GEETHANJALIINSTITUTEOF SCIENCEANDTECHNOLOGY (AUTONOMOUS)

NELLORE–524317(A.P)INDIA

B.TECH.(Regular-Fulltime)

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

COURSESTRUCTURE

UNDER B Tech AI&DS- RG 23 REGULATIONS

GEETHANJALI INSTITUTE OF SCIENCE &TECHNOLOGY

(Autonomous)

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956

3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137,

E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

Department of Artificial Intelligence & Data Science

Vision

To emerge as a prominent teaching–learning center in the domain of Artificial Intelligence and Data Science that nurtures high-caliber Engineering professionals for the benefit of the industry and society.

Mission

- **DM1**: Impart quality based education through innovative teaching - learning methodologies to upgrade technical expertise in the learners.
- **DM2:** Inculcate professional values and ethics in learners to empower them to address societal challenges through academia -industry interface.
- **DM3:** Foster employability and entrepreneurial skillset in the core domains of AI & DS through experiential and application oriented learning by hands on experience.
- **DM4:**Equip students with multi-disciplinary skill sets to offer practical viable solutions to real time problems in the contemporary technology scenario.

Program Educational Objectives (PEOs)

GraduatesofB.TechinArtificial Intelligence & Data Science Programmeshallable to:

- **PEO1:** To equip graduates with the expertise to leverage the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to create systems that call for effective management and accurate analysis of a large volume of data.
- **PEO2**: To empower and enrich graduates with required technical proficiency to pursue innovative research in the field of AI and Data Science and offer disruptive and sustainable solutions for the effective functioning of ecosystems.
- **PEO3**: To facilitate graduates to develop logical thinking process, pursue lifelong learning that aligns with an professional attitude in a multidisciplinary team.
- **PEO4:** To nurture ability and passion in the graduates for the applications of the acquired knowledge to ensure social development through promotion of ethical and moral values

PROGRAMOUTCOMES(POs)

EngineeringGraduateswillbeableto:

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

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

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

PO4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequentresponsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability:** Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering communityand withsocietyat large, suchas, being able to comprehend and write effective reports and designdocumentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance:** Demonstrate knowledge and understanding of the engineeringand management principlesandapplythesetoone'sownwork,asamember and leader in a team, to manage projects and in multidisciplinary environments.

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

ProgramSpecificOutcomes

PSO1: Apply Artificial Intelligence and Data Science methodologies to gain useful In sights to find effective solutions to challenging real-life problems.

PSO2: Design and formulate innovative AI based software applications to match the needs and demands of industry and society.

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B.Tech. I Year I Semester

SL. No	Category	CourseCode	CourseName	Hoursperweek			Total Credits
				L	T	P	
1	BS	23A0003T	EngineeringPhysics	3	0	0	3
2	BS	23A0001T	LinearAlgebra&Calculus	3	0	0	3
3	BS	23A0201T	BasicElectricalandElectronicsEngineering	3	0	0	3
4	ES	23A0301T	EngineeringGraphics	1	0	4	3
5	ES	23A0501T	IntroductiontoProgramming	3	0	0	3
6	BS	23A0503P	ITWorkshop	0	0	2	1
7	BS	23A0006P	EngineeringPhysicsLab	0	0	2	1
8	ES	23A0202P	Electrical and Electronics EngineeringWorkshop	0	0	3	1.5
9	ES	23A0502P	ComputerProgrammingLab	0	0	3	1.5
10	BS	23ANS01P	NSS/NCC/Scouts&Guides/ Community Service	-	-	1	0.5
Total							**20.5**

Category	CREDITS
BasicSciencecourse(BS)	7.5
EngineeringScienceCourses(ES)	13
Humanitiesandsocialscience(HSMC)	-
TOTALCREDITS	**20.5**

I. Shalini
Member Secretary

HEAD OF THE DEPARTMENT
Department of AI & DS
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B.Tech. I Year II Semester

SL. No	Category	CourseCode	CourseName	Hoursperweek			Total Credits
				L	T	P	
1	BS	23A0009T	CommunicativeEnglish	2	0	0	2
2	BS	23A0004T	Chemistry	3	0	0	3
3	ES	23A0002T	DifferentialEquations&VectorCalculus	3	0	0	3
4	ES	23A0101T	BasicCivil&MechanicalEngineering	3	0	0	3
5	PC	23A0504T	Data Structures	3	0	0	3
6	ES	23A0010P	CommunicativeEnglishLab	0	0	2	1
7	BS	23A0007P	Chemistry Lab	0	0	2	1
8	ES	23A0302P	EngineeringWorkshop	0	0	3	1.5
9	PC	23A0505P	Data Structures Lab	0	0	3	1.5
10	BS	23AYG01P	Healthandwellness,Yoga AndSports	-	-	1	0.5
TotalCredits							**19.5**

