital computer systems, Characteristics, Digital vs. Analog computer systems, History, Computer generations, Types of computers and their classifications, Application of computer in various fields, Types of Personal Computers (PC), PC setup and Basic Input Output System; Working knowledge of PC software including Word Processor; Introduction to Information Technology (IT), Components of an IT system: Hardware, Software, Networks, Data, People, and Processes; Data representation: Number systems, radix, decimal, binary, octal, hexadecimal, conversion, and Complements: 1's complement, 2's complement, 9's complement, and 10's complement.

Unit-II: Computer Hardware, Software, and Memories

Elements of computer hardware, CPU, I/O devices, storage and media used in PCs, Computer software: Types of software, System software, Application software, Introduction to Operating System (OS), Functions and types of OS, DOS commands, Memory system of a PC, Primary memory, Random access memory, Read only memory, Secondary memory, Types of secondary Storage, Access mechanism of storage devices.

Unit-III: Elements of Algorithms and Programming in C

Computer languages, Generation of languages, Translators- Assemblers, Interpreters, Compilers, Algorithm, Pseudo-code, Flowcharts rules and symbols, Structured programming concepts,

Introduction to 'C', importance of C, basic structure of a C program, constants, variables and data types, Operators and expressions, managing I/O operations, Control statement: 'IF' statement and its various forms, goto statement, for, while and do- while loops, Switch decision making statement.

Unit-IV: Array and Functions

Introduction to array, array notation, storage and representation, manipulating array elements, using multidimensional arrays, Functions: Built-in and user defined functions and their applications; Use of built-in graphics functions to draw 2D objects.

Unit-V: Structures and Pointers

Introduction to structures, Purpose, and usage of structures, declaring structures, assigning of structures, Pointers: Introduction, Address operator, and Basic programs using pointers, File handling, sequential and random-access files, Memory allocation, Command line parameters.

References

1. Thareja R., "Computers Fundamentals and Programming in C," Oxford University Press 3rd Edition, 2023, ISBN-10: 9354977898
2. Kanetkar Y., "Let Us C: Authentic Guide to C Programming Language," BPB Publications, 20th Edition, 2024, ISBN-10: 9355515510
3. Ram B. and Kumar S., "Computer Fundamentals: Architecture and Organization," New Age International Private Limited, 6th Edition, 2020, ISBN-10: 9388818555
4. Balagurusamy E., "Computing Fundamentals and C Programming," McGraw Hill Education, 2nd Edition, 2017, ISBN-10: 9352604164

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain about computer system, components of IT system and different ways of data representation.
CO-2	Differentiate among computer hardware, computer software, and memories.
CO-3	Write C programs based on algorithm and flowchart.
CO-4	Implement algorithms using array and functions of C programming language.
CO-5	Demonstrate the use of structures and pointers in C programming language.

Course Code:	:	ECES104
Course Title	:	**Fundamentals of Electronics Engineering**
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	Semiconductor Physics
Course Category	:	ES

Course Objectives

1. To get the ideas about the applications of electronics engineering in different fields of life.
2. To gain in-depth knowledge of p-n junction diode and its applications in electronic switching and rectifier circuits.
3. To explore the idea of electronic filtration process by using various filter circuits.
4. To gain knowledge about the zener diode and its application in voltage regulator.
5. To get familiarized with bipolar junction transistor and its applications in electronic switching and amplifier circuits.

Course Content

Unit-I: PN Junction Diode

PN Junction diode, Depletion layer, Potential barrier, Behavior of P-N junction diode under forward and reverse bias, Cut-in voltage, Reverse saturation current, V-I characteristics, Breakdown phenomenon, Static and dynamic resistance and their calculations from diode characteristics, Dynamic resistance of the diode in terms of diode current, Diode ratings and specifications.

Unit-II: Rectifiers and Filters

Rectifier circuits, Principle of operation and output waveforms of half wave rectifier, centre tapped and bridge type rectifier, Average value and RMS value of output voltage and load current, Performance analysis of rectifier circuits: ripple factor and rectification efficiency, Filter circuits, Shunt capacitor filter, Series inductor filter, L-type and pie type filter, Physical explanation of working of the shunt capacitor and series inductor filter and their suitability.

Unit-III: Special Purpose Diodes

Zener diode: construction and operation, zener and avalanche breakdown mechanism, V-I characteristics, Zener ratings: zener voltage, minimum zener current, maximum zener current, maximum zener power dissipation and zener resistance, Application of Zener diode in voltage regulator

circuit, Brief description with V-I characteristics and applications of varactor diode and light emitting diode.

Unit-IV: Bipolar Junction Transistor

Concept of bipolar junction transistor as a two junction three terminal device, NPN and PNP transistor, Principle of operation of transistor, Transistor current relation, Different configurations: CB, CE, and CC, concept of leakage current and effect of temperature on it, input and output characteristics, Determination of input, output dynamic resistances and current amplification factor from the characteristics, Comparison of the three configurations.

Unit-V: Amplifier and Biasing Circuits

Transistor as an amplifier in CE configuration, DC equivalent circuit, DC load line and operating point, Factors affecting operating point, Thermal runway condition of transistor, Effect of fixing operating point in cut off and saturation region, Different biasing circuits: Fixed biasing, collector to base biasing, potential divider biasing and emitter biasing circuit, Calculation of operating point for these biasing circuits, Merits and demerits.

References

1. N. N. Bhargava, D. C. Kulshrestha, S. C. Gupta, Basic Electronics and Linear Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. V. K. Mehta, Rohit Mehta, Principles of Electronics, S. Chand and Company, New Delhi.
3. Albert Malvino, David Paul, Electronics Principles, McGraw Hill Education, New Delhi.
4. R. S. Sedha, A Text Book of Applied Electronics, S. Chand and Company, New Delhi.
5. David Bell, Fundamental of Electronic Devices and Circuits, Oxford University Press.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Explain the construction, working and characteristics of p-n junction diodes.
CO-2	Gain knowledge about the rectifier and filter circuits in converting ac signal into smooth dc signal.
CO-3	Develop the ability to understand the application of zener diode in voltage regulator circuit.
CO-4	Gain in-depth knowledge about the construction, working and characteristics of bipolar junction transistor.
CO-5	To understand the applications of bipolar junction transistor in switching and amplification.

Course Code	:	COBS105
Course Title	:	**Applied Mathematics-I**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	BS

Course Objectives

1. Develop foundational knowledge of trigonometry
2. Strengthen understanding of algebraic concepts
3. Enhance combinatorial and theoretical skills
4. Introduce determinants and matrices for problem-solving
5. Explore and apply complex numbers

Course Content

Unit-I: Trigonometry

Grades, radians and their conversions. Trigonometrical ratios of allied angles (without proof), sum, difference formulae and their applications (without proof). Product formulae (transformation of product to sum, differences and vice-versa). Trigonometrical ratios of multiple and sub-multiple angles, Statement of cosine formula, sine formula, Napier's, half angle formula and Heron's formula.

Unit-II: Algebra

Sequences and series: Arithmetic progression, its nth term, sum to n terms. Geometric progression, its n^{th} term, sum to n terms and sum of infinite terms. Finite sum of squares and cubes of natural numbers. **Partial fraction**: Definition of polynomial fraction and partial fractions, proper and improper fraction. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factor and irreducible non-repeated quadratic factors.

Unit-III: Combinatory and Binomial Theorem

Permutations and Combinations: Basic Counting techniques, Value of P (n, r) and C (n, r), and their applications; Binomial Theorem: Binomial theorem (without proof) for positive integral index (expansion, general term, and middle term). Binomial theorem (without proof) for any index (expansion and general term). Binomial approximation of first and second-degree terms.

Unit-IV: Determinants and Matrices

Matrices: Definition and examples of matrices, types of matrices, Basic operations, Equality of matrices, addition, multiplication of two matrices, scalar multiplication of a matrix, Transpose of a matrix, symmetric, skew-symmetric matrices, singular and non-singular matrices, cofactor matrix, adjoint of a matrix, inverse of a matrix; Determinants: Determinants (up to 3^{rd} order only), minors, co-factors, Properties of determinants, Solution of linear simultaneous equations in three variables by Cramer's rule and matrix inverse methods.

Unit-V: Complex Numbers

Modulus and amplitude of a complex number, Conjugate of a complex number, Polar and cartesian representation of a complex number and its conversion from one form to other, Operations on complex numbers, De-Moiver's theorem and its application, cube roots and n-th roots of unity.

References

1. H.K. Dass, Rama Verma & Rajnish Verma, Mathematics for Polytechnics, CBS Publishers.
2. R.D. Sharma, Applied Mathematics, Dhan Pat Rai Publications.
3. Deepak Singh, Mathematics-I, Khanna Book Publishing Co. (P) Ltd.
4. Garima Singh, Mathematics-II, Khanna Book Publishing Co. (P) Ltd.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Apply trigonometric identities and formulas to solve problems involving angles, including those related to sum, difference, product, multiple, and sub-multiple angles.
CO-2	Solve problems involving sequences and series, including arithmetic progression, geometric progression, and partial fractions, to analyze and simplify expressions.
CO-3	Apply the principles of permutations and combinations to solve counting problems and use the binomial theorem for expansion and approximations.
CO-4	Use matrices and determinants to solve systems of linear equations, perform matrix operations, and understand key properties and types of matrices.
CO-5	Perform operations on complex numbers in both polar and Cartesian forms and apply De Moivre's theorem to solve problems involving powers and roots of complex numbers.

Course Code	:	COHS111
Course Title	:	**Communication Skills Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Communication Skills
Course Category	:	HS

Course Objectives

1. To enhance listening, speaking and digital communication for professional and social interaction.
2. To develop leadership, teamwork, and public speaking for impactful presentations.
3. To cultivate professional etiquette, cultural sensitivity, and global awareness for diverse work environments.

Course Content

Listening Skills – Enhancing Comprehension and Interpretation

Introduction to active listening strategies, focusing on listening for main ideas, details and inferences; Practice with a variety of audio-visual materials such as recorded lectures, podcasts, interviews, TED talks, speeches and debates; Listening tests based on different accents, dialects and speech patterns to improve listening comprehension in diverse settings; Exercises to differentiate between tone, mood and intent in spoken language to strengthen interpretative skills; Focus on active listening and emotional regulation during interactions.

Phonetics and Pronunciation – Mastering Sounds for Clarity

Study of the International Phonetic Alphabet (IPA) for accurate word transcription and pronunciation; Practice with consonants, vowels, diphthongs, stress patterns and weak forms to ensure precise and clear speech; Syllable division and understanding of stress patterns to enhance fluency and speech rhythm; Focus on intonation, voice modulation and pitch for effective communication and expressiveness; Techniques to improve accent reduction and pronunciation for clearer, more confident speech.

Speaking Skills – Effective Expression and Interaction

Focus on formal and standard speech practices in various contexts: academic, business and public communication. Exercises to enhance self-awareness, adaptability and resilience in challenging communication situations; Development of oral presentation skills with emphasis on structure, clarity

and audience engagement; Training in group discussions, debates and impromptu speaking to build confidence and articulation; Mock interviews and role-playing exercises to prepare students for real-world professional situations; Techniques for effective communication in business settings, including business presentations and public speaking engagements; Practice in conveying ideas clearly, assertively and persuasively in both individual and group settings.

Vocabulary Enhancement – Building Lexical Resource

Construction of new words through affixes, prefixes and suffixes to enhance word formation skills; Extensive practice with phrasal verbs, idioms and foreign phrases to build fluency in diverse communication settings; Introduction to jargon and specialized vocabulary related to organizational structures, industries and professional settings; Development of contextual vocabulary for accurate and appropriate word choices in different settings (formal vs. informal, professional vs. casual).

Digital and Virtual Communication – Handling Online Platforms

Techniques for effective communication in virtual settings, including webinars, video conferencing and digital presentations; Introduction to virtual communication etiquette: body language, tone and engagement in online meetings and webinars; Practice with writing and responding to professional emails, creating formal online presentations and using digital tools for effective communication; Developing skills to manage cross-cultural communication in global digital platforms; Developing empathy and emotional intelligence in communication for effective relationship-building.

References

1. Anjana Tiwari, Communication Skills in English. Khanna Book Publishing Co. (P) Ltd. Delhi, 2022.
2. Jones, Daniel. The Pronunciation of English. Cambridge University Press, 1956.
3. Hartman, James, et al. English Pronouncing Dictionary. Cambridge University Press, 2006.
4. Kumar, Kulbhushan. Effective Communication Skills. Revised ed., Khanna Publishing House, 2018.
5. O'Connor, J. D. Better English Pronunciation. Cambridge University Press, 1980.
6. Murray, Lindley. An English Grammar: Comprehending Principles and Rules. Wilson and Sons, 1908.
7. Maison, Margaret M. Examine Your English. Orient Longman, 1964.
8. Sethi, J., et al. A Practice Course in English Pronunciation. Prentice Hall, 2004.
9. Pfeiffer, William Sanborn, and T. V. S. Padmaja. Technical Communication: A Practical Approach. 6th ed., Pearson, 2007.
10. Bansal, R. K., and J. B. Harrison. Spoken English: A Manual of Speech and Phonetics. Orient Blackswan, 2013.
11. https://wordpowermadeeasy.files.wordpress.com/2007/12/gre_wordlist.pdf

Course Outcome

At the end of this course, the students will be able to:

CO-1	Apply active listening to understand key ideas, analyze speech patterns and interpret tone for effective communication, and master International Phonetic Alphabet, fine-tune pronunciation and enhance fluency, intonation, and accent for confident speech.
CO-2	Strengthen formal speech proficiency, improve presentations, and build confidence through discussions, debates, and role-plays; and expand vocabulary, develop fluency in idioms and phrasal verbs and refine word choice for effective formal and informal communication.
CO-3	Excel virtual and cross-cultural communication, enhance non-verbal skills and adapt to diverse accents with personalized feedback; and cultivate emotional intelligence, resilience, and adaptability for success in academic and professional settings.

Course Code	:	COBS112
Course Title	:	**Applied Physics Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Applied Physics
Course Category	:	BS

Course Objectives

1. Value the importance of precise measurement and error analysis.
2. Develop and enhance students' hands-on skills in measuring and recording of experiment data.
3. Relate theoretical concepts of physics to real-world applications and engineering tasks.

List of Experiments

1. To measure the volume of a cylinder using a Vernier caliper and calculate the associated uncertainty in the volume.
2. To measure the area of cross-section of a wire using a screw gauge and calculate the associated uncertainty in the area.
3. To determine radius of curvature of a spherical surface using spherometer.
4. To determine the spring constant of helical spring using dynamic method.
5. Verification of Ohm’s law.
6. Conversion of galvanometer into Ammeter/Voltmeter of desired range.
7. To determine focal length of a convex lens.
8. To determine temperature of room and hot bath using thermometer and convert the value into different scales.

References

1. M. Mudassir Husain & M. Rafat, An Experience of Physics, Cadplan Publishers.
2. A Manual of Higher Secondary Physics Laboratory Kit, NCERT.
3. Vivek Talati & Vinod Kumar Yadav, Applied Physics-I (with Lab manual), Khanna Book Publishing Co. (P) Ltd.
4. Hussain Jeevakhan, Applied Physics-II (with lab manual), Khanna Book Publishing Co. (P) Ltd.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Demonstrate a systematic approach to performing experiments, reporting results with significant figures and calculating experimental errors.
CO-2	Measure volume, area of cross-section, radius of curvature, temperature, spring constant and focal length using appropriate instruments or methods and calculate the associated uncertainties.
CO-3	Create an ammeter or a voltmeter using galvanometer and identify the relationship between current and voltage.

Course Code	:	COES113
Course Title	:	**IT Systems and Computer Programming Lab**
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Corequisites	:	IT Systems and Computer Programming
Course Category	:	ES

Course Objectives

1. Understand the functionalities of various MS office tools such as Word, PowerPoint, and Excel, for document creation and presentations.
2. Apply C programming concepts such as decision-making, loops, and arrays for problem-solving.
3. Write C programs using functions, graphics, structures, and pointers to manipulate data and generate visual outputs.

List of Practicals / Programs

1. Identify various word options dialog and make your resume to showcase your skills and experience.
2. Make a question paper of applied mathematics of your course using equation editor of word.
3. Make a power point presentation to discuss the importance of IT system and computer programming.
4. Design a spreadsheet using Excel to convert Celsius to Fahrenheit and Fahrenheit to Celsius.
5. Write an algorithm and program in C to check whether a given number is even or odd.
6. Write an algorithm and program in C to input marks of five subjects, i.e., Physics, Applied Mathematics, Information Technology, Digital Electronics, and Workshop; and compute the percentage as well as grade according to the following conditions: If percentage >= 90%: Grade A; If percentage >= 80%: Grade B; If percentage >= 70%: Grade C; If percentage >= 60%: Grade D; If percentage >= 40%: Grade E; If percentage < 40%: Grade F (Failed). Modify this program using logical AND operator.
7. Draw a flowchart to print the multiplication table of a number entered by the users; also write a program for generating the multiplication table using different types of loop.
8. Write an algorithm and program in C to add "n" numbers using two- dimensional array.

9. Write a program in C using function to calculate the factorial of a given number.
10. Write a program in C to draw any two-dimensional object using built-in graphics functions.
11. Write a program in C using structure to store and display the information of a book.
12. Write a program in C using pointers to swap two numbers entered by the user.

References

1. Thareja R., "Computers Fundamentals and Programming in C," Oxford University Press 3rd Edition, 2023, ISBN-10: 9354977898
2. Kanetkar Y., "Let Us C: Authentic Guide to C Programming Language," BPB Publications, 20th Edition, 2024, ISBN-10: 9355515510
3. Ram B. and Kumar S., "Computer Fundamentals: Architecture and Organization," New Age International Private Limited, 6th Edition, 2020, ISBN-10: 9388818555
4. Balagurusamy E., "Computing Fundamentals and C Programming," McGraw Hill Education, 2nd Edition, 2017, ISBN-10: 9352604164

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Design professional documents, presentations, and spreadsheets using MS office tools.
CO-2	Develop C programs using control structures, different types of loops, and arrays.
CO-3	Implement various types of problems using functions, structures, pointers, and graphics.

Course Code:	:	ECES114
Course Title	:	**Fundamentals of Electronics Engineering Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Fundamentals of Electronics Engineering
Course Category	:	ES

Course Objectives

1. To develop understanding of characteristics of p-n junction, zener and light emitting diode in different biasing conditions.
2. To analyze the performance of various rectifiers without and with different filter circuits.
3. To plot input and output characteristics curves for common base and common emitter bipolar junction transistor.