Category	CREDITS
Basic Science Course(BS)	8.5
Engineering Science Course(ES)	6.5
ProfessionalCoreCourse(PC)	4.5
TOTALCREDITS	**19.5**

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B.Tech. II Year I Semester

SL. No	Category	CourseCode	CourseName	Hoursperweek			Total Credits
				L	T	P	
1	BS	23A0015T	Discrete Mathematics & Graph Theory	3	0	0	3
2	HM	23A0021T	Universal Human Values 2 Understanding Harmony and Ethical human conduct	2	1	0	3
3	PC	23A0512T	Database Management Systems	3	0	0	3
4	PC	23A0506T	Advanced Data Structures &Algorithm Analysis	3	0	0	3
5	PC	23A0507T	Object-Oriented Programming Through JAVA	3	0	0	3
6	PC(Lab)	23A0508P	Advanced Data structures and Algorithms Analysis Lab	0	0	3	1.5
7	PC(Lab)	23A0509P	Object-Oriented Programming Through JAVA Lab	0	0	3	1.5
8	SEC	23A0510P	**Skill Enhancement Course** Python programming	0	1	2	2
9	MC	23A0109T	**Audit Course** Environmental Science	2	0	0	-
TotalCredits							**20**

Category	CREDITS
Basic Science Course(BS)	3
Professional Core Courses(PC)	12
Humanities and Science Course(HS)	3
Skill Enhancement Course(SEC)	2
Audit Course(MC)	-
TOTALCREDITS	**20**

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SL. No	Category	CourseCode	CourseName	Hoursperweek			Total Credits
				L	T	P	
1	HM	23A0022T 23A0023T 23A0024T	**Management Course- I** 1. Managerial Economics and Financial Analysis 2. Organizational Behavior 3. Business Environment	2	0	0	2
2	BS	23A3203T	Statistical methods for Data Science	3	0	0	3
3	PC	23A3301T	Artificial Intelligence	3	0	0	3
4	PC	23A3201T	Introduction to Data Science	3	0	0	3
5	ESC	23A0406T	Digital Logic and Computer Organization	3	0	0	3
6	PCC(Lab)	23A0525P	Artificial Intelligence Lab	0	0	3	1.5
7	PCC(Lab)	23A3001P	Data Science using Python Lab	0	0	3	1.5
8	SEC	23A0516P	**Skill Enhancement Course** Full Stack Development-1	0	1	2	2
9	BS&HC	23A0413T	Design Thinking & Innovation	1	0	2	2
Total Credits							**21**
MandatoryCommunityServiceProjectInternshipof06 to 08weeksdurationduringsummer vacation							

Category	CREDITS
Basic Science Course(BS)	3
Professional Core Courses(PC)	9
Engineering Science Course (ES)	3
Skill Enhancement Course(SEC)	2
Management Elective Course(HM)	2
Basic Science & Humanities Courses(BS&HC)	2
TOTAL CREDITS	**21**

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Program Educational Objectives (PEOs)

- **PEO1:** To equip graduates with the expertise to leverage the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to create systems that call for effective management and accurate analysis of a large volume of data.
- **PEO2**: To empower and enrich graduates with required technical proficiency to pursue innovative research in the field of AI and Data Science and offer disruptive and sustainable solutions for the effective functioning of ecosystems.
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Program Specific Outcomes

PSO1: Apply Artificial Intelligence and Data Science methodologies to gain useful In sights to find effective solutions to challenging real-life problems.

PSO2: Design and formulate innovative AI based software applications to match the needs and demands of industry and society.

Program Outcomes

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
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PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentation, give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team to manage projects and in multi-disciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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InductionProgram-3Weeks

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	MC		Physical Activities--Sports, Yoga and Meditation, Plantation	0	0	6	0
2	MC		Career Counseling	2	0	2	0
3	MC		Orientation to all branches – career options, tools, etc.	3	0	0	0
4	EC		Orientation on admitted Branch—corresponding labs, tools and platforms	2	0	3	0
5	ES		Proficiency Modules& Productivity Tools	2	1	2	0
6	MC		Assessment on basic aptitude and mathematical skills	2	0	3	0
7	MC		Remedial Training in Foundation Courses	2	1	2	0
8	MC		Human Values & Professional Ethics	3	0	0	0
9	BS		Communication Skills –focus on Listening, Speaking, Reading, Writing skills	2	1	2	0
10	ES		Concepts of Programming	2	0	2	0
Total Credits							**0**