List of Experiments

1. To draw V-I characteristics of p-n junction diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
2. To draw V-I characteristics of zener diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
3. To draw V-I characteristics of light emitting diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
4. To calculate ripple factor for half wave rectifier without filter and with filters.
5. To calculate ripple factor for centre-tap full wave rectifier without filter and with filters.
6. To calculate ripple factor for bridge type full wave rectifier without filter and with filters.
7. To draw input characteristics for common base transistor and to calculate its static and dynamic resistances.
8. To draw output characteristics for common base transistor and to calculate its static and dynamic resistances.
9. To draw input characteristics for common emitter transistor and to calculate its static and dynamic resistances.
10. To draw output characteristics for common emitter transistor and to calculate its static and dynamic resistances.

References

1. N. N. Bhargava, D. C. Kulshrestha, S. C. Gupta, Basic Electronics and Linear Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. V. K. Mehta, Rohit Mehta, Principles of Electronics, S. Chand and Company, New Delhi.
3. Albert Malvino, David Paul, Electronics Principles, McGraw Hill Education, New Delhi.
4. R. S. Sedha, A Text Book of Applied Electronics, S. Chand and Company, New Delhi.
5. David Bell, Fundamental of Electronic Devices and Circuits, Oxford University Press.

Course Outcomes

At the end of the course, the student will be able to:

CO-1	To calculate static and dynamic resistance of various semiconductor diodes in forward and reverse bias conditions.
CO-2	To measure and calculate the ripple factor produced by various rectifiers without and with different filter circuits.
CO-3	To compute static and dynamic input and output resistances of bipolar junction transistor.

Course Code:	:	MEES116
Course Title	:	**Engineering Graphics**
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives

1. To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
2. To develop drafting and sketching skills, to know the applications of drawing equipment and get familiarize with Indian Standards related to engineering drawings.
3. To develop skills to visualize actual object and to draw, read various engineering curves, projections, dimensioning styles, and understand common symbols used in engineering.

Course Content

Introduction to Engineering Drawing: Drawing Instruments and supporting materials, Sizes and layout of standard drawing sheets, Sizes of drawing boards, Method to use them with applications.

Lines: Convention of lines and their applications, Different types of lines in engineering drawing as per BIS Specifications, Practice of vertical, horizontal, and inclined lines.

Lettering: Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degrees, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4.

Dimensioning Techniques: Necessity of dimensioning, Dimensioning techniques as per BIS (Board of Indian standard) SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning. Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves, and arches.

Scales: Scales and their need and importance, type of scales, Representative Fractions – reduced, enlarged and full-size scales; Engineering Scales such as plain, diagonal scale and Vernier scale.

Geometrical Constructions: Construction of ellipse, parabola and hyperbola by eccentricity method and other methods, cycloids, epicycloids and hypocycloids, regular polygons, involute.

Projections: Introduction to projections. Basic concepts of projection techniques, projection of points and lines. Projection of Points in different quadrant, Projection of Straight Line (First angle and Third angle) Line parallel to both the planes, Line perpendicular to any one of the reference planes, Line inclined to any one of the reference planes.

Common Symbols and Conventions used in Engineering: Important Terms used in Building Drawing, Civil Engineering sanitary fitting symbols, Electrical fitting symbols for domestic interior installations.

List of Practicals

1. Draw horizontal, Vertical, 30-degree, 45 degrees, 60- and 75-degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter.
2. Letter writing single stroke and double stoke
3. Drawing of scales: plain, diagonal and vernier
4. Draw ellipse, parabola, and hyperbola by eccentricity method
5. Draw ellipse by arcs of a circle, oblong and concentric circle methods
6. Draw parabola and hyperbola using other methods
7. Draw regular polygons and involute
8. Draw various figures on projections of points
9. Draw some problems on projection of lines
10. Common symbols and conventions used in Engineering

References

1. Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat
2. P S Gill, Engineering Drawing, SK Kataria and sons. Delhi.
3. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: SP-46, BIS, Government of India, 3rd Reprint, October 1998:81-7061-091-2.
4. Jain and Gautam, Engineering Graphics and Design, Khanna Publishing House, New Delhi, ISBN: 978-93-86173-478.
5. Siddiqui A. N., Khan Z. A., and Ahmad M., Engineering Drawing with A primer on Autocad, PHI Learning Private Limited.

6. Jolhe D. A., Engineering Drawing, Tata McGraw Hill Education, New Delhi-2010, ISBN:9780-07-064837-1
7. Dhawan R. K., Engineering Drawing, S. Chand and Company, New Delhi, ISBN:81-219-1431-0.
8. Shah P. J., Engineering Drawing, S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4
9. Kulkarni D. M., Rastogi A.P, Sarkar A.K. Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, 2010, ISBN:978-8120337831.
10. Jeyapooyan T., Essentials of Engineering Drawing and Graphics using AutoCAD, Vikas Publishing House private Limited, 2011, ISBN:978-8125953005.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Draw lines and letter writing in single and double stroke
CO-2	Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
CO-3	Construct the various curves, draw views of given object, and understand engineering convention used in drawing

Course Code	:	CEES201
Course Title	:	**Engineering Mechanics**
Number of Credits	:	3 (L:2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives

1. To obtain resultant of various forces and support reactions through condition of equilibrium
2. To know the centre of gravity and moment of inertia of composite
3. To understand motion, work, power, and energy
4. To understand role of friction in equilibrium problems
5. To know fundamental laws of machines and their applications to various engineering problems

Course Content

Unit–I: Basics of Mechanics and Force System

Basics of Mechanics: Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body, scalar and vector quantity, units of measurement (SI units) - Fundamental units and derived units.

Force Systems: units, representation as a vector and by Bow's notation, characteristics and effects of a force, principle of transmissibility of force, force system and its classification, resolution of a force - orthogonal components of a force, Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems– Law of triangle, parallelogram and polygon of forces.

Unit- II: Equilibrium

Force: Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium, Lami's Theorem – statement and explanation, Application for various engineering problems.

Moment: Moment of a force, Varignon's theorem, Types of beams, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to

combination of point load and uniformly distributed load, beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit- III: Centre of Gravity and Moment of Inertia

Centre of Gravity: Centre of gravity and centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle). Centroid of composite figures composed of not more than three geometrical figures. Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere), Centre of Gravity of composite solids composed of not more than two simple solids.

Moment of Inertia: Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations), M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other reference axis, Polar moment of Inertia of solid circular sections.

UNIT- IV: Motion, Work, Power, and Energy

Rectilinear Motion: Newton's law of motion, momentum, conservation of momentum, impulse, torque; Circular motion: Angular motion, Equation of motion, angular momentum, torque, centripetal and centrifugal force; Work, Power and Energy: Definition of terms, Work Energy principles, Conservation of Mechanical Energy, simple numerical problems.

Unit– V: Friction and Simple Lifting Machine

Friction: Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between coefficient of friction and angle of friction, equilibrium of bodies on level surface subjected to force parallel and inclined to plane, equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Simple lifting machine: Simple lifting machine, load, effort, mechanical advantage, applications and advantages, velocity ratio, efficiency of machines, law of machine, Ideal machine, friction in machine, maximum mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility, velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

References:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal RK, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
5. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
6. Meriam, J.L., Kraige L.G., Engineering Mechanics-Statics, Vol. I, Wiley Publication, New Delhi.
7. Upadhay A.K, Applied Mechanics, S.K. Kataria & Sons, New Delhi

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Determine unknown forces and support reactions of different engineering systems
CO-2	Find the centroid, centre of gravity and moment of inertia of various components in engineering systems
CO-3	Apply work, power, energy concept to solve rectilinear and circular motion problems
CO-4	Apply the principles of friction in various conditions for useful purposes
CO-5	Select the relevant simple lifting machine(s) for given purposes

Course Code	:	COBS202
Course Title	:	**Applied Chemistry**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	High School Chemistry Course
Course Category	:	BS

Course Objectives

1. To understand atomic structure concepts (Rutherford's model, Bohr's theory, quantum numbers) and chemical bonding (ionic, covalent, coordination); to study molecular structures (H_2O, NH_3, CH_4) and concentration methods (molarity, normality, mole fraction).
2. To explore water hardness and its effects on industrial processes; to learn methods for determining hardness and water-softening techniques (soda lime, zeolite, ion exchange); to examine municipal water treatment and drinking water standards.
3. To study metal extraction and iron-based materials (cast iron, steel); to understand heat treatment and alloys (brass, bronze, duralumin); to learn about polymers (types, preparation, applications).
4. To classify and analyze the combustion of fuels, to calculate calorific values, and to study the properties of fuels (LPG, CNG); to learn about lubricants' physical and chemical properties.
5. To understand the principles of electrochemistry, including oxidation-reduction reactions and corrosion types; to learn methods for preventing corrosion, such as design, alloying, cathodic protection, and coating.

Course Content

Unit-I: Atomic Structure, Chemical Bonding, and Solutions

Rutherford model of atom, Bohr's theory, Quantum numbers – orbital concept. Shapes of *s, p* and *d* orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration. Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF, $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coordination bond in NH_4^+, and anomalous properties of NH_3, H_2O due to hydrogen bonding.

Solution – idea of solute, solvent and solution, methods to express the concentration of solution-molarity, normality, strength, ppm, mass percentage, volume percentage, mass by volume percentage and mole fraction.

Unit-II: Water

Classification of soft and hard water, salts causing water hardness, unit of hardness and simple numerical on water hardness. Problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by EDTA method. Estimation of dissolved oxygen, free chlorine, chloride ion and alkalinity. Water softening techniques – soda lime process, zeolite process and ion exchange process. Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilisation. Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collecting data and understand standards).

Unit-III: Engineering Materials

Natural occurrence of metals – minerals & ores of iron. Pig Iron, Cast iron, Steel and Heat treatment of steal. Alloys – definition, purposes of alloying. Composition, properties and uses of Brass, Bronze, Gun metal, Invar and Duralumin. Polymers – monomer, homo and co polymers, simple reactions involved in preparation and their application of thermoplastics and thermosetting polymers (PVC, PS, PTFE, nylon–6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

Unit-IV: Chemistry of Fuels and Lubricants

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV). Calculation of HCV and LCV using Dulong's formula. Fractional distillation of crude petroleum, octane number and cetane number. Chemical composition, calorific values and applications of LPG, CNG, Water gas, Coal gas and Producer gas. Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point) and chemical properties of lubricant (acid number, saponification value).

Unit-V: Electro Chemistry

Electronic concept of oxidation, reduction, and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples. Faraday's law of electrolysis. Introduction to Corrosion of metals: Definition, types of corrosion: Chemical and Electrochemical corrosion, Galvanic corrosion, Concentration corrosion, Pitting corrosion, and Stress corrosion. Protection of corrosion by Proper designing, Alloying, Cathodic and anodic protection and Coating methods. Primary and Secondary Cells.

References

1. Anju Rawlley and Devdatta Vinayakrao Saraf, Applied Chemistry (with lab manual), Khanna Book Publishing Co. (P) Ltd. Delhi.
2. Chemistry for Class XI& XII (Part-I, Part-II), N.C.E.R.T., Delhi.
3. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press, New Delhi.
4. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd.
5. Dara, S. S. & S. S. Umare, Engineering Chemistry, S. Chand. Publication, New Delhi.
6. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi.
7. S. Vairam, Engineering Chemistry, Wiley India Pvt. Ltd., New Delhi.
8. G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices (Vol. I and Vol. II), NITTTR Publications, Chandigarh.
9. Rajesh Agnihotri, Chemistry for Engineers, Wiley India Pvt. Ltd.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain atomic models, describe the concept of quantum numbers, and predict the shape and properties of molecules based on different types of chemical bonding, including ionic, covalent, and coordination bonds, as well as calculate the concentration of solutions using various methods.
CO-2	Classify water as hard or soft, understand the causes of water hardness, calculate water hardness, and describe methods of water softening and municipal water treatment processes, while adhering to Indian standards for drinking water.
CO-3	Identify the natural occurrence of metals, understand the properties and uses of alloys like brass, bronze, and duralumin, and explain the characteristics and applications of polymers, including thermoplastics, thermosetting plastics, and rubber.
CO-4	Classify fuels based on their combustion properties, calculate calorific values using Dulong's formula, and describe the types of lubrication, the properties of lubricants, and their functions in industrial applications.
CO-5	Explain redox reactions, differentiate between electrolytes and non-electrolytes, identify types of corrosion, and outline methods for preventing corrosion in metals.

Course Code	:	MEES203
Course Title	:	**Fundamentals of Mechanical Engineering**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives

1. To demonstrate the safety care and precautions in various mechanical shops, while working with tools and machines.
2. To understand working principles of lathe operations and power transmission.
3. To understand laws of thermodynamics and heat transfer Processes.
4. To understand the working principles of heat engines
5. To understand working principles of power developing and power absorbing devices

Course Content

Unit-I: Introduction to Mechanical Shops

Introduction to workshop practice, safety, care and precaution in workshop, Material, operations & tools used in carpentry shop, fitting shop, smithy shop, Welding Shop, Principle of operation of Arc welding and gas welding, tools and equipment used in arc and gas welding, soldering and brazing.

Unit-II: Lathe and its Operations

Description and function of various parts of a lathe, Classification and specification of various types of lathe, Lathe operations - Plain and step turning, facing, taper turning, drilling, reaming, boring, threading and knurling, Milling Machine, Shaper and Planer Machines, Drilling Machine, Grinding Machine Modes of Power Transmission: Transmission of Power through belt: flat belt V belt open belt and cross belt device, Derivation of tension ratio for flat belt, power transmission through chain and gears, Spur, Helical, Bevel, Rack and Pinion

Unit-III: Basic Thermodynamics, Steam Boiler and Steam Turbine

Fundamental concept of Thermodynamics: Introduction, Define Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics, Practical application of thermodynamics; Steam boiler: Introduction, classification, boiler accessories and mountings, construction and working of Cochran boiler, Babcock & Wilcox boiler; Steam turbine: Impulse and Reaction Turbines

Unit-IV Heat Engines

Heat Engines: Introduction, classifications, Components of IC engines, Cylinder, crankcase, crankpin, crank, crankshaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve; Working of four-stroke and two-stroke petrol and diesel engines; Comparison of two stroke and four stroke engines; Comparison of C. I. and S. I. engines

Unit-V: Thermal and Fluid Systems

Refrigeration and Air Conditioning System: Introduction and applications, Ton of refrigeration (TR), coefficient of performance, vapour compression cycle, vapour absorption cycle, Window air conditioner; Pumps: working principle of Reciprocating and centrifugal pump; Air compressor: working principle of rotary air compressor (root blower, vane blower), Fluid systems: Working principle of hydraulic jack, hydraulic lift, hydraulic coupling

References

1. M.P. Poonia & S.C. Sharma, Basic Mechanical Engineering, Khanna Pub. House, Delhi
2. M. L. Mathur, F. S. Mehta and R. P. Tiwari, Elements of Mechanical Engineering, Jain Brothers, New Delhi
3. B. S. Raghuvanshi, Workshop Technology (Vol.1 & 2), Dhanpath Rai and Sons, New Delhi.
4. J. Benjamin, Textbook of Basic Mechanical Engineering, Publisher: Kollam: Pentex
5. Roy Chaudhary, Basic Engineering Thermodynamic. Tata McGraw Hill, Delhi.

Course Outcome

At the end of this course, the students will be able to:

CO-1	Identify tools used in various mechanical workshops
CO-2	Understand functions and operations of machine tools including milling, shaping, grinding and lathe machines and mode of power transmission in machines
CO-3	Explain laws of thermodynamics and its practical application of thermodynamics
CO-4	Illustrate various parts of internal combustion engine
CO-5	Understand basics of pump, compressor and refrigeration and air-conditioning systems

Course Code	:	EEES204
Course Title	:	**Fundamentals of Electrical Engineering**
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

1. To provide basic knowledge of electric and magnetic quantities and their units.
2. To teach the basic concepts of electric and magnetic circuits as well as their inter-relations.
3. To learn the various electrical rules/laws/theorems to help students deal with electrical engineering applications in industrial processes of different fields.
4. To understand the concepts of alternating current and voltage, impedance, and phase angle.
5. To learn the construction and principle of different types of transformers and rotating machines.

Course Content

Unit-I: Electric Circuits

Basic concepts of charge; Electrical quantities and their units, Ohm's law; Resistance, Resistances in series; Resistances in parallel; Kirchhoff's laws & their applications; Network theorems; Laws of resistance; Temperature coefficient of resistance; Grouping of cells; Numerical problems.

Unit-II: Electromagnetism

Introduction to electromagnetism; Magnetic field at the axis of a solenoid; Force on a current carrying conductor placed in the magnetic field; Force between two parallel current carrying conductors.
Faraday's laws of electromagnetic induction; Lenz's law; Dynamically and statically induced emfs; Self and mutual inductances; Coefficient of coupling; Simple numerical problems.

Unit-III: Magnetic Circuits

Magnetic flux & flux density; Magnetizing force; Magneto motive force (MMF); Absolute and relative permeability; Reluctance; Series and parallel magnetic circuits; Ampere-turn calculations; Leakage flux; Leakage factor; Analogy between electric and magnetic circuits; Numerical problems.

Unit-IV: A.C. Circuits

Concept of alternating current and voltage; Cycle; Frequency; Periodic time; Amplitude; Angular velocity; Average value; RMS value; Form factor; Peak factor; Impedance; Phase angle; Mathematical

and phasor representation of alternating emf and current; A.C. through pure resistance, pure inductance & pure capacitance; Concept of conductance, susceptance & admittance; Power factor, A.C in R-L, R-C, R-L-C series and parallel circuits.

Unit V: Transformer and Rotating Machines

General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and working principle of motors; Basic equations and characteristic of motors; B-H curve; Concept of eddy current and hysteresis; Hysteresis loop; Eddy current and hysteresis losses.

References

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN: 978-0- 07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN: 97881236529513

Course Outcomes

At the end of the course, the students will be able to:

1.	Analyze electric circuits using Ohm's law, Kirchhoff's laws, and Network theorems.
2.	Understand the fundamental principles of electromagnetism including electromagnetic induction and magnetic forces.
3.	Design and analyze magnetic circuits including magnetizing force, reluctance, and permeability.
4.	Analyze and design AC circuits including impedance, phase angle, and power factor.
5.	Understand the construction, principle, and operation of transformers and rotating machines.

Course Code	:	COBS205
Course Title	:	**Applied Mathematics-II**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	BS

Course Objectives

1. Develop mathematical foundations
2. Explore advanced problem-solving techniques
3. Understand and apply geometrical and analytical Concepts
4. Develop the ability to solve first- and second-order differential equations
5. Enhance computational skills in vectors

Course Contents

Unit-I: Differential Calculus

Concept of limits and continuity (without problems), Four standard limits: $\lim_{n\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, and $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$. Differentiation of functions by first principle, Differentiation of sum, difference, product and quotient of two functions, Differentiation of function of a function (Chain rule), Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Higher order derivatives (or successive differentiation).

Unit-II: Integral Calculus

Integration as inverse operation of differentiation, Simple integration by substitution**,** by parts and by partial fractions. Use of $\int_0^{\frac{\pi}{2}}\sin^m\ x\ \cos^n\ x\,dx$ for solving problems, where *m* and *n* are positive integers. Evaluation of definite integral. Properties of definite integral, area bounded by a curve between two ordinates and *x*-axis.

Unit-III: Co-ordinate Geometry of Two Dimensions

Definition of locus with problems, Equations of straight lines in various forms. Angle between two lines, Perpendicular distance formula, Study of properties of Circle, Parabola, Ellipse and Hyperbola.

Unit-IV: Ordinary Differential Equations

Ordinary differential equation, Order and degree of differential equations, Solution of differential equations of first order and first degree, Variable separable, Homogeneous and Linear differential equations, Complementary function and Particular integral of linear differential equations of 2nd order with constant coefficient.

Unit-V: Vectors

Scalars and vectors, addition and subtraction of vectors and their simple applications, multiplication of a vector by a scalar, Scalar and vector product of two vectors and their simple applications. Scalar product of three vectors and its geometrical interpretation.

References

1. H.K. Dass, Rama Verma & Rajnish Verma, Mathematics for Polytechnics, CBS Publishers.
2. R.D. Sharma, Applied Mathematics, Dhan Pat Rai Publications.
3. Deepak Singh, Mathematics-I, Khanna Book Publishing Co. (P) Ltd.
4. Garima Singh, Mathematics-II, Khanna Book Publishing Co. (P) Ltd.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Use the concept of limits and differentiation to find derivatives of functions, including applications of sum, difference, product, quotient, chain rule, and differentiation of trigonometric, inverse trigonometric, and logarithmic functions.
CO-2	Apply integration techniques such as substitution, integration by parts, and partial fractions to evaluate integrals, and understand the properties of definite integrals for finding areas and solving related problems.
CO-3	Analyze and solve problems related to the equations of straight lines, conic sections, and loci, and apply the properties of geometric shapes like circles, parabolas, ellipses, and hyperbolas.
CO-4	Formulate and solve ordinary differential equations of first and second order, including separable, homogeneous, and linear equations, and find complementary functions and particular integrals.
CO-5	Understand and perform operations on vectors, including addition, subtraction, scalar multiplication, scalar and vector products, and apply these operations in geometric contexts and real-world applications.

Course Code	:	CEES211
Course Title	:	**Engineering Mechanics Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives

1. To obtain resultant of various forces and calculate support reactions through conditions of equilibrium for various structures
2. To understand role of friction in equilibrium problems
3. To know fundamental laws of machines and their applications to various engineering problems

List of Practicals: (Minimum 10 experiments to be performed)

1. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
2. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
3. Derive Law of machine using Worm and worm wheel.
4. Derive Law of machine using Single purchase crab.
5. Derive Law of machine using double purchase crab.
6. Derive Law of machine using Weston's differential or wormed geared pulley block.
7. Determine resultant of concurrent forces by Y-stem applying Law of Polygon of forces using force table.
8. Determine resultant of concurrent forces by Y-stem graphically.
9. Determine resultant of parallel forces by Y-stem graphically.
10. Verify Lami's theorem.
11. Study forces in various members of Jib crane.
12. Determine support reactions for simply supported beam.
13. Obtain support reactions of beam using graphical method.
14. Determine coefficient of friction for motion on horizontal and inclined plane.
15. Determine centroid of geometrical plane figures.

References

1. Bedi D.S., Engineering Mechanics, Khanna Publishing House.
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.

3. Bansal RK, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S., S Chand & Co. New Delhi.
5. Ram, H.D.; Chauhan, A.K. Foundations and Applications of Applied Mechanics, Cambridge University Press.

Course Outcomes

After completing this course, the students will be able to:

CO-1	Determine unknown force(s) of different engineering systems.
CO-2	Apply the principles of friction in various conditions for useful purposes.
CO-3	Select the relevant simple lifting machine(s) for given purposes.

Course Code	:	COBS212
Course Title	:	**Applied Chemistry Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Applied Chemistry
Course Category	:	BS

Course Objectives

1. Quantitative Chemical Analysis: Students will perform chemical analyses to determine the purity of oxalic acid, analyze NaOH and KOH mixtures, and estimate various water quality parameters such as hardness, chloride ions, free chlorine, dissolved oxygen, and alkalinity.
2. Water Hardness and Quality Assessment: Students will estimate temporary, permanent, and total water hardness using the EDTA method and assess water quality by measuring chloride ions, free chlorine, and dissolved oxygen.
3. Physical Property Measurements: Students will determine the viscosity of lubricating oils using the Redwood Viscometer and estimate the moisture content in coal samples.

List of Experiments

1. To determine the purity percentage of oxalic acid in a given impure mixture.
2. To analyze a mixture of NaOH and KOH (given a solution contacting 2.5g mixture of NaOH and KOH per liter).
3. To estimate the calcium and magnesium hardness in the given water sample.
4. To estimate the Chloride ion (Cl^-) in the given water sample.
5. To estimate the free Chlorine (Cl_2) in the given water sample.
6. To estimate the dissolved Oxygen (D.O) in the given water sample.
7. To estimate the Alkalinity in the given water sample.
8. To estimate the temporary, permanent and total hardness in the given water sample by EDTA method.
9. To determine the viscosity of a lubricating oil by Redwood Viscometer.
10. To determine the moisture percentage in a coal sample.

References

1. Anju Rawlley & Devdatta Vinayakrao Saraf, Applied Chemistry (with lab manual), Khanna Book Publishing Co. (P) Ltd. Delhi.

2. Laboratory Manual Chemistry (Class XI and Class XII), NCERT.
3. G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices (Vol. I and Vol. II), NITTTR Publications, Chandigarh.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Recall and explain the principles and methods used in the quantitative analysis of chemical substances, including the estimation of purity, hardness, chloride ions, and dissolved oxygen in water samples.
CO-2	Demonstrate the ability to apply appropriate analytical techniques, such as titration and viscosity measurement, to determine chemical concentrations and physical properties in various samples, including water, lubricants, and coal.
CO-3	Analyze experimental data, evaluate the results for accuracy and precision, and assess the impact of different factors (e.g., impurities, water quality) on the outcomes of chemical and physical measurements.

Course Code	:	EEES214
Course Title	:	**Fundamentals of Electrical Engineering Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Fundamentals of Electrical Engineering
Course Category	:	ES

Course Objectives

1. To verify Ohm's law and analyze series and parallel combinations of resistances in the circuit.
2. To familiarize students with the measurement and analysis of active, reactive, and apparent power in a single-phase R-L, R-C and R-L-C series circuit, and to understand the concept of power factor using impedance triangle.
3. To determine the permeability of a magnetic material by plotting B-H curve and analyze the transformation ratio of a single-phase transformer.

List of Experiments

1. To verify the Ohm's law and draw its I-V characteristics.
2. To verify the relation $R_T = R_1 + R_2 + R_3 + \ldots\ldots\ldots + R_N$ in series combination of resistances.
3. To verify the relation $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots\ldots\ldots \frac{1}{R_N}$ in parallel combination of resistances.
4. To determine the permeability of magnetic material by plotting its B-H curve.
5. To measure the voltage, current and power in single phase R-L series circuit. Draw its voltage, impedance, and power triangle.
6. To measure the voltage, current and power in single phase R-C series circuit. Draw its voltage, impedance, and power triangle.
7. To measure the voltage, current and power in single phase R-L-C series circuit. Draw its voltage, impedance, and power triangle.
8. To determine the transformation ratio of single-phase transformer.

References

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN: 978-0- 07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353

4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN: 97881236529513

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Verify Ohm's law, series, and parallel combinations of resistances.
CO-2	Measure and calculate active, reactive, and apparent power, impedance, and power factor in a single-phase R-L, R-C, and R-L-C series AC circuits.
CO-3	Determine the permeability of a magnetic material and able to find the transformation ratio of a single-phase transformer.

Course Code	:	MEES216
Course Title	:	**Engineering Workshop Practice**
Number of Credits	:	2 (L: 0 T: 0 P: 4)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives

1. To understand the use of different tools, equipment, and safety precaution in the workshops.
2. To understand, identify, select, and use various marking, measuring, and holding, striking and cutting tools and equipment
3. To understand and interpret job drawings, produce jobs, and acquire skills to operate inspect the job for specified dimensions

Course Contents

1. Carpentry Shop

(a) Safety Precautions to be served in the shop

(b) Demonstration of different wood working tools/machines and different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc.

(c) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.

2. Fitting Shop

(a) Safety Precautions to be served in the shop

(b) Demonstration of different fitting tools different operations like chipping, filing, drilling, tapping, sawing, cutting etc.

(c) One simple fitting job involving practice of above operations

3. Welding Shop

(a) Safety Precautions to be served in the shop

(b) Demonstration of different welding tools / machines, and arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding

(c) One simple job involving butt and lap joint

4. Sheet Metal shop

(a) Safety Precautions to be served in the shop

(b) Demonstration of different sheet metal tools / machines

(c) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting

(d) One simple job involving sheet metal operations and soldering and riveting.

5. **Smithy Shop**

   (a) Safety Precautions to be served in the shop

   (b) Demonstration and detailed explanation of tools, equipment used

   (c) One simple job involving operation of forging a square headed bolt.

6. **Machine Shop**

   (a) Safety Precautions to be served in the shop

   (b) Study and sketch of lathe machine, bench grinder, milling machine, drilling machine.

   (c) Study of various operations on lathe machine such as turning, step turning, taper turning, facing, and knurling.

References

1. S. K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
2. H S Bawa, Mechanical Workshop Practice, McGraw Hill Education
3. B. S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
4. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
5. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

Course Outcomes

At the end of the course, the student will be able to:

CO-1	Acquire practical skills of using various marking, measuring, holding, striking, and cutting tools & equipment and machines.
CO-2	Understand job drawing, job material and complete jobs as per specifications in allotted time.
CO-3	Operate, control different machines and equipment adopting safety practices.

Course Code	:	COHS217
Course Title	:	**Sports and Yoga**
Number of Credits	:	1 (L:0 T:0 P:2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives

1. To make the students understand the importance of sound health and fitness principles as they relate to better health.
2. To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
3. To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury.

Course Content

- Introduction to Physical Education: Meaning & definition of Physical Education, Aims & Objectives of Physical Education, Changing trends in Physical Education
- Olympic Movement: Ancient & Modern Olympics (Summer & Winter), Olympic Symbols, Ideals, Objectives & Values, Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)
- Physical Fitness, Wellness & Lifestyle: Meaning & Importance of Physical Fitness & Wellness, Components of Physical fitness, Components of Health-related fitness, Components of wellness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle
- Fundamentals of Anatomy & Physiology in Physical Education, Sports, and Yoga: Define Anatomy, Physiology & Its Importance, Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)
- Kinesiology, Biomechanics & Sports: Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports, Newton's Law of Motion & its application in sports, Friction and its effects in Sports.
- Postures: Meaning and Concept of Postures, Causes of Bad Posture., Advantages & disadvantages of weight training, Concept & advantages of Correct Posture, Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis, Corrective Measures for Postural Deformities,

- Yoga: Meaning & Importance of Yoga, Elements of Yoga, Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas, Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Sha-shankasana), Relaxation Techniques for improving concentration-Yog-nidra, Yoga & Lifestyle: Asanas as preventive measures, Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana,
- Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
- Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
- Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.
- Training and Planning in Sports**:** Meaning of Training, Warming up and limbering down, Skill, Technique & Style, Meaning and Objectives of Planning, Tournament – Knock-Out, League/Round Robin & Combination.
- Psychology & Sports**:** Definition & Importance of Psychology in Physical Edu. & Sports, Define & Differentiate Between Growth & Development, Adolescent Problems & Their Management, Emotion: Concept, Type & Controlling of emotions, Meaning, Concept & Types of Aggressions in Sports, Psychological benefits of exercise, Anxiety & Fear and its effects on Sports Performance, Motivation, its type & techniques.
- Doping**:** Meaning and Concept of Doping, Prohibited Substances & Methods, Side Effects of Prohibited Substances
- Sports Medicine: First Aid – Definition, Aims & Objectives, Sports injuries: Classification, Causes & Prevention, Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries
- Sports / Games: Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc., History of the Game/Sport, Latest General Rules of the Game/Sport, Specifications of Play Fields and Related Sports Equipment, Important Tournaments and Venues, Sports Personalities, Proper Sports Gear and its Importance.

References

1. Modern Trends and Physical Education by Prof. Ajmer Singh.

2. Light on Yoga by B.K.S. Iyengar.

3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Outcomes

After the successful completion of this course, the students will be able to

CO-1	Improve personal fitness and develop understanding of health fitness and psychological problems associated with the age and lifestyle
CO-2	Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
CO-3	Understand basic skills associated with yoga and physical activities and perform yoga movements in various combination and forms.

Course Code	:	COAU200
Course Title	:	**Environmental Science**
Number of Credits	:	0 (non-credit) (L: 2, T: 0, P: 0)
Prerequisites	:	High School Science
Course Category	:	AU

Course Objectives

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. Solve various engineering problems applying ecosystem to produce eco – friendly products.
2. Use relevant air and noise control method to solve domestic and industrial problems.
3. Use relevant water and soil control method to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

Course Content

Unit-I: Ecosystem

Structure of ecosystem, Biotic & Abiotic components Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle; Global warming -Causes, effects, process, Green House Effect, Ozone depletion.

Unit-II: Air and Noise Pollution

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler); Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator); Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler; Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.

Unit- III: Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation; Waste Water Treatment:

Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis). Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

Unit-IV: Renewable Sources of Energy

Solar Energy: Basics of Solar energy, Advanced collector, Solar Pond, Solar water heater, solar dryer, Solar stills; Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel, Biogas production mechanism, Utilization, and storage of biogas; Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy; New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion) Concept, origin and power plants of geothermal energy

Unit-V: Solid Waste Management, ISO 14000, and Environmental Management

Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste; Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries; Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste; Air quality act 2004, air pollution control act 1981 and water pollution and control act1996; Structure and role of Central and state pollution control board, Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry, ISO14000: Implementation in industries, Benefits.

References

1. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
2. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
3. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House,NewDelh
4. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw illiam, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. Rao, M. N. Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
6. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.

7. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
8. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
CO-2	Explain the suitable air, extent of noise pollution, and control measures and acts
CO-3	Observe the water and soil pollution, and control measures and acts
CO-4	Distinguish different renewable energy resources and efficient process of harvesting.
CO-5	Understand solid Waste Management, ISO 14000 & Environmental Management.

Course Code	:	COPC301
Course Title	:	**Computer Oriented Numerical Methods**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Applied Mathematics-I
Course Category	:	PC

Course Objectives

1. To evaluate algebraic and transcendental equations using numerical methods
2. To understand different interpolation methods with equal and unequal intervals
3. To analyze numerical differentiation and integration methods using examples
4. To apply numerical methods for solving the ordinary differential equations
5. To evaluate determinants and matrices using numerical methods; and curve fitting using method of least squares

Course Content

Unit-I: Solution of Algebraic and Transcendental Equations

Introduction to numerical analysis, Accuracy of numbers, Error in the approximation of a function; Solution of algebraic and transcendental equations: Bisection method, Iteration method, Method of false position, Newton-Raphson method, Secant method, Rate of Convergence of Iterative methods, Polynomial Equations.

Unit-II: Interpolation

Interpolation: Finite Differences, Difference Tables, Polynomial Interpolation: Newton's forward and backward formula, Central Difference Formulae: Gauss forward and backward formula, Sterling's and Bessel's formula, Interpolation with unequal intervals: Lagrange's Interpolation, Newton's Dividend difference formula, Hermite's Interpolation.

Unit-III: Numerical Differentiation and Integration

Numerical Integration and Differentiation: Introduction, Numerical differentiation, Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, and Waddle's rule.

Unit-IV: Numerical Solution to Ordinary Differential Equations

Solution of differential Equations, Initial and boundary conditions, Picard's Method, Taylor's Method, Euler's method, Modified Euler's method, Runge-Kutta Methods, Predictor-corrector method, and Milne's method.

Unit-V: Algebraic Equations and Curve Fitting

Introduction to determinants and matrices, Gauss elimination method, Gauss-Jordan method, Iterative method of solution: Jacobi's iteration method, Gauss-Seidal iteration method. Empirical laws and curve fitting: Graphical method, Laws reducible to the linear law, Principle of least squares, Method of least squares, fitting of straight lines, Fitting of other curves such as $y = ax^b, y = ae^{bx}, xy^a = b$; Method of moments.

References

1. Grewal B. S., "Numerical Methods in Engineering and Science", Khana Publishers, 11th Edition, 2013, ISBN-10: 817409248X
2. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall India Learning Private Limited, 5th Edition, 2012, ISBN-10: 9788120345928
3. Hamming R. W., "Numerical Methods for Scientists and Engineers", Dover Publications, 2nd Revised Edition, 2012.
4. Gupta R. S., "Elements of Numerical Analysis," Cambridge University Press, 2015, ISBN-10:1107500495.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Compute the approximate solution of algebraic and transcendental equations
CO-2	Implement various interpolation methods
CO-3	Differentiate and integrate the given function using numerical methods
CO-4	Solve differential equations and matrices using numerical methods
CO-5	Determine the solution of algebraic equations and solve the problems using method of least squares

Course Code:	:	COPC302
Course Title	:	**Operating System**
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives

1. Understand the fundamental concepts, structure, services, and functions of operating systems
2. Compare and analyze different process scheduling techniques and multithreading approaches in UNIX and Windows operating systems
3. Analyze different memory management techniques and apply principles of scheduling, synchronization, and deadlock management to real-world problems
4. Understand and compare UNIX and Windows operating systems based on directory structure and file management.
5. Understand the concepts of mass storage structures, disk organization, and disk scheduling techniques and apply OS security techniques, including authentication, access rights, and system logs, to enhance system protection.

Course Content

Unit-I: Overview and System Structures

Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems, Operating system services and systems calls, system programs, operating system structure, and operating systems generations.

Unit-II: Process Management

Process concepts, process state, process control block, scheduling queues, process scheduling, multithreaded programming, threads in UNIX, and comparison of UNIX and Windows, Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, synchronization issues, readers and writers' problem, dining philosophers' problem, monitors, synchronization examples (Solaris), atomic transactions. Comparison of UNIX and Windows.

Unit-III: Deadlock and Memory Management

Deadlocks: Resource allocation graph, deadlock prevention, detection, avoidance, and recovery from deadlock banker's algorithm. Process Swapping, contiguous memory allocation, paging, page table

structure, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing, case study - UNIX.

Unit-IV: File Management

File Concept, access methods, directory structure, file system mounting, file sharing, protection. File system implementation, file system structure, directory implementation, allocation methods, free-space management, efficiency and performance, comparison of UNIX and Windows.

Unit-V: I/O Management

Mass storage structure overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types. OS Security: Authentication, Access Control, Access Rights, System Logs.