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B.tech I year I Semester (Theory-5, Lab-4)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BS	23A0003T	Engineering Physics	3	0	0	3
2	BS	23A0001T	Linear Algebra & Calculus	3	0	0	3
3	BS	23A0201T	Basic Electrical and Electronics Engineering	3	0	0	3
4	ES	23A0301T	Engineering Graphics	1	0	4	3
5	ES	23A0501T	Introduction to Programming	3	0	0	3
6	BS	23A0503P	IT Workshop	0	0	2	1
7	BS	23A0006P	Engineering Physics Lab	0	0	2	1
8	ES	23A0202P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	ES	23A0502P	Computer Programming Lab	0	0	3	1.5
10	BS	23ANS01P	NSS/NCC/Scouts & Guides/ Community Service	-	-	1	0.5
Total				**13**	**00**	**15**	**20.5**

Category	**CREDITS**
Basic Science course(BS)	7.5
Engineering Science Courses (ES)	13
Humanities and social science (HSMC)	-
TOTALCREDITS	**20.5**

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B.tech I year I Semester

ENGINEERING PHYSICS
(Common to all branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0003T	3:0: 0:0	3	CIE: 30 EE:70	3Hours	BS

Prerequisite: Student should know about fundamental and basic principles in physics

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

On completion of this course, the students are able to:-
CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2: Familiarize with the basics of crystals and their structures.
CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4: Apply fundamentals of quantum mechanics to band theory of solids.
CO5: Identify the type of semiconductor using Hall effect.

SYLLABUS		Total Hours:48
Unit- I	**WAVEOPTICS**	**10Hrs**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings-Determination of wave length and refractive index.

Diffraction: Introduction-Fresnel and Fraunhofer diffractions- Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction-Nicol's Prism-Half wave and Quarter wave plates

Unit- II	CRYSTALLOGRAPHY AND X-RAY DIFFRACTION	8Hrs

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices –crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC – Miller indices – separation between successive (hkl)planes.

X- ray diffraction: Bragg's law - X-ray Diffracto meter – crystal structure determination by Laue's and powder methods.

Unit- III	DIELECTRICAND MAGNETICMATERIALS	10Hrs

Dielectric Materials: Introduction-Dielectric polarization-Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors-Types of polarizations-Electronic(Quantitative), Ionic(Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation – complex dielectric constant–Frequency dependence of polarization–di electric loss

Magnetic Materials: Introduction-Magneticdipolemoment-Magnetization-Magneticsusceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials-Domain conceptforFerromagnetism&Domainwalls(Qualitative)-Hysteresis-softandhardmagneticmaterials

Unit- IV	QUANTUMMECHANICSAND FREEELECTRON THEORY	10Hrs

Quantum Mechanics: Dual nature of matter–Heisenberg's Uncertainty Principle –Significance and properties of wave function–Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution –Density of states-Fermi energy.

Unit- V	SEMI CONDUCTORS	10Hrs

Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers–dependence of Fermi energy on carrier concentration and temperature –Drift and diffusion currents–Einstein's equation-Hall effect and its applications.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors–BCS theory–High Tc superconductors–Applications of super conductors

Textbooks:

1. ATextbookofEngineeringPhysics-M.N.Avadhanulu,P.G.Kshirsagar&TVSArunMurthy, S.ChandPublications,11thEdition2019.
2. EngineeringPhysics-D.K.BhattacharyaandPoonamTandon,Oxfordpress(2015).
3. Engineering Physics–K.Thyagarajan, McGraw Hill Publishers

Reference Books:

1. Engineering Physics-B.K.Pandeyand S.Chaturvedi, Cengage Learning
2. Engineering Physics-Shatendra Sharma, Jyotsna Sharma, Pearson Education,2018.
3. Engineering Physics"-SanjayD. Jain, D.Sahasrabudhe and Girish, University Press.
4. EngineeringPhysics-M.R.Srinivasan,NewAgeinternationalpublishers(2009).

E-resources:

- https://www.textbooks.com/Catalog/MG5/Applied-Physics.php
- https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs
- https://libguides.ntu.edu.sg/c.php?g=867756&p=6226561
- https://bookauthority.org/books/best-applied-physics-books
- https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2

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B.tech I year I Semester

LINEAR ALGEBRA &CALCULUS (Common to All Branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A0001T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3Hours**	**BS**

Course Objectives:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1: Solving systems of linear equations that is needed by engineers for practical applications.

CO2: Find the Eigen values and Eigen vectors to facilitate the calculation of matrix characteristics.

CO3: Utilize mean value theorems to real life problems.

CO4: Apply the technique of partial differentiation to find the Jacobian and the extreme values of functions of several variables.

CO5: Apply the techniques of multiple integrals to find the areas and volumes.

Syllabus		**TotalHours:45**
Unit-I	**MATRICES**	**9Hrs**

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations - Gauss elimination method, Iteration Methods: Gauss- Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in electrical circuits.

Unit-II	**EIGENVALUES, EIGENVECTORS AND ORTHOGONAL TRANSFORMATION**	**9Hrs**

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit-III	**CALCULUS**	**9Hrs**

Mean Value Theorems: Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof) with their geometrical interpretation, Cauchy's mean value theorem (Without Proof), Taylor's and Maclaurin's theorems with remainders (Without Proof), Problems and applications on the above theorems.

Unit-IV	**PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)**	**9Hrs**

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit-V	**MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)**	**9Hrs**

Double integrals, triple integrals, change of order of integration (Cartesian Coordinate only), change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals)

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

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B.tech I year I Semester

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A02101T	**3:0:0:0**	**3**	**CIE:30 & SEE:70**	**3 Hours**	**ES**

Course Objectives:

The objectives of the course are to make the students learn about:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes (CO):

At the end of studying the course, the student should be able to:

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.

CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

CO4: Analyze different electrical circuits, performance of machines and measuring instruments.

CO5: Evaluate different circuit configurations, Machine performance and Power systems operation

Syllabus	**PART A: BASIC ELECTRICAL ENGINEERING**	**Total Hours: 48**
Unit-I	**DC & AC Circuits**	**10Hrs**

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

Unit-II	**MACHINES AND MEASURING INSTRUMENTS**	**8Hrs**

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

Unit -III	**ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES**	**6Hrs**

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and

demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

B.tech I year I Semester

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

WebResources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

The objectives of the course are to make the students learn about:

- This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

Course Outcomes (CO):

At the end of studying the course, the student should be able to:

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.

CO2: Explain the characteristics of diodes and transistors.

CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.

C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems

Syllabus		
Unit-I	**SEMICONDUCTOR DEVICES**	**6Hrs**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier

Unit-II	**BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**	**10Hrs**

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

Unit -III	**DIGITAL ELECTRONICS**	**8Hrs**

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits– Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).

Textbooks:

1. R.L.Boylestad&LouisNashlesky,ElectronicDevices&CircuitTheory,PearsonEducation
2. R. P.Jain ,Modern Digital Electronics, 4thEdition,TataMcGrawHill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009

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B.tech I year I Semester

ENGINEERING GRAPHICS
(Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0301T	3:0:0:0	3	CIE:30 SEE:70	3Hours	ES

Course Objectives:

The students completing the course are expected to:

- To introduce the fundamental concepts of machine learning algorithms and their practical relevance.
- To explore supervised, unsupervised, semi-supervised, and reinforcement learning techniques.
- To equip students with algorithmic and mathematical intuition behind ML models.
- To train students in using tools and frameworks for implementing ML models.
- To enable application of ML algorithms to solve real-world problems in various domains

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

CO1: Understand the concepts and types of machine learning algorithms.

CO2: Design and implement suitable machine learning algorithms for classification, regression, and Clustering.

CO3: Understandandapplyconceptsofsectionalviewstorepresentdetailsofsolidsinsimple positions.

CO4: Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.

CO5: Developtheabilitytodrawisometricviewsandorthographicviewsandshouldbeable to convert isometric views to orthographic views and viceversa.

Syllabus		Total Hours:45
Unit-I	**INTRODUCTION**	**9Hrs**

Lines, Lettering and Dimensioning,Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

Unit-II	ORTHOGRAPHIC PROJECTIONS	9Hrs

Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

Unit-III	PROJECTIONS OF SOLIDS	9Hrs

Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Unit-IV	SECTIONS OF SOLIDS	9Hrs
Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only. **Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone		
Unit-V	**CONVERSION OF VIEWS**	**9Hrs**
Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. **Computer graphics:** Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).		
Textbooks: 1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.		
Reference Books: 1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill,2013. 2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson EducationInc,2009. 3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill,2017.		

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B.tech I year I Semester

INTRODUCTION TO PROGRAMMING (Common to All Branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A05101T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3Hours**	**ES**

Course Objectives:

The students completing the course are expected to:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To faster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions and arrays.
- To encourage collaborative learning and team work in coding projects

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

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyze a problem and develop an algorithm to solve it.
CO3: Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Developproblem-solvingskillsandtheabilitytodebugandoptimizethecode.