References

1. A. Silberschatz, P. B. Galvin, and G. Gagne, "Operating System Concepts, Global ed.", 10th ed. Hoboken, NJ, USA: Wiley, 2018, ISBN: 9789357460569
2. W. Stallings, "Operating Systems: Internals and Design Principles", 9th ed. India: Pearson Education, 2018, ISBN: 978-9332585604.
3. A. S. Tanenbaum and H. Bos, "Modern Operating Systems", 5th ed. Pearson, 2022. ISBN: 978-0137614267.
4. D. M. Dhamdhere, "Operating Systems: A Concept-Based Approach", 3rd ed. New Delhi, India: McGraw-Hill Education, 2008, ISBN: 978-0070611948.

Course Outcomes

At the end of this course, students will be able to:

CO-1	Demonstrate basic knowledge of Operating Systems.
CO-2	Solve synchronization and concurrency problems using semaphores, monitors, and algorithms like Peterson's solution.
CO-3	Implement deadlock prevention and recovery mechanisms using techniques such as Banker's algorithm and analyze memory management methods like paging and segmentation.
CO-4	Analyze file management and directory structure to compare UNIX and Windows operating system
CO-5	Evaluate disk scheduling and storage management techniques.

Course Code	:	COPC303
Course Title	:	**Object Oriented Programming**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	IT Systems and Computer Programming
Course Category	:	PC

Course Objectives

1. Understand the principles of Object-Oriented Programming (OOP) and compare with Procedure-Oriented Programming
2. Apply different forms of functions, classes, and objects in C++ programming
3. Analyze the use of constructors, destructors, and different types of inheritance in programming
4. Evaluate memory management techniques, polymorphism, and overloading in C++
5. Create applications using templates and exception handling

Course Contents

Unit-I: Introduction to Object Oriented Programming

Object oriented paradigm-Differences between Object Oriented Programming and Procedure oriented programming, Basic concepts of Object-Oriented Programming, Encapsulation, Inheritance and Polymorphism, Benefits of OOP, Structure of a C++ program, Data types, Tokens, Identifiers, Variables, Constants, Operators, Control structures & Loops.

Unit-II: Functions, Classes, and Objects

Introduction to Classes, Class Definition, Defining a Member, Objects, Access Control, Class Scope, Scope Resolution Operator, Inline functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions.

Unit-III: Constructors, Destructors, and Inheritance

Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors. Inheritance: Introduction to Inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.

Unit-IV: Pointers, Virtual Functions, and Polymorphism

Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.

Unit-V: Templates and Exception handling

Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters. Exception handling: Basics of Exception Handling, Types of exceptions, Exception Handling Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.

References

1. E. Balagurusamy, "Object-Oriented Programming with C++", McGraw Hill Education, 2020, 8th Edition, ISBN-10: 9389949181.
2. Sourav Sahay, "Object-Oriented Programming with C++", Oxford University Press, 2012, 2nd Edition, ISBN-10: 0198065302.
3. Reema Thareja, "Object-Oriented Programming with C++", Oxford University Press, 1st Edition, 2022, ISBN-10: 978-0199459630.
4. Mahesh Bhave and Sunil Patekar, "Object-Oriented Programming with C++", Pearson Education India, 2012, ISBN-10: 978-8131798585.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe basic Object-Oriented Programming (OOP) concepts using C++ programs
CO-2	Illustrate different classes, objects, and functions through C++programs
CO-3	Categorize various types of inheritance and demonstrate the correct use of constructors and destructors through C++ programming
CO-4	Determine pointers to objects to dynamically allocate memory for objects and manage memory using new and delete
CO-5	Design C++ programs based on generic programming and exception handling

Course Code	COPC304
Course Title	**Cyber Security**
Number of Credits	3 (L:2, T:1, P:0)
Prerequisites	IT Systems and Computer Programming
Course Category	PC

Course Objectives

1. To understand the basics of cyber security, law, and intellectual property rights with respect to cyber space
2. To analyze the theories of criminal psychology and behaviour intelligence
3. To understand the basics of forensic science and ethical hacking concepts
4. To analyse various tools and techniques used in Cybercrime
5. To apply cryptography algorithm for encrypting data and check the authenticity of users

Course Contents

Unit-I: Legal Aspects of Computing

Introduction to cyber security, Cyber-crimes, Evolution of the IT Act, Various authorities under IT Act and their powers. Penalties and Offences, amendments. Case laws on Cyber space jurisdiction and Jurisdiction issues under IT Act, E – commerce and Laws in India, Digital and electronic signature in Indian laws. Intellectual property rights, Domain names and Trademark disputes, Concept of patent right, Sensitive personal data and Information in Cyber Law

Unit-II: Criminal Psychology and Behaviour Intelligence

Nature and history of criminal and Forensic psychology, Social context of crime: Extent of criminality, Changing nature of crime: Conservative and radical interpretations in complexity of victimization. Types of offenders, Violent offenders: Media influences, Theories of Homicide: Psychological disposition, Socio-biological theory, and multi-factorial approach. Mental Illness and Crime: Problem of evidence, Mental illness and Crime in general and Eyewitness testimony.

Unit-III: Forensic Science and Ethical Hacking

Digital forensic science, Cyber forensics and digital evidence, Digital forensic life cycle, Network forensic, Forensics and social networking sites, Digital image forgery detection: active and passive methods; Hacking and ethical hacking concepts, Hacker behaviour and mindset, Hacking methodology, social engineering attacks and countermeasures, and Password attacks.

Unit-IV: Cybercrime

Introduction to Cybercrime and Cybercriminals, Classification of Cybercrimes, Botnets; Tools and method used in Cybercrime: Proxy Servers and anonymizers, Phishing, Password cracking, Keyloggers and Spywares, Virus and Worms, Trojan horses and backdoors, Steganography, Attack on wireless networks, and identity theft.

Unit-V: Cryptography

Cryptography, cryptanalysis, cryptology, and classical cryptosystem- shift cipher, affine cipher, substitution, transposition techniques, Block ciphers and Modes of operations: Data encryption standard, Block cipher principles, block cipher modes of operation; Hash functions, Digital signature, and authentication protocols.

References

1. Sushma Arora, Raman Arora, "Cyber Crimes and Laws," Taxmann, 4th Edition, 2021, ISBN-10: 9390712491
2. Howitt D., "Introduction to Forensic and Criminal Psychology," 7th Edition, Pearson, 2022, ISBN-10: 1292295783
3. Behrouz A. Forouzan, Debdeep M., "Cryptography and Network Security", McGraw Hill Education, 3rd Edition, 2015, ISBN-10:9339220943
4. Michael G., Roberto T., "Introduction to Computer Security," Pearson Publications, 1st Edition, 2013, ISBN-10: 1292025409

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe Cyber law with respect to Indian IT Act and Intellectual property rights
CO-2	Differentiate between criminal psychology and behaviour
CO-3	Explain different methods used in forensic science and ethical hacking
CO-4	Protect their valuable data from Cybercriminals
CO-5	Use various private and public key cryptosystems for encryption, key exchange, and authentication algorithms

Course Code:	:	ECPC305
Course Title	:	**Digital Electronics and Microprocessors**
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	Fundamentals of Electronics Engineering
Course Category	:	PC

Course Objectives

1. To introduce students to the fundamentals of digital electronics including number systems, binary codes, and the advantages of digital systems over analog systems.
2. To develop an understanding of logic gates, Boolean algebra, and simplification techniques for designing efficient digital circuits.
3. To enable students to design and analyze combinational circuits such as adder, subtractor, multiplexer and encoder.
4. To familiarize students with sequential circuits including flip-flops, counters, shift registers and their real-world applications.
5. To provide foundational knowledge of microprocessor systems focusing on the architecture and pin diagram.

Course Content

Unit-I: Number Systems and Logic Gates

Difference between analog and digital signals, Types of number systems (Radix, Symbols): Binary, octal, decimal and hexadecimal, Representation of binary number system: 1's and 2's complements, BCD code, Excess-3 code and Gray code, Concept of logic gates: Graphical symbols, algebraic forms and truth tables, Basic logic gates: AND, OR and NOT, Universal gates: NAND and NOR: Graphical symbols, algebraic forms, truth tables and realization of logic gates using NAND and NOR gates, Ex-OR and Ex-NOR gates: Graphical symbols, algebraic forms and truth tables.

Unit-II: Boolean Algebra

Boolean algebra relations: Commutative laws, associative laws, distributive laws, AND laws, OR laws, Double inversion law, De Morgan's theorem, Simplifications of Boolean expressions using Boolean laws and theorem, Karnaugh map (K-map): Sum of product in terms of Minterms, Product of sum in terms of Maxterms, Karnaugh map construction and properties, Minimization of the Boolean function using K-map.

Unit-III: Combinational Logic Circuits

Introduction to combinational circuits, Arithmetic circuits: Half adder, full adder, half subtractor and full subtractor, Multiplexers (MUX) and Demultiplexers (DEMUX), Encoders and decoders.

Unit-IV: Sequential Logic Circuits

Introduction to sequential circuits, SR flip-flop, JK flip-flop, D flip-flop and T flip-flop, Counters: Synchronous and asynchronous, Applications of counters, Shift registers, Shift register operations: Serial in – serial out, serial in – parallel out, parallel in – serial out and parallel in – parallel out.

Unit-V: Microprocessors

Evolution of microprocessors, Microprocessor architecture, Accumulator, Program Counter, Instruction Register and Instruction Decoder, Arithmetic Logic Unit, General Purpose Registers, Status Registers, Stack Pointer, Index Register, Timing and Control circuitry, Functional block diagram of 8085 microprocessor and its pin out diagram, 8086 features and comparison with 8085.

References

1. M. Morris Mano, Digital Design, Pearson Education, India.
2. R. P. Jain, Modern Digital Electronics, McGraw Hill Publication, New Delhi.
3. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Application with 8085, New Age International Publication, New Delhi.
4. Thomas L. Floyd, Digital Electronics, Pearson Publication, India.
5. M. Morris Mano, Digital Logic and Computer Design, Pearson Education India.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Explain the difference between analog and digital signals and use of different number systems.
CO-2	Design and simplify logical expressions using Boolean algebra and K-map techniques to create efficient digital systems.
CO-3	Develop combinational logic circuits such as adders, subtractors, multiplexers and encoders and implement them practically.
CO-4	Understand and design sequential circuits including flip-flops, counters and shit registers and apply them in real-world scenarios.
CO-5	Describe the architecture and operation of the microprocessors.

Course Code	:	COPC311
Course Title	:	**Computer Oriented Numerical Methods Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Corequisite	:	Computer Oriented Numerical Methods
Course Category	:	PC

Course Objectives

1. To understand the concepts of numerical techniques and the implementation of algebraic and transcendental equations.
2. To apply numerical methods for the implementation of interpolation and integration methods.
3. To implement differential equations and linear equations using numerical methods; and generate curves using least square methods.

List of Programs

1. Write a program in C to find the root of algebraic and transcendental equations using Bisection method.
2. Write a program in C to find the root of algebraic and transcendental equations using Iterative method.
3. Write a program in C to find the root of algebraic and transcendental equations using Newton-Raphson method.
4. Write a program in C to analyze the rate of convergence of iterative methods.
5. Write a program in C to implement Newton's forward interpolation formula.
6. Write a program in C to implement Newton's backward interpolation formula
7. Write a program in C to compute the approximate value of definite integral using Simpson's 1/3 and 3/8 rules.
8. Write a program in C to compute the approximate value of definite integral using Trapezoidal rule.
9. Write a program in C to solve ordinary differential equations using Runge-Kutta method.
10. Write a program in C to solve the systems of linear equations using Gauss Elimination method.
11. Write a program in C to solve the systems of linear equations using Gauss-Jordon method.
12. Write a program in C to implement least squares method for curve fitting.

References

1. Grewal B. S., "Numerical Methods in Engineering and Science", Khana Publishers, 11th Edition, 2013, ISBN-10: 817409248X
2. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall India Learning Private Limited, 5th Edition, 2012, ISBN-10: 9788120345928
3. Hamming R. W., "Numerical Methods for Scientists and Engineers", Dover Publications, 2nd Revised Edition, 2012.
4. Gupta R. S., "Elements of Numerical Analysis," Cambridge University Press, 2015, ISBN-10:1107500495.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Implement algebraic and transcendental equations using numerical methods.
CO-2	Implement interpolation and numerical integration techniques.
Co-3	Analyse the solution of differential and linear equations using program; and to implement the least squares methods for the generation of curves.

Course Code	:	COPC312
Course Title	:	**Operating System Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Operating System
Course Category	:	PC

Course Objectives

1. Understand and analyze the types and evolution of operating systems, apply MS-DOS commands for system operations, and demonstrate two-way process communication using pipes
2. Understand inter-process communication mechanisms and analyze CPU scheduling techniques
3. Understand memory management techniques, page replacement algorithms, and essential system utilities

List of Practicals/Programs

1. Study and explain the types of operating systems (their types with structure, functionality, dependencies, and application software with their differences).
2. Explain in detail the evolution of operating systems over the past few years
3. Practice 20 internal and external commands from MS-DOS.
4. Implement two-way process communication using pipes.
5. Implement a message queue for inter-process communication.
6. Implement shared memory and semaphore for inter-process communication
7. Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority
8. Simulate Bankers Algorithm for Deadlock Avoidance and Prevention
9. Simulate the FIFO Page Replacement Algorithm using the C program.
10. Simulate LRU Page Replacement Algorithms using the C program
11. Simulate Paging Technique of Memory Management.
12. Practice various commands/utilities such as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep, fgrep cut, paste, join, du, df, ps, who.

References

1. A. Silberschatz, P. B. Galvin, and G. Gagne, “Operating System Concepts, Global ed.”, 10th ed. Hoboken, NJ, USA: Wiley, 2018, ISBN: 9789357460569
2. W. Stallings, “Operating Systems: Internals and Design Principles”, 9th ed. India: Pearson Education, 2018, ISBN: 978-9332585604.
3. A. S. Tanenbaum and H. Bos, “Modern Operating Systems”, 5th ed. Pearson, 2022. ISBN: 978-0137614267.
4. D. M. Dhamdhere, “Operating Systems: A Concept-Based Approach”, 3rd ed. New Delhi, India: McGraw-Hill Education, 2008, ISBN: 978-0070611948.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Analyze the structure and functionality of different operating systems, apply command-line operations for system management, and create inter-process communication mechanisms using pipes.
CO-2	Apply inter-process communication methods, simulate CPU scheduling algorithms, and analyze deadlock handling techniques
CO-3	Implement page replacement algorithms, simulate memory management techniques, and utilize system commands to manage files, processes, and system resources in a Unix/Linux environment.

Course Code	:	COPC313
Course Title	:	**Object Oriented Programming Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Object Oriented Programming
Course Category	:	PC

Course Objectives

1. Apply object-oriented programming principles in C++ to design and develop efficient solutions for computational problems.
2. Analyze real-world problems and evaluate appropriate object-oriented features such as encapsulation, inheritance, and polymorphism to create scalable applications.
3. Create robust C++ applications by implementing exception handling, data structures (arrays, linked lists, stacks, queues, trees, and graphs), and various sorting and searching algorithms.

List of Programs

1. Write C++ programs to implement various control statements: if-else statement, while loop, do-while loop, for loop, and switch statement.
2. Write a C++ program to demonstrate structures and their use.
3. Write a C++ program to sort a list of numbers using bubble sort and insertion sort implemented within a class.
4. Write a program that implements a class with an inline function to calculate the factorial of a number.
5. Write a program to implement a student class where: Data members: name, roll-no, marks array (for multiple subjects), average, grade; and Member functions: assign (), compute (), display (), calculateGrade ().
6. Write a program to demonstrate default constructor, parameterized constructor, and copy constructor
7. Write a program to swap two private data members of two different classes using a friend function.
8. Write C++ programs to demonstrate multi-level inheritance (e.g., Vehicle → Car → ElectricCar), and hierarchical inheritance (e.g., Animal → Dog & Cat)

9. Write a C++ program to demonstrate function overloading by implementing an area calculation function for: Circle (radius given), Rectangle (length and breadth given), Triangle (base and height given).
10. Write a C++ program to overload the - operator for a class Number that represents an integer. The program should allow subtracting two Number objects using the - operator and display the result.
11. Write a C++ program that takes two integers as input and performs division. Use exception handling to catch a division by zero error and display an appropriate message.
12. Write a template-based program to implement sorting for different data types (integers, floating point numbers, strings).

References

1. E. Balagurusamy, "Object-Oriented Programming with C++", McGraw Hill Education, 2020, 8th Edition, ISBN-10: 9389949181.
2. Sourav Sahay, "Object-Oriented Programming with C++", Oxford University Press, 2012, 2nd Edition, ISBN-10: 0198065302.
3. Reema Thareja, "Object-Oriented Programming with C++", Oxford University Press, 1st Edition, 2022, ISBN-10: 978-0199459630.
4. Mahesh Bhave and Sunil Patekar, "Object-Oriented Programming with C++", Pearson Education India, 2012, ISBN-10: 978-8131798585.

Course Outcomes

CO-1	Understand and explain the fundamental concepts of object-oriented programming in C++ and how they enhance software design and reusability.
CO-2	Apply object-oriented techniques such as classes, objects, operator overloading, templates, and file handling to develop structured and efficient C++ programs.
CO-3	Evaluate different data structures and algorithms to solve complex computational problems and optimize performance in real-world applications

Course Code:	:	ECPC315
Course Title	:	**Digital Electronics and Microprocessors Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Digital Electronics and Microprocessors
Course Category	:	PC

Course Objectives

1. To gain knowledge of fundamental logic gates.
2. To design and implement combinational circuits as adders and subtractors.
3. To gain hand-on experience with digital integrated circuits.

List of Experiments

1. To verify the truth tables of basic logic gates (AND, OR and NOT).
2. To verify the truth tables of universal gates (NAND and NOR.
3. To design and verify the truth tables of basic logic gates by using NAND gate.
4. To design and verify the truth tables of basic logic gates by using NOR gates.
5. To design and verify the truth tables of Ex-OR gate by using NAND gates.
6. To design and verify the truth tables of Ex-NOR gate by using NOR gates.
7. To design and verify the circuit and truth table of Half Adder.
8. To design and verify the circuit and truth table of Full Adder.
9. To design and verify the circuit and truth table of Half Subtractor.
10. To design and verify the circuit and truth table of Full Subtractor.

References

1. M. Morris Mano, Digital Design, Pearson Education, India.
2. R. P. Jain, Modern Digital Electronics, McGraw Hill Publication, New Delhi.
3. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Application with 8085, New Age International Publication, New Delhi.
4. Thomas L. Floyd, Digital Electronics, Pearson Publication, India.
5. M. Morris Mano, Digital Logic and Computer Design, Pearson Education India.

Course Outcomes

At the end of the course, the student will be able to:

CO-1	Verify the truth tables of all basic and universal gates.
CO-2	Design adder and subtractor circuits using logic gates and verify their functioning.
CO-3	Design circuits using digital ICs and verify their working.