Syllabus		**Total Hours:48**
Unit-I	**INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING**	**10Hrs**

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables and Constants, Basic Input and Output, Operations, Type Conversion and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

Unit-II	**CONTROL STRUCTURES**	**8Hrs**

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

Unit-III	**ARRAYS AND STRINGS**	**10Hrs**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings

Unit-IV	**POINTERS & USER DEFINED DATA TYPES**	**10Hrs**

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

Unit-V	**FUNCTIONS & FILE HANDLING**	**10Hrs**

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Life time of Variables, command line arguments, Preprocessor directives, Basics of File Handling

Textbooks:

1. The C Programming Language ", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill
2. Education, 2008.
3. Programming in C, Rema Theraja, Oxford, 2016, 2 nd edition
4. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad,CENGAGE, 3 rd edition

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B.tech I year I Semester

IT WORKSHOP (Common to All branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0503P	**0:0:2:0**	**1**	**CIE:30 &SEE:70**	**3 Hours**	**ES**

Course Objectives:

This course will enable students to:
CO1: Introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
CO2: Demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
CO3: Teach basic command line interface commands on Linux.
CO4: Teach the usage of Internet for productivity and self-paced life-long learning
CO5: Introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

List of Experiments: **Total Hours : 32**

PC Hardware & Software Installation

1. Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2. Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
3. Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
4. Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva
5. Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

1. **Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
2. **Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
3. **Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
4. **Task 4**: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to

block pop ups, block active x downloads to avoid viruses and/or worms.

5. **Task 5:**Install any anti-virus software on your computer

LaTeX and WORD

1. **Task 1** – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
2. **Task 2**: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.
3. **Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
4. **Task 4**: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using **Excel** – Accessing, overview of toolbars, saving excel files, Using help and resources.

1. **Task 1**: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
2. **Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP

1. **Task 3**: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

1. **Task 1**: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.
2. **Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
3. **Task 3**: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

1. **Task 1**: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
   • Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
2. **Task 2**: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
   • Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
3. **Task 3**: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

4.

• Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

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B.tech I year I Semester

ENGINEERING PHYSICS LAB

(Common to All Branches of Engineering)

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0006P	0:0:2:0	1	CIE: 30 EE:70	3Hours	BS

Prerequisite: Student should know about fundamental and basic principles in physics

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes:

On completion of this course, the students are able to:-
CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate dielectric constant of capacitor and magnetic induction of current carrying coil
CO3: Identify the type of semiconductor and calculate band gap of it.
CO4: Evaluate different modulus of materials.
CO5: Measure the frequency of tuning fork and verify the laws in Sonometer.

SYLLABUS **Total Hours : 32**

List of Experiments:

1. Determination of radius of curvature of a given plane convex lens by Newton's rings.
2. Determination of wave lengths of different spectral lines in mercury spectrum using Diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of wave length of Laser light using diffraction grating.
5. Estimation of Planck's constant using photo electric effect.
6. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
7. Determination of dielectric constant using charging and discharging method.
8. Study the variation of B versus H by magnetizing the magnetic material(B-Hcurve).
9. Determination of magnetic susceptibility by Kundt's tube method.
10. Determination of the resistivity of semiconductors by four probe methods.
11. Determination of energy gap of a semiconductor using p-n junction diode.
12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
13. Determination of temperature coefficients of a thermistor.
14. DeterminationofrigiditymodulusofthematerialofthegivenwireusingTorsionalpendulum.
15. Determinationofyoung'smodulusforthegivenmaterialofwoodenscalebynon-uniformbending (or double cantilever) method.
16. DeterminationofFrequencyofelectricallymaintainedtuningforkbyMelde'sexperiment.
17. Sonometer : Verification of laws of stretched string.
18. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** Experiments may be conducted in virtual mode.

References Books:

1. A Text book of Practical Physics-S. Balasubramanian, N. Srinivasan, S.Chand Publishers, 2017.

URL:*www.vlab.co.in*

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B.tech I year I Semester

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common to All branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0202P	**0:0:3:0**	**1.5**	**CIE:30 &SEE:70**	**3 Hours**	**ES**

Course Objectives:

This course will enable students to:

Impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations

Course Outcomes (CO):

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

CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

List of Experiments:(Any 10 experiments from the above list) **Total Hours : 32**

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second **order system**
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
10. Fault studies using Zbus matrix
11. Design of virtual PMU
12. Wide area control of Two area **Kundur system**

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
    - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
    - Provide some exercises so that measuring instruments are learned to be used by the students
3. Components:

- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors,

IC’s etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

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B.tech I year I Semester

COMPUTER PROGRAMMING LAB
(Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0502P	0 : 0: 3:0	1.5	CIE: 30 SEE:70	3Hours	ES

Course Objectives:
The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

Course Outcomes:
On completion of this course, the students are able to:-
CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

SYLLABUS **Total Hours : 45**

UNIT I

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment
I. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
II. Exposure to Turbo C, gcc
III. Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT II

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can beusedandhowtousethem.Exploreallrelationalandlogicaloperatorswhilewritingconditionalsfor"ifconstruct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop andfor loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

UNIT III

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array**.**

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings**.**

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C.

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bit fields, Self-Referential Structures, Linked lists

Lab10 : Bit fields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bit fields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V

WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.

ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.

iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.

ii) Write a recursive function to find the lcm of two numbers.

iii) Write a recursive function to find the factorial of a number.

iv) Write a C Program to implement Ackermann function using recursion.

v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.

ii) Demonstrate Dangling pointer problem using a C program.

iii) Write a C program to copy one string into another using pointer.

iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite()

iii) Copy the contents of one file to another file.

iv) Write a C program to merge two files into the third file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) Write a C program to print last n characters of a given file

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

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B.tech I year I Semester

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23ANS01P	**0: 0: 1: 0**	**0.5**	100	-	

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and downtrodden people.
CO5: Develop leadership skills and civic responsibilities.

Syllabus

Module-I	Orientation	

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.
Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution

Module-II	Nature & Care	

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

Module-III	Community Service	

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc

Reference Books:

1. NirmalyaKumarSinha&SurajitMajumder,*ATextBookofNationalServiceScheme* Vol;.I, VidyaKutirPublication,2021(ISBN978-81-952368-8-6)
2. *RedBook-NationalCadetCorps*– StandingInstructionsVolI&II,DirectorateGeneralofNCC,MinistryofDefence,NewDelhi
3. DavisM.L.andCornwellD.A.,"IntroductiontoEnvironmentalEngineering",McGraw Hill,NewYork4/e2008
4. MastersG.M.,JosephK.andNagendranR."IntroductiontoEnvironmentalEngineering andScience",PearsonEducation,New Delhi.2/e 2007
5. RamAhuja. *SocialProblemsinIndia*,RawatPublications,NewDelhi.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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B.Tech. – I Year II Semester (Theory-5, Lab-4)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BS	23A0009T	Communicative English	2	0	0	2
2	BS	23A0004T	Chemistry	3	0	0	3
3	ES	23A0002T	Differential Equations& Vector Calculus	3	0	0	3
4	ES	23A0101T	Basic Civil& Mechanical Engineering	3	0	0	3
5	PC	23A0504T	Data Structures	3	0	0	3
6	ES	23A0010P	Communicative English Lab	0	0	2	1
7	BS	23A0007P	Chemistry Lab	0	0	2	1
8	ES	23A0302P	Engineering Workshop	0	0	3	1.5
9	PC	23A0505P	Data Structures Lab	0	0	3	1.5
10	BS	23AYG01P	Health and wellness, Yoga And Sports	-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

Category	**CREDITS**
Basic Science course(BS)	8.5
Engineering Science Courses(ES)	6.5
Professional Core Course (PC)	4.5
TOTALCREDITS	**19.5**

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B.tech I year II Semester

COMMUNICATIVE ENGLISH
(Common to all Branches of Engineering)

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23A0009T	2: 0: 0: 0	2	CIE:30 SEE:70	3 Hours	BS

Course Objectives:

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well-structured reports
- Broaden the knowledge base of **grammatical structures** and **vocabulary** and encourage their appropriate use in speech and writing

Course Outcomes(CO):

On completion of this course, student will be able to
CO1: The learner will be able to speak and write grammatically accurate sentences through applications of principles of English grammar
CO2: The learner will enhance vocabulary skills to build strong language skills.
CO3: The learner acquires the ability to understand the academic text from multiple dimensions employing ethical and logical reasoning based on accurate comprehension
CO4: The learner gains evaluation potential by employing standard reading & listening strategies to grasp the core essence and spirit of the text
CO5: The learner will gain mastery on speaking & writing skills through the application of relevant guidelines, through consistent practice of functional English expression

Syllabus		**Total Hours:32**
Module-I	**HUMAN VALUES:** Gift of Magi **(Short Story)**	**8Hrs**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text Scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

Module-II	**The Brook by Alfred Tennyson (Poem)**	**7Hrs**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by shortstructured talks**.**
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

Module-III	**BIOGRAPHY: Elon Musk**	**6 Hrs**

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words**,**
Vocabulary: Compound words, Collocations

Module-IV	**INSPIRATION: The Toys of Peace -Saki**	**6 Hrs**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data
Writing: Letter Writing: Official Letters, Resumes
Grammar : Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

Module-V	**MOTIVATION: The Power of Intrapersonal Communication (An Essay)**	**5 Hrs**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading for Comprehension
Writing: Writing structured essays on specific topics**.**
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

ReferenceBooks:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:
GRAMMAR:
1. www.bbc.co.uk/learningenglish

2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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B.tech I year II Semester

CHEMISTRY (Common to EEE,ECE,CSE,IT and allied branches)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A0004T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3Hours**	**BS**

Prerequisite: Student should know fundamental concepts about Engineering Chemistry

Course Objectives:

This course will enable students to:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, and cement

Syllabus		**Total Hours:48**
Unit-I	**WATER TECHNOLOGY**	**10Hrs**

Soft and hard water, Estimation of hardness of water by complexometry (EDTA Method), Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming**,** scale and sludge, Caustic embrittlement, Purification of water: **Zeolite process,** Ion-exchange processes - desalination of brackish water by Reverse Osmosis (RO) and electro dialysis; Specifications for safe drinking water as per the Bureau of Indian Standards (BIS)and World Health Organization (WHO) standards, Industrial water treatment

Unit-II	**ELECTROCHEMISTRYANDAPPLICATIONS**	**10Hrs**

Electrodes –electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bed worth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

Unit-III	**POLYMERS AND FUEL CHEMISTRY**	**10Hrs**

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization, Polydispersity Index (PDI).

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of polystyrene, PVC, Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number-alternative fuels- propane, methanol, ethanol and bio fuel-biodiesel.

Unit-IV	**MODERN ENGINEERING MATERIALS**	**8Hrs**

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and applications.
Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification number and applications.
Building materials- Portland Cement, constituents, Setting and Hardening of cement (Chemical reactions involved).

Unit-V	**SURFACE CHEMISTRY AND NANOMATERIALS**	**9Hrs**

Introduction to surface chemistry, colloids, nano metal and nano metal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nano metal and metal oxides, stabilization of colloids and nonmaterial's by stabilizing agents. Adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nonmaterial's – catalysis, medicine, sensors, etc.

Course Outcomes(CO):

On completion of this course, student will be able to

1. Describe the basic properties of water and its significance in domestic and industrial purposes.(L2)
2. Analyze the principles of electrochemistry in batteries and fuel cells and corrosion prevention methods that are useful to know about the protection of metals. (L3)
3. Describe advanced polymer materials and their industrial applications and know about calorific values, octane number, refining of petroleum and cracking of oils. (L2)
4. Define various types of engineering materials and their applications in the industry. (L1)
5. Summarize the concepts of colloids, micelle and nano-materials .(L2)

Textbooks:

1. 1. JainandJain, Engineering Chemistry, 16/e,DhanpatRai,2013.
2. Peter Atkins, Juliode Paula and James Keeler, Atkins' Physical chemistry,10/e,OxfordUniversityPress,2010.

Reference Books:

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. H.F.W.Taylor,Cement Chemistry,2/e,ThomasTelfordPublications,1997.
3. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.

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B.tech I year II Semester

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0002T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	ES

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

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

CO1: Solve the first order differential equations related to various engineering fields.
CO2: Solve the linear differential equations of higher order with constant coefficients
CO3: Identifysolutionmethodsforpartialdifferentialequationsthatmodelphysical processes.
CO4: Interpretthephysicalmeaningofdifferentoperator'ssuchasgradient,curlanddivergence.
CO5: Apply Green's, Stokes and Divergence theorem in work done, circulation, flux and triple integrals.

Syllabus		Total Hours: 45
Unit-I	**DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE**	**9Hrs**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay Electrical circuits.

Unit-II	**LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)**	**9Hrs**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

Unit-III	**PARTIAL DIFFERENTIAL EQUATIONS**	**9Hrs**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

Unit-IV	**VECTOR DIFFERENTIATION**	**9Hrs**

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

Unit-V	**VECTOR INTEGRATION**	**9Hrs**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

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B.tech I year II Semester

BASICCIVIL & MECHANICAL ENGINEERING (Common for all branches)					
Course Code	**L:T:P:S**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0101T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3Hours**	**ES**

Course Objectives:

- GetfamiliarizedwiththescopeandimportanceofCivilEngineeringsub-divisions
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water
- Introductiontobasiccivilengineeringmaterialsandconstructiontechniques

Syllabus	**PART-A**	**TotalHours:24**
Unit–I		**8Hrs**

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of CivilEngineering-StructuralEngineering-Geo-technicalEngineering-TransportationEngineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of eachdiscipline-BuildingConstructionandPlanning-ConstructionMaterials-Cement-Aggregate-Bricks-Cementconcrete-Steel.Introductionto Prefabricated construction Techniques

Unit–II		**8Hrs**

Fluid Mechanics: Properties of fluids and types of fluids.

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Leveling instruments used for leveling -Simple problems on leveling and bearings-Contour mapping

Unit–III		**8Hrs**

Transportation Engineering Importance of Transportation in Nations economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements -Simple Differences. Basics of Harbor, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. BasicCivilEngineering,SatheeshGopi,PearsonPublications,2009,FirstEdition

Reference Books:

1. Surveying, Vol-I and Vol-II, S.K.Duggal, Tata Mc Graw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi.2016
3. Irrigation Engineering and Hydraulic Structures-Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G.Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER—SPECIFICATIONIS10500-2012.