Course Code	:	COSI316
Course Title	:	**Summer Internship-I**
Number of Credits	:	2 (L: 0, T: 0, P: 0)
Prerequisites	:	Nil
Course Category	:	SI

The Summer Internship-1 (COSI316) of at least four-week duration in offline mode is mandatory for the students. It should be undertaken in an Industry / Government or Private certified agencies which are in social sector / Government skill centres / Institutes / Schemes. Throughout the internship, students will have the chance to explore and work with new technologies while developing the project using C programming, Python, HTML/CSS, PHP-MySQL, etc. Upon completion, students are required to submit their training project report, signed by their respective instructors or trainers, to the Training and Placement Coordinator (TPC) of Computer Engineering Section, University Polytechnic, JMI. The project report will be evaluated by the faculty members of the Computer Engineering Section. The schedule for the examination/viva/ presentation of the training project report will be notified by the Head of Section / TPC of Computer Engineering Section, University Polytechnic, JMI.

Course Objectives

1. To provide industrial exposure to students that will help students to gain real life experience.
2. To engage students with experienced professionals that can help them further in their careers
3. To provide industrial exposure to student to real time.
4. To enable the students to work on short industry projects and gain the skill of preparing report, describing its results and findings.
5. To identify the gap between existing knowledge and industry expectations.

Course Code	:	COPC401
Course Title	:	**Data Structures and Algorithms**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	IT Systems and Computer Programming
Course Category	:	PC

Course Objectives

1. To understand the basics of data types, data structures, arrays, and pointers
2. To analyze the stack and queue based on the logical, application, and implementation view
3. To apply linked list for the implementation of linear data structures and for the solution of some real-world problems
4. To evaluate various sorting and searching algorithms based on their complexity
5. To analyze various non-linear data structures based on their applications

Course Content

Unit-I: Introduction to Data Structures

Data and information, Data type and data structures, Types of data structures, Character strings, Hardware and Software, Concept of implementation, Abstract data types, Array as an abstract data type, implementing one dimensional array, two dimensional arrays, and multidimensional arrays, View of pointers at logical and implementation level, Concept of static and dynamic variables.

Unit-II: Stack and Queue

The stack: Definition, Motion picture of a stack, Primitive operations, Stack in problem solving, Infix, prefix, and postfix notations, evaluating a postfix expression, Implementation of a stack using an array. Queue: Definition, Sequential representation, Operations, Implementation of queue using array.

Unit-III: Linked List

Linear linked list, inserting and removing nodes from a list, linked implementation of stack and queue, linked list as a data structure, Stack as a circular list, Queue as a circular list, Circular list with header node, doubly linked list, Addition of long positive integers using a circular list.

Unit-IV: Sorting and Searching

Efficiency consideration, Asymptotic notations, Exchange sorts: Bubble sort and Quick sort; Selection and Tree Sorting: Selection sort, Binary tree sort, Heap sort; Insertion sort, and Shell sort; Searching: Basic searching techniques, Linear search, Binary search, Efficiency of searching algorithms.

Unit-V: Tree and Graphs

Tree: Tree terminologies, Types of binary trees, Properties, Tree traversal techniques, Graphs: Applications of graphs, representation of graphs, Transitive closure, Warshall's algorithm and shortest path algorithms, linked representation of graphs, Graph traversals: traversal methods for graphs, Depth-first traversal, Breadth-first traversal, and minimum spanning tree.

References

1. Langsam Y., Augenstein M. J., and Tanenbaum A. M., "Data Structures using C and C++", Eastern Economy Edition, 2nd Edition, 1999, ISBN:81-203-1177-9.
2. Lipschutz S., "Data Structures with C" Schaum's Outlines, McGraw Hill Education, 2017, ISBN-10: 0070701989
3. Samanta D., "Classic Data Structures", PHI Learning Private Limited, 2nd Edition, 2009, ISBN-10: 9788120337312
4. Kanetkar Y., "Data Structures through C," BPB Publications; 4th Edition, 2022, ISBN-10: 9355511892

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe data types, data structures, arrays, and pointers
CO-2	Differentiate between stack and queue based on logical, implementation, and application view
CO-3	Use linked list for the implementation of stack, queue, problems related to long positive integers
CO-4	Compare various sorting and searching techniques based on their complexity
CO-5	Differentiate between the applications of tree and graph in software development

Course Code	:	COPC402
Course Title	:	**Database Management System**
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives

1. Understand the fundamental concepts of database systems, their architecture, and the differences between database systems and traditional file systems.
2. Analyze and design Entity-Relationship (E-R) models by identifying entities, attributes, relationships, and constraints to represent real-world applications.
3. Apply the principles of the relational model, relational algebra, and tuple relational calculus to manipulate and retrieve data efficiently.
4. Evaluate database normalization techniques and functional dependencies to ensure data integrity and minimize redundancy in relational databases.
5. Develop SQL queries for creating, managing, and querying relational databases using Data Definition Language (DDL), Data Manipulation Language (DML), and Data Query Language (DQL) commands, incorporating joins, subqueries, and constraints.

Course Content

Unit-I: Database System Concept and Data Modelling

An overview of database management system, Database system Vs File system, Database system concepts and Architecture, Data models schema and Instances, Data independence, and Database language and interfaces, Difference between DML and DDL, Overall Database Structure.

Unit-II: Entity-Relationship model

Basic concepts, Design process, Constraints, Design issues, E-R Diagrams: Entities, Attributes, Relationships, Constraints, Keys, Extended E-R features, Generalization, Specialization, Aggregation, Reduction of an ER diagrams to tables, and Relationships of higher degree.

Unit-III: The Relational Model

Structure of relational databases, Domains, Relations, Relational data model concepts, Integrity constraints: Entity integrity, Referential integrity, Domain constraints, Relational algebra – fundamental operators and syntax, Relational algebra queries, and Tuple relational calculus.

Unit-IV: Relational Database Design

Relational database design: Functional Dependency (FD): Definition, Trivial and Non-trivial FD, Closure of FD set, Closure of attributes, Irreducible set of FD; Normalization: 1NF, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multivalued dependency, 4NF, Join dependency and 5NF.

Unit-V: MYSQL/SQL

Overview of SQL, its purpose, and tools for database management, DDL, DML, and DQL commands for defining and manipulating data, Joins, Subqueries, and Functions for advanced data retrieval, Application of constraints and Keys to maintain data integrity, Hands-on exercises to Design, Query, and Manage relational databases.

References

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 2020, 7th Edition, ISBN: 978-1260084504.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 2016, 7th Edition, ISBN: 978-0133970777.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill Education, 2014, 3rd Edition, ISBN: 978-0072465631.
4. James R. Groff, Paul N. Weinberg, Andy Oppel, "SQL: The Complete Reference", McGraw-Hill Education, 2018, 3rd Edition, ISBN: 978-0071592550

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain the fundamental concepts, architecture, and components of database management systems.
CO-2	Design E-R models for database applications and convert them into relational schemas.
CO-3	Formulate and execute queries using relational algebra and tuple relational calculus to retrieve meaningful insights from databases.
CO-4	Assess and implement normalization techniques to enhance database design and reduce redundancy.
CO-5	Construct and optimize SQL queries to perform complex data operations and ensure data integrity in relational databases.

Course Code	:	COPC403
Course Title	:	**Computer Networks**
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives

1. Understand the fundamental concepts of computer networks, network architectures, and communication models.
2. Analyze the design and functioning of data link layer protocols, error detection/correction techniques, and medium access control mechanisms.
3. Evaluate network layer functionalities, including routing algorithms, congestion control, and internetworking.
4. Apply transport layer principles and protocols, including TCP and UDP, to ensure reliable communication.
5. Design and implement application layer protocols and services, such as DNS, email, and web communication.

Course Content

Unit-I: Introduction

Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay. The Physical Layer: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

Unit-II: The Data Link Layer

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. The Medium Access Sublayer: Channel allocations problem, multiple access protocols, Ethernet, Token bus, Token ring, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth.

Unit-III: The Network Layer

Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

Unit-IV: The Transport Layer

Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

Unit -V: The Application Layer

Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. Application Layer Protocols: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

References

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson Education, 2021, 8th Edition, ISBN: 978-0136681557.
2. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", Pearson Education, 2020, 5th Edition, ISBN: 978-0132126953.
3. William Stallings, "Data and Computer Communications", Pearson Education, 2017, 10th Edition, ISBN: 978-0133506488.
4. Douglas E. Comer, "Internetworking with TCP/IP: Principles, Protocols, and Architecture", Pearson Education, 2013, 6th Edition, ISBN: 978-0136085300.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain the basic concepts of networking, including network hardware, software, and communication models.
CO-2	Analyze data link layer functionalities, error detection/correction methods, and various multiple access protocols.
CO-3	Evaluate different routing algorithms and congestion control strategies used in network layer operations
CO-4	Compare transport layer protocols (TCP & UDP) and their role in providing end-to-end communication services
CO-5	Implement various application layer protocols and analyze their functionalities in real-world networking scenarios

Course Code	:	COPE404
Course Title	:	**Artificial Intelligence**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	IT System and Computer Programming
Course Category	:	PE

Course Objectives

1. To understand basics of artificial intelligence and intelligent agents
2. To apply propositional logic for representing knowledge to achieve a goal
3. To analyze the real-world problems using first-order logic
4. To evaluate different types of machine learning algorithms
5. To apply algorithms and knowledge that allow computer to learn from data and make predictions

Course Content

Unit-I: Intelligent Agents and Problem Solving

Introduction to Artificial Intelligence (AI), Foundations and history of AI, Agents and environments, Concept of rationality, Nature of environments, and Structure of agents, Problem-solving agents, Toy and real-world problem, Searching for solutions, Uninformed search strategies, and informed (Heuristic) search strategies, and Heuristic functions.

Unit-II: Logical Agents

Knowledge-based agents, The Wumpus world problem, Logic, Propositional logic, Propositional Theorem Proving, Effective propositional model checking, and Agents based on propositional logic.

Unit -III: First-Order Logic

Representation, Syntax, and semantics of first-order logic (FOL), Using FOL, Knowledge engineering in FOL, Inferences in FOL: Propositional vs First-order inference, unification and lifting, Forward chaining, Backward chaining, and Resolution.

Unit-IV: Learning

Forms of learning, Supervised and unsupervised learning, Learning decision trees: The decision tree representation, expressiveness of decision trees, Inducing decision trees from examples, Theory of learning, Regression and classification with linear models, Artificial Neural Networks (ANN), Support

Vector Machine (SVM), Ensemble learning, and Practical machine learning (ML): Handwritten digit recognition and House price prediction.

Unit-V: Knowledge in Learning

Logical formulation of learning: Examples and hypotheses, Current-best-hypothesis search and least commitment search; Knowledge in learning, Explanation-based learning, Inductive logic programming: An example, Top-down inductive learning methods, Inductive learning with inverse deduction, Introduction to reinforcement learning.

References

1. Russell S. J. and Norvig P., "Artificial Intelligence-A Modern Approach", Pearson, 4th Edition, 2022, ISBN-10: 9356063575
2. Padhy N. P., "Artificial Intelligence and Intelligent Systems", Oxford University Press, 1st Edition, ISBN-10: 0195671546.
3. Goel L., "Artificial Intelligence: Concepts and Applications", Wiley, 2021, ISBN-10: 8126519932
4. Deisenroth M. P., Faisal A. A., and Ong C. S., "Mathematics for Machine Learning", Cambridge University Press, 1st Edition, 2020, ISBN-10: 110845514X

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe the basics of AI and different types of searching
CO-2	Solve the problems related to propositional logic
CO-3	Represent knowledge using first-order logic in AI-based systems
CO-4	Differentiate among different forms of learning, decision trees, ANN, and SVM
CO-5	Demonstrate knowledge in learning

Course Code	:	COPC405
Course Title	:	**Computer Organization and Architecture**
Number of Credits	:	2 (L:2, T:0, P:0)
Prerequisites	:	IT Systems and Computer Programming
Course Category	:	PC

Course Objectives

1. Understand the concepts of the Central Processing Unit (CPU), instruction formats, and addressing modes.
2. Apply arithmetic operations and algorithms, including multiplication, division, and floating-point arithmetic.
3. Analyze different types of memory systems, including cache, virtual memory, and memory hierarchy.
4. Explain the working of control units, including microprogrammed and hardwired control.
5. Evaluate input/output systems, modes of transfer, and direct memory access (DMA) mechanisms.

Course Content

Unit-I: Introduction to Computer Architecture

CPU, General Register and Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer, and Complex Instruction Set Computer, Register Transfer Language, Memory Transfers, Arithmetic Micro-operations, Logic micro-operations, Shift micro-operations, Arithmetic Logic shift unit, Computer Registers, Computer instructions and Instruction cycle.

Unit-II: Computer Arithmetic and Pipelining

Addition and Subtraction with Signed-Magnitude, Addition, and Subtraction with Signed-2's Complement Data, Hardware Algorithm for multiplication, Booth Multiplication Algorithm, Array Multiplier, Division using Hardware Implementation for Signed-Magnitude Data, Divide Overflow, Hardware Algorithm for division and Arithmetic algorithms for Floating point numbers. Instruction and Arithmetic Pipe lining, Vector Processing, and Array Processors.

Unit-III: Memory Organization

Memory Hierarchy, Main Memory: Random access memory and Read-only memory Chips, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Address Space and Memory Space, Address Mapping Using Pages, Associative Memory Page Table, Page Replacement, Segmented-Page Mapping.

Unit-IV: Design of Control Unit

Control Memory, Address Sequencing, Conditional Branching, Mapping of Instruction Subroutines, Microinstruction Format, The Fetch Routine, Binary Microprogram and Microprogram Sequencer.

Unit-V: Input/Output

Peripheral Devices, Input-Output (1/O) Bus and Interface Modules, I/O versus Memory Bus, Isolated versus Memory-Mapped I/O, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Daisy Chaining, Direct Memory Access, I/O Processor.

References

1. M. M. Mano, "Computer System Architecture," Prentice Hall, 3rd Edition, 1993 ISBN-10: 0131755633.
2. M. Rafiquzzaman and R. Chandra, *"*Modern Computer Architecture*,"* West Publishing Company, 1988, ISBN-10: 0314601740.
3. W. Stallings, *"*Computer Organization and Architecture," Pearson Education, 11th Edition, 2019, ISBN-10: 0135205123.
4. A. S. Tanenbaum and T. Austin, Structured Computer Organization, 6th ed. Boston, MA, USA: Pearson, 2013.The ISBN-10: 0132916525.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe the CPU architecture, instruction cycles, and addressing modes.
CO-2	Implement the algorithms for performing addition, subtraction, multiplication, and division for both decimal and floating-point numbers.
CO-3	Explain the structure and functioning of different memory units.
CO-4	Compare hardwired and microprogrammed control unit designs.
CO-5	Understand the input/output mechanisms including peripheral devices, data transfer modes, and priority interrupts.

Course Code	COPC411
Course Title	**Data Structures and Algorithms Lab**
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	Data Structures and Algorithms
Course Category	PC

Course Objectives

1. To understand the implementation of arrays, stack, and queue using C programming.
2. To implement stack and queue using dynamic variables and linked list using C programming.
3. To analyse various sorting, searching, binary tree, and graph traversal algorithms using C programming.

List of Programs

1. Write a program in C to print diagonal elements from 2D array
2. Write a program in C to perform push and pop operations on a stack. This program will also check the overflow and underflow conditions.
3. Write a program in C using static variables to insert and delete elements from a queue; and check the overflow and underflow conditions.
4. Write a program in C to insert and delete elements from a circular queue; and check the overflow and underflow conditions.
5. Write a program in C to add n numbers using pointers.
6. Write a program in C using dynamic variables to perform push and pop operations on stack; and check the overflow and underflow conditions.
7. Write a program in C using dynamic variables to insert and delete elements from a queue; and check the overflow and underflow conditions.
8. Write a program in C to implement stack and queue using linked list.
9. Write a program in C to sort the data using Bubble sort and Selection sort.
10. Write a menu driven program in C to search an element from an array using (i) Linear search and (ii) Binary search
11. Write a menu driven program using C which has the following options:
    (a) To find the level and height of a Binary tree
    (b) To compute the indegree and outdegree of each node of a directed graph.
12. Write a program in C to implement Breadth First Search (BFS) and Depth First Search (DFS) algorithm.

References

1. Langsam Y., Augenstein M. J., and Tanenbaum A. M., "Data Structures using C and C++", Eastern Economy Edition, 2nd Edition, 1999, ISBN:81-203-1177-9.
2. Lipschutz S., "Data Structures with C" Schaum's Outlines, McGraw Hill Education, 2017, ISBN-10: 0070701989
3. Samanta D., "Classic Data Structures", PHI Learning Private Limited, 2nd Edition, 2009, ISBN-10: 9788120337312
4. Kanetkar Y., "Data Structures through C," BPB Publications; 4th Edition, 2022, ISBN-10: 9355511892

Course Outcome

At the end of this course, the students will be able to:

CO-1	Implement arrays, stack, linear queue, and circular queue using C programming
CO-2	Implement linear data structures using dynamic variables and linked list.
CO-3	Implement (a) different types of sorting and searching algorithms, (b) various operations on binary tree and graph, and (c) BFS and DFS algorithms.

Course Code	:	COPC412
Course Title	:	**Database Management System Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Database Management System
Course Category	:	PC

Course Objectives

1. Apply fundamental concepts of database management systems by designing and implementing relational databases.
2. Analyze the structure and functionality of relational database models using normalization techniques, SQL queries, and constraints.
3. Evaluate advanced database concepts such as data mining, big data analysis, and query optimization to enhance database performance.

List of Practicals / Programs

1. Write in detail about the CREATE command; and create a database for college using the following Tables:
Table Name: Faculty Attributes: Faculty ID, Faculty Name, Qualification, Department ID
Table Name: Student Attributes: Student ID, Student Name, Branch, Marks
Table Name: Department Attributes: Department ID, Department Name

2. Write in detail about the INSERT command. Insert data into the created tables.

3. Write in detail about the SELECT command. Query the created database using the select command. Describe the DISTINCT, WHERE and ORDER BY clauses used with select command and show their usage.

4. Write in detail about the following operators and show their usage on the created database.
(a). IN, NOT IN (b). BETWEEN, NOT BETWEEN (c). LIMIT (d). IS NULL, IS NOT NULL
(e). LIKE, NOT LIKE

5. Write in detail about the JOIN command. Show its usage on the created database using different types of joins used in MySQL i.e.
(a). CROSS JOIN (b). INNER JOIN (c). LEFT JOIN (d). RIGHT JOIN

6. Write in detail about the SET operations including UNION, MINUS and INTERSECT. Show their usage on the created database.

7. Write in detail about the AGGREGATE functions including COUNT, SUM, MAX, MIN and AVERAGE. Show their usage on the created database.

8. Write in detail about the use of ARITHMETIC operators on SQL queries. Show the usage of '+', '-' , '* 'and '/ 'on the created database.

9. Write in detail about the GROUP BY clause. Show its usage on the created database.

10. Implementation of different types of constraints in SQL.

11. Create a University Database and implement the relationships between the various tables thus created. (Introduction, Functional requirements, design, data feeding and ER diagram, SQL Queries).

12. Create a sample database to explain the concept and implementation of Normalization. (1NF, 2NF, 3NF, BCNF).

References

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 2020, 7th Edition, ISBN: 978-1260084504.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 2016, 7th Edition, ISBN: 978-0133970777.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill Education, 2014, 3rd Edition, ISBN: 978-0072465631.
4. James R. Groff, Paul N. Weinberg, Andy Oppel, "SQL: The Complete Reference", McGraw-Hill Education, 2018, 3rd Edition, ISBN: 978-0071592550

Course Outcome

At the end of this course, the students will be able to

CO-1	Create relational database schemas using SQL and implement various constraints, joins, set operations, aggregate functions, triggers, and views
CO-2	Demonstrate the ability to design and develop Entity-Relationship (ER) diagrams, UML models, and flowcharts for database applications
CO-3	Develop real-world database applications by integrating database design principles, normalization techniques, and query optimization strategies.

Course Code	:	COPC413
Course Title	:	**Computer Networks Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Computer Networks
Course Category	:	PC

Course Objectives

1. Understand the concepts of wired and wireless media, network protocols, error-detection techniques, and network diagnostic tools.
2. Apply knowledge of network communication, error-detection algorithms, and IP addressing to implement and configure network setups and protocols.
3. Analyze network traffic, simulate network scenarios, and evaluate performance metrics using tools like Wireshark and NS2 simulator.

List of Practicals/Programs

1. To study about wired media (Guided media) and wireless media (Unguided media).
2. Study and implement the cross-wired and straight cable connection of twisted pair cable using RJ 45 connector.
3. Demonstrate wireless unguided communication using IR transceiver and analyze it using a serial terminal program.
4. Demonstrate communication using wired protocol with a simple USB – serial converter, and analyze it using a serial terminal program.
5. Demonstrate an example of error detecting code (parity bit) in C programming language.
6. Demonstrate an example of error detecting code (Checksum) in C programming language.
7. Demonstrate an example of error detecting code (CRC) in C programming language.
8. Interpreting “ping” & “Traceroute” output.
9. To implement classfull and classless IP address using C programming language.
10. To examine Network Address Translation.
11. Perform the following using Wireshark packet analyzer:
    a. Packet Capture Using Wire shark
    b. Starting Wire shark
    c. Viewing Captured Traffic
    d. Analysis and Statistics and Filters.

12. Perform the following using NS2 Simulator:
    a. NS2 Simulator-Introduction
    b. Simulate to Find the Number of Packets Dropped
    c. Simulate to Find the Number of Packets Dropped by TCP/UDP
    d. Simulate to Find the Number of Packets Dropped due to Congestion
    e. Simulate to Compare Data Rate and Throughput
    f. Simulate to Plot Congestion for Different Source/Destination
    g. Simulate to Determine the Performance with respect to Transmission of Packets

References

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson Education, 2021, 8th Edition, ISBN: 978-0136681557.
2. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", Pearson Education, 2020, 5th Edition, ISBN: 978-0132126953.
3. William Stallings, "Data and Computer Communications", Pearson Education, 2017, 10th Edition, ISBN: 978-0133506488.
4. Douglas E. Comer, "Internetworking with TCP/IP: Principles, Protocols, and Architecture", Pearson Education, 2013, 6th Edition, ISBN: 978-0136085300.

Course Outcome

At the end of this course, the students will be able to

CO-1	Describe the concepts of wired and wireless media, network protocols, error-detecting codes, and network analysis tools.
CO-2	Implement network configurations, error-detection algorithms, and packet analysis using tools like Wireshark and NS2 simulator.
CO-3	Demonstrate the ability to analyze network traffic, interpret diagnostic tools (ping, traceroute), and evaluate network performance using Wireshark and NS2 simulator.

Course Code	:	COPC415
Course Title	:	**Computer Hardware Lab**
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives

1. Understand the components and functionalities of computer hardware.
2. Assemble, install, and configure computer hardware components, including the motherboard, CPU, RAM, storage, expansion cards, and peripherals.
3. Analyze and troubleshoot hardware and software issues related to device installation, system configuration, and system performance.

List of Experiments

1. Identify front panel indicators and switches, Front side, and Rear side connectors, marking positions of Switched-mode power supply, Motherboard, Floppy disk drive (FDD), Hard disk drive (HDD), Compact disc, D*igital video disc* (DVD), and add-on cards.
2. Identify Motherboard components of Desktop & Laptop computer – CPU Socket, Chipset, Read Only Memory, Random Access Memory (RAM) slots, Expansion slots/bus, Interfaces: Serial advanced technology attachment and small computer system interface, Ports and connectors, Power connectors, CMOS Backup battery.
3. Identify Input/output Devices – Keyboard, Mouse, Touchpad, Track-point, Trackball, Scanner, Barcode recognition, *Optical character recognition*, Magnetic ink character recognition, Optical marks recognition, Camera, Visual Display Unit, printer, plotter, projector.
4. Identify components of Power Supply, Power Connectors, Voltage levels and other signals, Form factor, Backup power supplies.
5. Experiment with fixing Motherboard – fixing CPU and Heat sink assembly, Fixing RAM modules, Adding HDD/FDD.
6. Experiment with installing and configuring expansion cards such as Network Interface Card, Graphics card, and Sound card.
7. Experiment with Basic input and output system (BIOS) Setup and Configurations: system date and time, security passwords, boot options and priorities – Factory reset, hardware configurations.

8. Experiment with fixing up of SMPS power connection to various components motherboard, drives, Add-on card, cooling fans, etc.
9. Install and configure Webcam, Biometric devices.
10. Install and configure various types of Scanners and printers.
11. Install and configure a DVD writer and perform recording on a DVD/Blu-ray disc.
12. Install and configure an Operating System (OS) – Installation of Windows/Linux OS, system partitioning, disk formatting, and driver installation.

References

1. M. M. Mano, "Computer System Architecture," Prentice Hall, 3rd Edition, 1993 ISBN-10: 0131755633.
2. M. Rafiquzzaman and R. Chandra, "Modern Computer Architecture," West Publishing Company, 1988, ISBN-10: 0314601740.
3. W. Stallings, "Computer Organization and Architecture," Pearson Education, 11th Edition, 2019, ISBN-10: 0135205123.
4. A. S. Tanenbaum and T. Austin, Structured Computer Organization, 6th ed. Boston, MA, USA: Pearson, 2013.The ISBN-10: 0132916525.

Course Outcome

At the end of this course, the students will be able to

CO-1	Describe the functions and roles of various computer hardware components.
CO-2	Assemble, install, and configure computer hardware components, including motherboards, CPUs, RAM, storage devices, expansion cards, and peripherals.
CO-3	Demonstrate the ability to troubleshoot and configure BIOS settings, power supply connections, and hardware installations.

Course Code	:	COPR416
Course Title	:	**Minor Project**
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	Nil
Course Category	:	PR

Course Objectives

1. Understand the method of applying engineering knowledge to solve specific problems.
2. Apply engineering and management principles while executing the project.
3. Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. The number of projects that a faculty can guide would be limited to two groups or decided by the Head of Section.
6. The project can be carried out on-campus or in an industry or an organization with prior approval from the principal through Head of Section.
7. The project shall be completed and submitted at least one month before the last teaching day.
8. The project should be presented by students using power point once before submission of project.

Course Outcomes

At the end of this course, the students will be able to

CO-1	Conceptualize, design and implement solutions for specific problems.
CO-2	Communicate the solutions through presentations and technical reports.
CO-3	Apply project and resource managements skills, professional ethics, and societal concerns.

Course Code	:	COAU400
Course Title	:	**Indian Knowledge and Tradition**
Number of Credits	:	0 (L:2, T:0; P:0)
Prerequisites	:	NIL
Course Category	:	AU

Course Content

- Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उन्नवेद (आयुवेद, धनुवेद, गन्धवेद , स्थान्नत्य आदद) (iii) वेदथाथांग (शिक्था, कलन्न, ननरुत , व् थाकरण , ज्योनतष छथांद), (iv) उन्नथाइग (धर्म शथास्न , र्ीर्थाथांसथा, नुरथाण, तकशरथास्न)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Reference

1. Sivaramakrishna, Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, The wave of Life
4. Fritzof Capra, Tao of Physics
5. V N Jha, arkasangraha of Annam Bhatta, Inernational, Chinmay Foundation, Velliarnad, Amaku,am, RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

Course Code	:	COPE501
Course Title	:	**Computer Graphics**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	PE

Course Objectives

1. To understand the applications of computer graphic and the working procedure of video display devices
2. To analyze line, circle, and ellipse algorithms
3. To evaluate different types of two-dimensional geometric transformations
4. To analyze viewing and clipping algorithms
5. To create an environment for solving the problems using three-dimensional geometric transformations and viewing

Course Content

Unit-I: Graphics Systems

Introduction to computer graphics, Computer-aided design, Presentation graphics, Computer art, Entertainment, Visualization, and Graphical user interface. Video display devices: Refresh cathode-ray tubes (CRT), Raster and random scan displays, Color CRT monitors, and Direct-view storage tubes; Mathematics for computer graphics.

Unit-II: Output Primitives

Point and lines, Line drawing algorithms: DDA algorithm and Bresenham's line algorithm, Circle generating algorithm: properties of circle, Midpoint circle algorithm, Ellipse generating algorithm: properties of ellipse, midpoint ellipse algorithm

Unit-III: Two-Dimensional Geometric Transformations

Basic transformations: Translation, Rotation, Scaling; Matrix representation and homogeneous coordinates, Composite transformations: General pivot point rotation and general fixed-point scaling; Advanced transformations: Reflection and Shear.

Unit-IV: Two-Dimensional Viewing

The viewing pipeline, viewing coordinate reference frame, Window-to-viewport transformation, Two-dimensional functions; Clipping operations, point clipping, Line clipping algorithm: Cohen-Sutherland line clipping, Liang-Barsky line clipping, and Nicholl-Lee-Nicholl line clipping; Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping, Weiler-Atherton Polygon clipping.

Unit-V: Three-Dimensional geometric Transformations and Viewing

Three-dimensional geometric transformations: translation, rotation: coordinate-axes rotations, general three-dimensional rotations, rotations with quaternions; Viewing pipeline, viewing coordinates, Transformation from world to viewing coordinates, Projections: Parallel projections, Perspective projection.

References

1. Hearn Donald D. and Baker M. Pauline, "Computer Graphics- C Version", 2nd Edition, Pearson, Delhi, 2002, ISBN-10: 9788177587654
2. Xiang Z. and Plastock R., "Computer Graphics," Schaum's Outlines, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition, 2020, ISBN-10: 938953884X
3. William M. Newman and Robert F. Sproull, "Principles of Interactive Computer Graphics," Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017, ISBN-10: 0074632930
4. Rogers D. F., "Procedural Elements for Computer Graphics," McGraw Hill Education, 2nd Edition, 2017, ISBN-10: 0070473714

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe user-defined and built-in graphics functions
CO-2	Differentiate among the lines, circles, and ellipse algorithms
CO-3	Determine the solution of problems using two-dimensional geometric transformation
CO-4	Categorize the algorithms based on two-dimensional viewing and clipping
CO-5	Implement three-dimensional geometric transformations and viewing

Course Code	:	COPC502
Course Title	:	**Web Technologies**
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives

1. Understand core web concepts, internet protocols, and web development strategies.
2. Apply Hypertext Markup Language (HTML) and Cascading Style Sheet (CSS) to design structured and responsive web pages.
3. Create dynamic web applications using JavaScript, Extended Markup Language (XML) and, Asynchronous JavaScript and XML (AJAX).
4. Analyze web deployment strategies, multi-tier architecture, and client-server interactions.
5. Evaluate security threats in web applications; and implement authentication, authorization, and firewall strategies for security.

Course Content

Unit-I: Introduction to Web Technologies and Internet

Introduction to web, Basic internet protocols: Hypertext Transfer Protocol (HTTP), HTTP Request and Response Message, Domain Name System, Internet Protocol: Classfull addressing, Classless addressing, IPv4 Datagram, Network address translation; Web clients, Web development strategies, Web project, Web team, Writing web projects, Identification of objects, Target users, web project planning, and development.

Unit-II: Hypertext Markup Language and Cascading Style Sheets

Introduction to HTML: HTML history and Versions, Basic HTML syntax and semantic, Introduction to elements of HTML, HTML tags: Lists, Headings, Tables, Frames, Forms, Images, Unified Resource Locater (URL): Relative URL and Absolute URL; Introduction to CSS, Features of CSS, CSS text properties, and CSS box model.

Unit-III: Client and Server-Side Programming

Introduction to JavaScript: Basic syntax, Variables, Data types, Operators, Functions, Objects; Events and event handling; Introduction to Document Object Model, Sessions, Cookies, XML: Introduction,

XML version, XML Declaration, Uses and key components of XML, Document Type Definitions, Schemas; Introduction to AJAX: Advantages and Disadvantages.

Unit-IV: Web Application Security

Introduction to web security, Securities issues: SQL injection, Cross-site scripting, Phishing; Authentication, Authorization, Auditing, Securities issues, Firewall, Proxy server. Securities framework and standards.

Unit-V: Web Deployment

Features of web pages, Muti-tier web applications, Web servers, Services of web servers, Web server and its deployment, Web client, Mail server, Multimedia server, Introduction to Apache web server and its features, Evaluation of websites, Deployment of your website – a case study.

References

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Prentice Hall, 1st Edition, 2007 ISBN-10: 0131856030.
2. Thomas A. Powell, "The Complete Reference: HTML & CSS", McGraw Hill 5th Edition, 2010, ISBN-10: 0071496297.
3. Thomas A. Powell, "The Complete Reference: Web Design", McGraw Hill 1st Edition, 2000, ISBN-10: 0072122978.
4. M. Srinivasan, "Web Technology: Theory and Practice", Pearson Publication, 1st Edition, 2012, ISBN-10:8131774198.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe fundamentals of web technologies, internet protocols, and web development strategies.
CO-2	Design web pages using HTML and CSS.
CO-3	Implement interactive features in web applications by utilizing JavaScript, AJAX, and XML.
CO-4	Categories the role of web servers, deployment strategies, and multi-tier architectures in web development.
CO-5	Demonstrate knowledge of web security threats and apply preventive security measures.

Course Code	COPE503
Course Title	**Java Programming**
Number of Credits	2(L:2, T:0, P:0)
Prerequisites	IT Systems and Computer Programming
Course Category	PE

Course Objectives

1. Understand the fundamentals of Java programming, including variables, data types, control structures, and object-oriented principles
2. Apply concepts of object-oriented programming such as inheritance, polymorphism, encapsulation, and abstraction to achieve modularity in programs
3. Develop Java applications using packages, multithreading, and exception handling to enhance performance and reliability
4. Create graphical user interfaces (GUIs) using Abstract Window Toolkit (AWT), Swing, and event-driven programming to build interactive applications
5. Evaluate the effectiveness of the Java Collections Framework in managing and processing data with lists, sets, and maps

Course Contents

Unit-I: Basics of Java Programming

Java features, Constants, Variables and Data types, Scope of variables, Type casting, Standard default values, Operators and expressions, Decision making and looping: While loop, Do-while loop, and For loop, Jumps in Loops, Labelled loops; Classes, Object and Methods defining a class, creating object, accessing class members; Constructor, Method overloading, Static variables, Methods, and Blocks.

Unit-II: Object-Oriented Programming Concepts in Java

Inheritance: Extending a class, implementing interfaces, Method overriding, Super keyword, Use of final with variables, Methods, and classes; Polymorphism: Method overloading and Method overriding, Abstract classes, and interfaces: Defining and using abstract methods, default methods, and static methods in interfaces, Encapsulation and Visibility Control: Importance of encapsulation, access modifiers and controlling visibility, Arrays, Strings, and Wrapper Classes.

Unit-III: Packages, Multithreading and Exception Handling

Packages: Introduction to packages, creating and using packages, the import statement, and access protection, Multithreading: Extending a thread class, implementing a Runnable interface, thread methods, thread priority, synchronization, Thread life cycle: States of a thread, Exception Handling: Types of errors, exceptions, try-catch blocks, multiple catch statements, finally statement, throwing exceptions, throws clause, built-in exceptions, custom exceptions.

Unit-IV: AWT, Swing, and Graphics Programming

Java GUI Frameworks: Introduction to AWT and Swing, AWT components, Creating containers, Event handling in AWT using Event Listeners, Swing basics, Adding swing components and event handling using ActionListener, Graphics programming: Using the Graphics class, Drawing shapes (lines, rectangles, ovals, circles, polygons), Setting colors and fonts, Using control loops for dynamic graphics, and Creating animations with AWT and Swing.

Unit-V: Java Collections

Overview of interfaces: Collection interface, Set interface, List interface, and Map interface; Overview of Classes: array list class, Linked List class, the Hash Set class, and Stack class; Iterators: Introduction to iterator and list iterator, Traversing collections using iterators.

References

1. Balagurusamy, “Programming with Java: A Primer”, McGraw Hill Education, 7th Edition, 2023, ISBN- 10: 9355325894
2. Herbert Schildt, “Java: The Complete Reference”, McGraw Hill Education, 11th Edition, 2018, ISBN-10: 1260440230
3. Cay S. Horstmann and Gary Cornell, “Core Java Volume I—Fundamentals”, Pearson Education, 11th Edition, 2020, ISBN-10: 0135166306
4. Kathy Sierra, Bert Bates, Trisha Gee, “Head First Java”, O'Reilly Media, 3rd Edition, 2022, ISBN-10: 1491910771

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Discuss Java programs using variables, operators, control statements, loops, and object-oriented constructs
CO-2	Implement object-oriented concepts such as inheritance, polymorphism, encapsulation, and abstraction in Java applications
CO-3	Build Java applications using packages, multithreading techniques, and exception handling for robust and efficient execution
CO-4	Design interactive GUI applications using AWT, Swing, and event-driven programming techniques
CO-5	Determine the efficiency of Java Collections Framework classes such as Array List, LinkedList, HashSet, and Stack in managing and manipulating data

Course Code	:	EEOE504
Course Title	:	**Soft Computing Techniques**
Number of Credits	:	3(L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	OE

Course Objectives

1. Understand the types of computing and constituents of soft computing.
2. Learn the basic principles of fuzzy sets, membership functions, operations, and fuzzy relations.
3. Apply genetic algorithm to solve real world problems.
4. Analyse various types of neural networks.
5. Explore MATLB toolbox for soft computing techniques.

Course Content

Unit-I: Elements of Soft Computing

Introduction to computing, Types of computing: Hard computing and soft computing; Constituents of soft computing: Fuzzy logic, Genetic algorithm, Neural networks, Evolutionary computation, Rough-set theory, and Probabilistic reasoning; and Applications of soft computing in engineering.

Unit-II: Fuzzy Logic

Introduction to fuzzy logic, Difference between classical sets and fuzzy sets, Membership functions, Defuzzification, Types of fuzzy numbers, Difference between fuzzy numbers and rough numbers; Fuzzy set operations: Union, Intersection, Complement, Inverse, Algebraic sum, Algebraic product, Bounded sum, and Bounded difference; Properties of fuzzy sets, Classical relations and fuzzy relations; Fuzzy-based control systems.

Unit-III: Genetic Algorithm

Introduction to genetic algorithm, Biological-background: The cell, Chromosomes, Genetics, Reproduction, and Natural selection; Genetic algorithm vs. Traditional algorithms, Basic terminologies in genetic algorithms: Individuals, Genes, Fitness, and Populations; Simple genetic algorithm, Operator in genetic algorithm, stopping condition for genetic algorithm, Constraints in genetic algorithm, and problem solving using genetic algorithm; Advantages and limitations of genetic algorithm.

Unit-IV: Neural Networks

Introduction to neural networks, Fundamental concepts: Artificial neural networks (ANN), Biological neural networks, and Brain vs. Computer; Evolution of neural networks, Basic models of ANN: Connections, Supervised and supervised learning, Reinforcement learning, Activation functions, Important terminologies of ANN, McCulloch-Pitts neuron, Linear separability, and Hebb network.

Unit-V: MATLAB Environment for Soft Computing Techniques

Introduction to MATLAB, Fuzzy logic MATLAB toolbox: Commands in fuzzy logic toolbox, fuzzy logic Graphical User Interface (GUI) toolbox; Genetic algorithm MATLAB toolbox: Commands and genetic algorithm GUI; MATLAB neural network toolbox: Creating a custom neural network, Commands in neural network toolbox, and Neural network GUI toolbox.

References

1. George J. Klir and Yuan B., "Fuzzy Sets and Fuzzy Logic-Theory and Applications," Pearson Education India, Edition 1st, 2015, ISBN-10: 9789332549425
2. Jang J-S R., Sun C-T, and Mizutani E., "Neuro Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence," Pearson Education India, Edition 1st, 2015, ISBN-10: 9332549885.
3. Saroj K. and Sunita T., "Soft Computing-Fundamentals, Techniques, and Applications," McGraw Hill Education, Edition 1st, 2018, ISBN-10: 9353160669.
4. Rajasekaran S. and Vijayalakshmi Pai G. A., "Neural Networks, Fuzzy Logic, And Genetic Algorithms: Synthesis and Applications," PHI Publisher, ASIN: B00K7YK5QS.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain various types of soft computing techniques
CO-2	Apply fuzzy logic in interdisciplinary fields such as Electrical and Computer Engineering, Industrial systems, etc.
CO-3	Design and implement genetic algorithms for a wide range of problems, from simple to complex tasks.
CO-4	Explain the theory and structure of neural networks, including layers, neurons, activation functions, and the flow of information in the network.
CO-5	Apply specific MATLAB toolboxes, e.g., Fuzzy logic toolbox, Neural network toolbox, Genetic algorithm toolbox, used for implementing various soft computing techniques.

Course Code	:	COHS505
Course Title	:	**Entrepreneurship and Start-ups**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	HS

Course Objectives

1. To acquiring Entrepreneurial spirit, and resourcefulness.
2. To understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
3. To acquiring entrepreneurial quality, competency, and motivation
4. To eliminate unproductive activities under the control of the Management, Supervisor, worker and the Design of Products and Processes.
5. To use the Charts to record the Activities of the people, materials, and Equipment to find alternative methods which minimize waste and to implement the best method.

Course Content

Unit-I: Introduction to Entrepreneurship and Start-Ups

Definitions, Traits of an entrepreneur, Intrapreneurship, Qualities to becomes entrepreneur, Motivation, Types of Business Structures, Similarities/differences between entrepreneurs and managers, Small Scale of industries, Business Ideas and their implementation, Business Plan.

Unit-II: Idea to Start-Up

Market Survey, Project report, Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis, Communication of Ideas to potential investors – Investor Pitch, Patenting and Licenses, exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy.

Unit-III: Principles of Management

Definition of Management, Administration Organization, F.W. Taylor's and Henry Fayol's Principles of Management, Functions of Manager, Types of Organization: Line, Staff, and committee type, Directing, Leadership; Styles of Leadership; Qualities of a good leader; Motivation, Positive and

Negative Motivation, Modern Management Techniques, Management Information Systems, Objectives, and Importance.

Unit-IV: Production Planning and Control

Introduction, Major functions of Production Planning and Control, Methods of forecasting, Concept of Critical Path Method (CPM), Types of Production: Mass Production, Batch Production and Job Order Production, Principles of Product and Process Planning, Quality Control: Definition, Objectives, Sampling Inspection, Benefits of ISO to the organization, Concept of ISO 9001:2008, Quality Management System, Registration/Certification.

Unit-V: Financial Management

Financial Institutions, Financing methods available for start-ups in India, Fixed and Working Capital; Resources of Capital; Shares Preference and Equity Shares; Debentures; Public Deposits; Factory Costing: Direct Cost; Indirect Cost; Factory Overhead; Selling Price of a product; Profit.

References

1. S.C. Sharma, Industrial Engineering & Management, Khanna Book Publishing Co. (P) Ltd., Delhi
2. O.P. Khanna, Industrial Engineering and Management, Revised Edition, Dhanpat Rai Publications (P) Ltd., New Delhi – 110002.
3. Steve Blank and Bob Dorf, K & S Ranch, The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, ISBN – 978-0984999392
4. Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Penguin UK ISBN – 978-0670921607
5. Heinz Weihrich, Harold Koontz, Management, A global perspective, 10th Edition, McGraw Hill International Edition 1994.
6. M. Mahajan, Industrial Engineering and Production Management, Dhanpat Rai & Co.

Course Outcomes

At the end of the course, the students will be able to:

CO-1	Understanding the concept and process of entrepreneurship
CO-2	Understand the ideas of start-up, finance and protection
CO-3	Explain the production planning and quality control, and its functions
CO-4	Understand the basic principles, approaches and functions of management and identify concepts to specific situations
CO-5	List and explain the different financial sources and methods of inventory management

Course Code	:	COPE511
Course Title	:	**Computer Graphics Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Computer Graphics
Course Category	:	PE

Course Objectives

1. To understand built-in graphics functions; and implement line, circle, and ellipse algorithms using C programming language.
2. To transform various objects using 2D geometric-transformations.
3. To implement line clipping algorithm and transform various objects using 3D geometric-transformations.

List of Practicals / Programs

1. Write a program in C to draw Two-Dimensional (2D) image according to your choice using any 40 built-in graphics functions.
2. Write a program in C to draw a line using Digital-Differential Analyzer (DDA) and Bresenham's Line Drawing (BLDA) algorithms.
3. Write a program in C to draw a circle using Mid-point circle algorithm.
4. Write a program in C to draw an ellipse using Mid-point ellipse algorithm.
5. Write a program in C to transform 2D object using the following 2D geometric-transformations: (a) Translation, (b) Rotation, and (c) Scaling.
6. Write a program in C to rotate an object with general pivot-point $P(h, k)$
7. Write a program in C to scale an object with general pivot-point $P(h, k)$
8. Implement Cohen-Sutherland line clipping algorithm.
9. Write a program in C to translate an object using 3D translation.
10. Write a program in C to rotate an object using 3D rotations with x −axes, y −axes, and z −axes.
11. Write a program in C to scale an object using 3D scaling.
12. Develop a computer graphics-based software to perform various operations like drawing 2D objects, performing various 2D and 3D transformations, etc.

References

1. Hearn Donald D. and Baker M. Pauline, "Computer Graphics- C Version", 2nd Edition, Pearson, Delhi, 2002, ISBN-10: 9788177587654
2. Xiang Z. and Plastock R., "Computer Graphics," Schaum's Outlines, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition, 2020, ISBN-10: 938953884X
3. William M. Newman and Robert F. Sproull, "Principles of Interactive Computer Graphics," Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017, ISBN-10: 0074632930
4. Rogers D. F., "Procedural Elements for Computer Graphics," McGraw Hill Education, 2nd Edition, 2017, ISBN-10: 0070473714

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Develop 2D images using built-in graphics functions; and implement line, circle, and ellipse algorithms.
CO-2	Perform various operations on 2D objects such as translation, rotation, and scaling
CO-3	Implement clipping algorithms and transform an object using 3D geometric-transformations.

Course Code	:	COPC512
Course Title	:	**Web Technologies Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Web Technologies
Course Category	:	PC

Course Objectives

1. Apply fundamental web development concepts using HTML, CSS, JavaScript, and PHP to design interactive web pages and applications.
2. Develop dynamic and responsive web pages, integrating various web technologies (HTML, CSS, JavaScript, and PHP) for effective content presentation and user interaction.
3. Demonstrate the ability to create functional web applications that handle user input, data processing, and display information dynamically.

List of Programs

1. Design a web page using following HTML tags: Heading, Table, and Image tags.
2. Design a web page to display the contents of the Applied Mathematics paper using HTML Tags.
3. Design a form to store the information of Computer Engineering –V Semester students.
4. Develop and demonstrate the usage of inline, internal, and external style sheet using CSS.
5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
7. Implement a web application that takes the name and age from an HTML page. If the age is less than 18, it should display the following message: “Hello, [name]”, you are not authorized to visit the site." If the age is 18 or older, it should display the message: “Welcome to the site, [name]”.
8. Build a basic webpage with a frame-based layout that separates the content into different sections, including a navigation menu in one frame and a main content area in another.
9. Write a PHP Program to display current Date, Time and Day.
10. Write a program to design a simple calculator using JavaScript.

11. Develop a personal portfolio website in which navigation bar has the following options: Personal details, Qualifications, Experience and Contact details.
12. Develop a to-do list application using HTML, CSS and JavaScript to perform the following operations: add, delete, and update.

References

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Prentice Hall, 1st Edition, 2007 ISBN-10: 0131856030.
2. Thomas A. Powell, "The Complete Reference: HTML & CSS", McGraw Hill 5th Edition, 2010, ISBN-10: 0071496297.
3. Thomas A. Powell, "The Complete Reference: Web Design", McGraw Hill 1st Edition, 2000, ISBN-10: 0072122978.
4. M. Srinivasan, "Web Technology: Theory and Practice", Pearson Publication, 1st Edition, 2012, ISBN-10:8131774198.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Recall and identify the core HTML tags and CSS properties required to build a webpage.
CO-2	Use HTML, CSS, and JavaScript to design interactive forms, validate inputs, and dynamically update web content based on user interaction.
CO-3	Design and develop a personal portfolio website with integrated navigation, including features like personal details, qualifications, experience, and contact information.

Course Code	:	COPE513
Course Title	:	**Java Programming Lab**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Java Programming
Course Category	:	PE

Course Objectives

1. Understand fundamental Java programming concepts, including installation, type casting, and object-oriented principles.
2. Apply object-oriented programming concepts such as inheritance, interfaces, and exception handling.
3. Create Java applications using abstraction, final classes, collections, and graphical user interfaces (GUIs).

List of Practical / Programs

1. Write the procedural steps to download, install, and configure the JDK (Java Development Kit), followed by the execution of the following programs: (a) Swapping the values of two variables without using a third variable, (b) Checking whether a number is prime or not, and (c) Generating the Fibonacci sequence.
2. Write a Java program to demonstrate type casting: (a) Narrowing Casting (Explicit) and (b) Widening Casting (Implicit)
3. Write a Java program to demonstrate the implementation of the this and super keywords.
4. Write a Java program to create and implement a package.
5. Write a Java program to demonstrate single and multi-level inheritance.
6. Write a Java program to implement an interface.
7. Write a Java program to handle exceptions using: (a) Try-and-catch blocks, (b) Multiple catch blocks, and (c) throws and finally blocks
8. Write a Java program to create threads using: (a) Thread class, (b) Runnable interface, and (c) Implement synchronization and set thread priorities
9. Write a Java program to demonstrate abstraction by creating abstract classes, methods, and variables.
10. Write a program in Java to demonstrate the use of final classes, methods, and variables.

11. Write a Java program to create a simple Java Swing application with JFrame, JLabel, JTextField, and JButton. When the user enters their name and clicks the button, display "Hello, [name]!".
12. Write a Java program that demonstrates the usage of ArrayList, HashSet, and HashMap. Perform operations like adding, removing, and iterating through the elements.

References

1. Balagurusamy, "Programming with Java: A Primer", McGraw Hill Education, 7th Edition, 2023, ISBN- 10: 9355325894
2. Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education, 11th Edition, 2018, ISBN-10: 1260440230
3. Cay S. Horstmann and Gary Cornell, "Core Java Volume I—Fundamentals", Pearson Education, 11th Edition, 2020, ISBN-10: 0135166306
4. Kathy Sierra, Bert Bates, Trisha Gee, "Head First Java", O'Reilly Media, 3rd Edition, 2022, ISBN-10: 1491910771

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Implement Java environment setup, type casting, and object-oriented programming concepts
CO-2	Evaluate various object-oriented programming techniques and exception-handling strategies
CO-3	Design Java applications that incorporate abstraction, final classes, collections, and GUI components

Course Code	:	COSI516
Course Title	:	**Summer Internship-II**
Number of Credits	:	2 (L:0, T:0, P:0)
Prerequisites	:	Nil
Course Category	:	SI

Summer Internship-II (COSI516) during the Diploma in Computer Engineering offers various key benefits, both personally and professionally. Internships allow you to apply the theoretical knowledge you have learned in the classroom to real-world situations. This hands-on experience helps you understand how things work in actual work environments. The internship should be in offline mode.

After the completion of internship, students are required to submit their training project report, signed by their respective instructors or trainers, to the Training and Placement Coordinator (TPC). The project report will be evaluated by faculty members of the Computer Engineering Section, and the schedule for the examination/viva/ presentation of the project report will be notified by the Head of Section / TPC of Computer Engineering Section.

Course Objectives

1. To provide industrial exposure to student that will help students to gain real life experience.
2. To engage students with experienced professionals that can help them further in their careers.
3. To provide industrial exposure to student to the real time.
4. To enable the students to work on short industry projects and gain the skill of preparing report, describing its results and findings.
5. To identify the gap between existing knowledge and industry expectations.

Course Code	:	COPR517
Course Title	:	**Major Project-I**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Nil
Course Category	:	PR

Course Objectives

1. Understand the method of applying engineering knowledge to solve specific problems.
2. Apply engineering and management principles while executing the project.
3. Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. The students are required to specify project topics and perform systematic literature review to identify WHAT and WHY of a project. Students will design, develop, and implement software or system that solve real-world problems using programming techniques and tools. The Major Project-I focuses on the elicitation and analysis of the requirements of system and show the partial implementation of the system with test-cases.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Conceptualize, design, and implement solutions for specific problems.
CO-2	Communicate the solutions through presentations and technical reports
CO-3	Apply project and resource managements skills, professional ethics, societal concerns.

Course Code	:	COPC601
Course Title	:	**Software Engineering**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Data Structures and Computer Programming
Course Category	:	PC

Course Objectives

1. To understand the applications of various software development life cycle models
2. To apply different requirements elicitation and modeling techniques for the identification and representation of functional and non-functional requirements of software
3. To analyze different methods for managing software projects
4. To apply design process and concepts for designing the requirements of software
5. To evaluate various software testing techniques

Course Contents

Unit-I: Software and Software Engineering

Introduction to software engineering, Reasons for software failure, Software crisis, Requirements engineering processes; Software Development Life Cycle (SDLC) models: Waterfall model, Prototype model, Spiral model, Evolutionary development model, Iterative enhancement model; Introduction to agile development: Agility, Agile process, Scrum, and Extreme Programming.

Unit-II: Software Requirements Elicitation and Modeling

Requirements elicitation techniques: Traditional methods and Goal-oriented method, Visualization of functional and non-functional requirements using AND/OR graph; Data flow diagram, Software requirements specification document; Requirements modeling using Unified Modeling Language (UML) models and Goal-oriented techniques.

Unit-III: Managing Software Projects

The management spectrum: The people, The product, The process, and The project; People: The stakeholders, Team leaders, Software team, and Agile team. Process and project metrics: Size-oriented metrics and Function-oriented metrics; Software project estimation: Decomposition Techniques: Software sizing, Problem-based estimation, An example of lines of code and function point-based estimation; Empirical estimation models: The structure of estimation models, The constructive cost model, and the Software Equation; Software risk assessment and estimation model.

Unit-IV: Design Concepts

The design process, Design concepts: Abstraction, Architecture, Patterns, Separation of concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, Refactoring, and Object-oriented design concepts; Data design elements, Architecture design elements, and interface design elements.

Unit-V: Software Testing

Software testing fundamentals, Internal and external views of testing, Black-box and White-box testing; Basis path testing: Flow-graph notation, Independent program paths, Deriving test cases, Cyclomatic complexity, and Graph matrices; Control structure testing: Condition testing, Data flow testing, and Loop testing; Black-box testing: Boundary value analysis, Graph-based testing, and Equivalence partitioning; Levels of testing: Unit testing, Integration testing and System testing; Software quality.

References

1. Pressman R. S., "Software Engineering-A Practitioner's Approach," McGraw Hill Education, 7th Edition, 2014, ISBN-10: 93-392-1208-8
2. Jalote P., "Software Engineering- A Precise Approach," Wiley, 2010, ISBN-10: 9788126523115
3. Aggarwal K. K., and Singh Y., "Software Engineering", New Age International Publishers, 2013, ISBN:978-81-224-2360-0
4. Sommerville I., "Software Engineering," Pearson Education; 10th Edition, 2017, ISBN-10: 9332582696

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Explain the selection of an appropriate SDLC model according to the need of a project in software industry
CO-2	Elicit and model the functional and non-functional requirements of software using UML and goal-oriented models
CO-3	Differentiate different ways of managing the software projects
CO-4	Model and design the requirements of software
CO-5	Compare the test cases based on black-box and white-box methodologies

Course Code:	COPC602
Course Title	**Visual Programming**
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	IT Systems and Computer Programming
Course Category	PC

Course Objectives

1. Understand the .NET Framework architecture, including Common Language Runtime (CLR) and Just-In-Time (JIT) compilation
2. Apply Object-Oriented Programming concepts to achieve modular and reusable code in VB.NET and C#
3. Develop web applications with ASP.NET, including session management and database integration
4. Analyze the role of ADO.NET in efficient data access and management for web and desktop applications
5. Create applications using advanced technologies such as Windows Communication Foundation (WCF) for distributed systems and Windows Presentation Foundation (WPF) for creating rich user interfaces

Course Contents

Unit-I: Introduction to .NET Framework and Visual Programming

Introduction to .NET framework, CLR and JIT compiler, Languages under .NET: VB.NET and C#; Overview of Visual programming languages (VB.NET, C#): Syntax, Data types, and Control structures; Introduction to GUI programming: Controls, Properties, Methods, Events; Event-driven Programming: Concepts and Applications in VB.NET and C#.

Unit -II: Object-Oriented Programming in .NET

Object-Oriented Programming with VB.NET and C#: Classes, Inheritance, Polymorphism, and Abstraction, Encapsulation and Namespace, User interface design in .NET: Designing forms and Controls, Procedures and Functions in VB.NET and C#, Error handling: Exceptions, Try-Catch blocks, Concepts of deployment for Windows applications.

Unit-III: Web Development with ASP.NET

Introduction to ASP.NET and Web applications using C#, Web Forms and ASP.NET Core Model View Controller: Displaying data and User input, Web form Controls: Validation, GridView, DropDownList, and other controls, Session, and Application State: Managing user sessions, Variables, and Cookies, Website Security: User authentication, Login forms, and Role-based security, ASP.NET Identity, Database connectivity with ADO.NET: Connecting and Displaying data on Web forms.

Unit-IV: ADO.NET and Data Handling

Introduction to ADO.NET: Key Features and Evolution, ADO.NET Namespaces: System.Data, System.Data.SqlClient, System.Data.OleDb, and System.Data.Odbc, ADO.NET Classes: Connection, Command, DataReader, DataAdapter, Data Retrieval: Connected vs. Disconnected Models, Data Binding: Binding data to Controls (e.g., GridView, DropDownList), Working with DataTables, DataSets, and Data Relations.

Unit-V: Advanced .NET Development and Application Deployment

Advanced ADO.NET Concepts: Transactions, Stored Procedures, and Exception Handling, Working with XML in .NET: Reading, Writing, and Manipulating XML Data, Introduction to WCF: Building Distributed Applications, Introduction to WPF: Rich User Interface Development, Deployment Strategies for Web, and Windows applications: Best practices for performance optimization in .NET Applications.

References

1. Troelsen, A., & Japikse, "Pro C# 10 with .NET 6", Apress, 11th Edition, 2022, ISBN-10: 1484278682
2. John Sharp, "Microsoft Visual C# Step by Step", Microsoft Press, 8th Edition, 2015, ISBN-10: 1509301046
3. Mark J. Price, "C# 10 and .NET 6 - Modern Cross-Platform Development", Packt Publishing, 6th Edition, 2021, ISBN-10: 1801077363
4. Adam Freeman, "Pro ASP.NET Core 6", Apress, 9th Edition, 2022, ISBN-10: 1484279565

Course Outcomes

At the end of this course, students will be able to:

CO-1	Explain the .NET Framework architecture and event-driven programming concepts
CO-2	Implement Object-Oriented Programming (OOP) concepts in VB.NET and C# for modular design
CO-3	Build dynamic web applications using ASP.NET and ADO.NET with session management and database integration
CO-4	Examine the role of ADO.NET's connected and disconnected models in efficient database interactions for web and desktop applications
CO-5	Design and optimize .NET applications with advanced ADO.NET, XML processing, WCF, and WPF

Course Code	:	COPC603
Course Title	:	**Introduction to E-Governance**
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Nil
Course Category	:	PC

Course Objectives

1. Understand the meaning of E-governance and outline the fundamental concepts and importance of e-Governance
2. Apply the role of E-Governance in good governance and discuss its impact on Digital India
3. Analyze the evolution of E-Governance in India and globally
4. Evaluate technologies like Blockchain and Cloud Computing in E-Governance
5. Understand the implementation approach and frameworks for E-Governance

Course Content

Unit-I: Basics of E -Governance

Meaning, objectives of E-Governance, Types of interactions of E-Governance, Concept of E-Governance, Advantages of E-Governance, Disadvantages of E-Governance, Importance of E-Governance, Governance Theories, Pillars of E-Governance, Goals of E-Governance, Role of the Technologies in E-Governance, Impact of E-Governance on different service sectors of Government, E-Governance, and E-Government: an Overview.

Unit-II: Fundamentals of E-Governance

Good Governance through E-Governance, Empowering India through E-Governance and Digital India, Nine pillars of digital India, Approaches and methodology of the digital program, Models of E -Governance-Broadcasting Model, Comparative analysis model, Critical flow model, E-Advocacy Model, and Interactive service model.

Unit-III: Evolution to E-Governance

Introduction, Phases of E-Government in India, History, and the origin of E-Governance in India, E-Government evolution in different parts of the world, Core principles of E-Governance, Guiding principles of E-Governance strategy, Strategies for E-Government, Role of E-Democracy as a core principle in E-Governance, Role of smart ICT Infrastructure in E-Governance, Role of architecture in E-Governance.

Unit-IV: E-Governance Technologies

Block chain technology and E-Governance, Information technology and E-Governance in India, E-Governance and Information technology, Smart E-Government platform through technologies, and Cloud computing in E-Governance.

Unit-V: Implementing E-Governance Reforms

Strategies for implementation of E-Governance, Implementation approach, E-Governance implementation framework, Requirements for implementing successful E-Governance across the Nation.

References

1. Satyanarayana J., "Managing Transformation –Objectives to Outcomes", Prentice Hall of India Learning,1st Edition,2012, ISBN-10:8120345371
2. Sumathy M., "A Handbook of E-Governance in India", Abhijeet Publications, 1st Edition,2020, ISBN-13:9789388865579
3. Bagga R. K., Keniston K, and Mathur R. R., "The State, IT and Development", Sage Publications Pvt. Ltd,1st Edition,2005, ISBN-10:0761933980
4. Satyanarayana J., "e-Government -The Science of the Possible", Prentice Hall of India Learning,1st Edition,2004, ISBN-10: 8120326083

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Describe the meaning and importance of E-Governance
CO-2	Determine the concept of good Governance through E-Governance and discuss its role in empowering India under the Digital India initiative.
CO-3	Categorize the phases of E-Governance and explain the role of Smart ICT Infrastructure.
CO-4	Compare technologies for establishing a smart E-government platform.
CO-5	Explain strategies for implementing E-governance.

Course Code:	:	ECOE604
Course Title	:	**Microcontrollers and Embedded Systems**
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	Digital Electronics and Microprocessors
Course Category	:	OE

Course Objectives

1. To understand the difference between microprocessor and microcontroller.
2. To understand the architecture and instruction set of 8051 microcontrollers.
3. To write basic program in assembly and embedded C.
4. To understand Arduino, Arduino IDE and EDSIM-51 simulator.
5. To construct basic projects using 8051 Arduino.

Course Content

Unit-I: Architecture of 8051

Introduction and classification of microcontrollers, Overview of microcontroller families, Comparison of microprocessor and microcontroller, Salient features of INTEL 8051, Functional pin diagram, Pin diagram and block diagram of INTEL 8051 microcontroller, ALU, Special function registers, Data memory structure and program memory structure of INTEL 8051 and Concept and advantages of register banks of 8051.

Unit-II: Instruction Set

Programmer's view of 8051, Program counter, PSW register, Stack pointer, I/O ports, Instruction set of 8051: Data transfer group, arithmetic group, logical group and batch processing group.

Unit-III: Programming of 8051

Addressing modes of 8051: immediate addressing, register addressing, direct addressing, indirect addressing, index addressing and implied addressing, simple programming examples in assembly and embedded C.

Unit-IV: Advance Topics in 8051

Interrupts and interrupt structure of 8051, Interrupt handling in8051, IE and IP register, External interrupts, TCON register, Serial port, SCON register, Timers of 8051, TMOD register, Mode0, Mode1 and Mode2 operation of Timer/Counter.

Unit-V: Arduino and Interfacing of 8051

Introduction of Arduino, Classification, Arduino IDE software, Arduino UNO, Programming using Arduino, Basic projects, EDSIM-51 simulator, Interfacing LEDs, Switches, 7-Segment display, LCDs with 8051.

References

1. Mazidi & Mazidi, The 8051 Microcontroller and Embedded System using Assembly and C, Pearson Education.
2. Dogan Brahim, Microcontroller Projects in C for 8051, Newson Publication.
3. K. Udaya Kumar, B. S. Umashankar, 8085 Microprocessor Architecture, Programming and Interfacing, Pearson Education.
4. Ankaj Gupta, Fundamentals of Microcontroller and Embedded System, Katson Books.

Course Outcomes

At the end of the course, the student will be able to:

CO-1	Understand the difference between a microprocessor and microcontroller and the architecture of 8051 microcontroller.
CO-2	Learn the instruction set of 8051 microcontroller.
CO-3	Gain knowledge about the addressing modes of 8051 and able to write the simple program using Assembly and Embedded C.
CO-4	Understand about the interrupts and timer facilities available in 8051 microcontroller.
CO-5	Define Arduino and construct basic projects using Arduino and 8051 microcontroller.

Course Code	:	COPC611
Course Title	:	**Software Engineering Lab**
Number of Credits	:	2 (L:0, T:0, P:4)
Prerequisites	:	Software Engineering
Course Category	:	PC

Course Objectives

1. To elicit the functional and non-functional requirements of software using various requirements elicitation techniques; and prepare the software requirements specification documents without any discordances among the stakeholders.
2. To understand Unified Modeling Language, architecture of software, and estimation of the effort and cost of software.
3. To analyse the black-box and white box software testing techniques and their implementation.

List of Practicals/Programs

1. Identify the Functional Requirements (FRs) and Non-Functional Requirements (NFRs) of an Institute Examination System using traditional methods of requirements elicitation techniques.
2. Apply goal-oriented requirements elicitation technique for the identification of FRs and NFRs of an Institute Examination System.
3. Develop a tool using C language for the detection of discordances among the stakeholders who will participate during the development of an Institute Examination System.
4. Prepare a software requirements specification document using IEEE standard for the development of Recruitment Portal.
5. Draw Use-case diagram and Class-diagram for an Institute Examination System and Recruitment Portal.
6. Compute the value of function point of an Institute Examination System and Recruitment Portal.
7. Calculate the effort and cost of the development of Library Management System, if it is developed in India.
8. Draw the architecture of Library Management System.
9. Write a program in C to compute the Cyclomatic complexity.
10. Write a program in C to generate the test-cases for quadratic equation using Black-box and White-box testing techniques.

11. Write a program in C to identify the independent path of previous date problem.
12. Generate test-cases for the Login module of Recruitment Portal.

References

1. Pressman R. S., "Software Engineering-A Practitioner's Approach," McGraw Hill Education, 7th Edition, 2014, ISBN-10: 93-392-1208-8
2. Jalote P., "Software Engineering- A Precise Approach," Wiley, 2010, ISBN-10: 9788126523115
3. Aggarwal K. K., and Singh Y., "Software Engineering", New Age International Publishers, 2013, ISBN:978-81-224-2360-0
4. Sommerville I., "Software Engineering," Pearson Education; 10th Edition, 2017, ISBN-10: 9332582696

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Identify the various types of software requirements using traditional and goal-oriented techniques without any conflictions among the stakeholders of software so that an SRS document can be prepared prior to the beginning of software development.
CO-2	Represent the FRs and NFRs of software using UML Use-case and class diagrams, design the software, and estimate the effort and cost of software.
CO-3	Test the software using black-box and white box testing techniques.

Course Code	:	COPC612
Course Title	:	**Visual Programming Lab**
Number of Credits	:	2 (L:0, T:0, P:4)
Prerequisites	:	Visual Programming
Course Category	:	PC

Course Objectives

1. To understand the fundamental concepts of C# and VB.NET, including data types, control structures, and object-oriented programming (OOP).
2. To apply Windows Forms, ASP.NET, and database connectivity concepts to develop interactive applications.
3. To create web and desktop applications using ASP.NET MVC, ADO.NET, and WPF to implement real-world functionalities.

List of Programs

1. Write a simple C# program to demonstrate the use of data types, variables, and control structures (if-else, loops).
2. Create a basic Windows Forms application in C# with a button and a label. When the button is clicked, the label should display "Hello, .NET!".
3. Develop a VB.NET application that calculates the factorial of a number entered by the user using a loop and displays the result.
4. Write a C# program to demonstrate OOP concepts by creating a class Person with attributes Name and Age, and a method to display details. Implement inheritance by creating a subclass Student with an additional attribute Roll Number.
5. Design a Windows Forms application in C# that allows the user to enter their name and age, and displays a message based on their age category (Child, Teenager, Adult).
6. Create a C# program that implements exception handling using try-catch-finally blocks to handle division by zero errors.
7. Develop a simple ASP.NET Web Form that takes user input (name and email) and displays it on another page using session state.
8. Create an ASP.NET MVC application that displays a list of students retrieved from an array. Use a simple Model-View-Controller structure.
9. Write an ASP.NET program that implements a login page with user authentication using session management.

10. Develop a C# program using ADO.NET to connect to a SQL Server database and display employee records in a Data Grid View control.
11. Create an ASP.NET Web Form that allows users to insert, update, and delete records in a database using ADO.NET.
12. Develop a simple WPF application with a button that changes the background color of the window when clicked.

References

1. Troelsen, A., & Japikse, "Pro C# 10 with .NET 6", Apress, 11th Edition, 2022, ISBN-10: 1484278682
2. John Sharp, "Microsoft Visual C# Step by Step", Microsoft Press, 8th Edition, 2015, ISBN-10: 1509301046
3. Mark J. Price, "C# 10 and .NET 6 - Modern Cross-Platform Development", Packt Publishing, 6th Edition, 2021, ISBN-10: 1801077363
4. Adam Freeman, "Pro ASP.NET Core 6", Apress, 9th Edition, 2022, ISBN-10: 1484279565

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Implement basic C# and VB.NET programs utilizing control structures, OOP principles, and exception handling.
CO-2	Evaluate the development of Windows Forms and ASP.NET applications with user interaction and session management.
CO-3	Design database-driven and graphical applications using ADO.NET, ASP.NET MVC, and WPF.

Course Code	:	COSE616
Course Title	:	**Seminar**
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Nil
Course Category	:	SE

A seminar course at Diploma Engineering level covers a range of topics within the Computer Engineering field such as Operating System, Computer Networks, Software Engineering, Artificial Intelligence, etc. Each teacher is expected to supervise 8-10 students and the focus is on analysis and presentation of a chosen topic. The student may choose any topic for seminar presentation from the following list:

Topics for the presentation

1. Computer Graphics / Image Processing using MATLAB
2. Games and Multimedia
3. Network Administration and Network Security
4. Database / Database Administrator/ Database Security
5. Mobile Computing
6. Cloud Computing
7. Software Development
8. Software Engineering and Requirements Engineering
9. Intelligent Agents
10. Soft Computing and its applications in Computer Engineering
11. Machine Learning
12. Natural Language Processing
13. Search Engine Optimization
14. Computer Science and Economics
15. Computer Science and Business and
16. Any other topic related to Computer Engineering (with the permission of supervisor)

Course Code	:	COPR617
Course Title	:	**Major Project-II**
Number of Credits	:	3 (L:0, T:0, P:6)
Prerequisites	:	Nil
Course Category	:	PR

Course Objectives

1. Understand the method of applying engineering knowledge to solve specific problems.
2. Apply engineering and management principles while executing the project.
3. Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. The number of projects that a faculty can guide would be limited to two groups or decided by the Head of the Section.
6. The project can be carried out on-campus or in an industry or an organization with prior approval from the principal through head of section.
7. The project shall be completed and submitted at least one month before the last teaching day.
8. The project should be presented by students using power point once before submission of project.

Course Outcomes

At the end of this course, the students will be able to:

CO-1	Conceptualize, design, and implement solutions for specific problems.
CO-2	Communicate the solutions through presentations and technical reports.
CO-3	Apply project and resource managements skills, professional ethics, and societal concerns.

Course Code	:	COAU600
Course Title	:	**Indian Constitution**
Number of Credits	:	0 (L:2, T:0, P:0)
Prerequisites	:	Nil
Course Category	:	AU

Course Content

Unit-I: The Constitution - Introduction

The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation, State Policy Principles

Unit-II: Union Government

Structure of the Indian Union, President – Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha

Unit-III: State Government

Governor – Role and Power, Chief Minister and Council of Ministers, State Secretariat

Unit-IV: Local Administration

District Administration, Municipal Corporation, Zila Panchayat

Unit-V: Election Commission

Role and Functioning, Chief Election Commissioner, State Election Commission

References

1. Rajeev Bhargava, Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008
2. B.L. Fadia, The Constitution of India, Sahitya Bhawan; New edition (2017)
3. DD Basu, Introduction to the Constitution of India, Lexis Nexis; Twenty-Third Edition, 2018.
4. Suggested Software/Learning Websites: https://www.constitution.org/cons/india/const.htm, http://www.legislative.gov.in/constitution-of-india; https://www.sci.gov.in/constitution, https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india

Appendix -I

The list of program electives is given in Table 1.

Table 1: List of Program Elective Courses [PE]

S. No.	Course Title	Course Code
1.	Mobile Computing	COPE###
2.	Multimedia Technologies	COPE###
3.	Computer Graphics	COPE###
4.	Software Project Management	COPE###
5.	Artificial Intelligence	COPE###
6.	Java Programming	COPE###
7.	Advance Computer Networks	COPE###
8.	Requirements Engineering	COPE###
9.	Software Testing	COPE###
10.	Free and Open Source Software	COPE###

###: Three-digit numeric code

Appendix-II

The list of open electives is given in Table 2.

Table 2: List of Open Elective Courses [OE]

S. No.	Course Title	Course Code
1.	Cyber Security	COOE###
2.	Internet of Things	COOE###
3.	Introduction to E-Governance	COOE###
4.	Web Designing and Multimedia Technology	COOE###
5.	Artificial Intelligence	COOE###
6.	Microcontroller and Embedded System	ECOE###
7.	Smart Systems	ECOE###
8.	3-D Printing	ECOE###
9.	Soft Computing Techniques	EEOE###
10.	Renewable Energy Technologies	EEOE###
11.	Robotics	MEOE###

###: Three-digit numeric code

Appendix -III: Exit Policy

By implementing the guidelines of **NEP-2020**, if any student fails to continue Diploma Engineering course of three-year duration after passing 2nd year of the enrolled discipline of the course due to any reason/s, he/she may be awarded with a certificate in the respective discipline of Engineering. The result of the same will be prepared according to Table 3.

Table 3: Final-Result Preparation for Certificate in Computer Engineering

S. No.	Year	Weightage	Maximum Marks
1.	First	25 Percent	500
2.	Second	75 Percent	1500
Grand Total			**2000**

Appendix -IV

The final-result processing for Diploma in Computer Engineering is exhibited in Table 4.

Table 4: Final-Result Preparation for Diploma in Computer Engineering

S. No.	Year	Weightage	Maximum Marks
1.	First	25 Percent	500
2.	Second	75 Percent	1500
3.	Third	100 Percent	2000
Grand Total			**4000**