E-Resources :
https://archive.nptel.ac.in/courses/105/106/105106201/

PART-B BASIC MECHANICAL ENGINEERING

Course Objectives:

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Syllabus		**TotalHours:24**
Unit–I		**8Hrs**

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

Unit–II		**8Hrs**

Manufacturing Processes: Principles of Casting, Forming, and joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

Unit–III		**8Hrs**

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject).

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish KumarPulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical

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

CO1: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying

CO2: Realize the importance of Transportation in nations economy and the engineering measures related to highways in terms of geometrics.

CO3: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.

CO4: Understand the different manufacturing processes.

CO5:Understand the basics of thermal engineering and its applications

CO6: Describe the working of different mechanical power transmission systems and power plants, learn basics of robotics.

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B.tech I year II Semester

DATA STRUCTURES (Common to CSE, IT& allied branches)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A0504T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

`Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving

Course Outcomes: At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation**.**
CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.
CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems

Syllabus		**TotalHours: 45**
Unit-I	INTRODUCTION TO LINEAR DATA STRUCTURES	**9Hrs**
Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort		
Unit-II	LINKED LISTS	**9Hrs**
Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.		
Unit-III	STACKS	**9Hrs**
Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.		
Unit-IV	QUEUES	**9Hrs**
Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc. Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.		
Unit-V	TREES	**9Hrs**

Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders

2. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft

3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum

4 4. Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

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B.tech I year II Semester

COMMUNICATIVE ENGLISH LAB
(Common to all Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0010P	0 : 0: 2:0	1	CIE: 30 SEE:70	3Hours	BS

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning students will get trained in the basic communication skills and also make them ready to face job interviews.

Course Outcomes:

On completion of this course, the students are able to:-

CO1: Analyze the English speech sounds, stress, intonation for better Listening practice

CO2: Apply communication skills through various language learning activities

CO3: Application of writing skills through design and preparation of professional Resume & email writing

CO4: Create effective resonate and prepare themselves to face interviews in future

List of Experiments **Total Hours : 32**

1. Vowels & Consonants
2. Neutralization/ Accent Rules
3. Communication Skills & Jam
4. Role Play Or Conversational Practice
5. Email Writing
6. Resume Writing, Cover Letter, Sop
7. Group Discussion-Methods & Practice
8. Debate - Method & Practice
9. PPT Presentation / Poster Presentation
10. Interview Skills

Suggested Software: Walden Infotech / Young India Films

Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press.

Online Learning Resources/Virtual Labs:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com

3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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B.tech I year II Semester

CHEMISTRYLAB					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0007P	**0:0:2:0**	**1**	**CIE:30SEE:70**	**3 Hours**	**BS**

Course Objectives:

This course will enable students to:

- To Verify the fundamental concepts with experiments

Course Outcomes(CO):

At the end of the course, the students will be able to
CO1: Determine the cell constant and conduct a nce of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyze the IR spectra of some organic compounds.
CO5: Calculate strength of acid in Pb-Acid battery.

Syllabus **Total Hours:32**

List of Experiments

List of Experiments:
1. Measurement of 10Dq by spectro photo metric method
2. Conduct metric titration of strong acid vs. strong base
3. Conduct metric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometer - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer’s law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference Books

1."Vogel'sQuantitativeChemicalAnalysis6thEdition6thEdition"PearsonPublicationsbyJ.Mendham,R.C. Denney,J.D.BarnesandB.Sivasankar

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B.tech I year II Semester

ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0302P	0 : 0: 3:0	1.5	CIE: 30 SEE:70	3Hours	ES

Course Objectives:
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.

Course Outcomes:
On completion of this course, the students are able to:-
CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice.

SYLLABUS **Total Hours : 42**

1. Demonstration: Safety practices and precautions to be observed in workshop.
2. Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints.
3. Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
4. Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
5. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
6. Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises.
7. V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
8. Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections.
9. Parallel and series b) Two-way switch c) Godown lighting
10. d) Tube light e) Three phase motor f) Soldering of wires
11. Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
12. Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
13. Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:
1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

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B.tech I year II Semester

DATA STRUCTURES LAB
(Civil Engineering & allied branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0505P	0:0:3:0	1.5	CIE:30SEE:70	3Hours	PC

Course Objectives:

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.

CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

Syllabus **TotalHours:48**

Note: Studentshavetoperformany10of the following Experiments

Exercise 1: Array Manipulation

i) Write a program to reverse an array.

ii) C Programs to implement the Searching Techniques – Linear & Binary Search

iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.

ii) Develop a program to reverse a linked list iteratively and recursively.

iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.

ii) Implement a linked list to represent polynomials and perform addition.

iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand its properties and applications.

ii) Implement a circular linked list and perform insertion, deletion, and traversal. Exercise 5: Stack Operations

i) Implement a stack using arrays and linked lists.

ii) Write a program to evaluate a postfix expression using a stack.

iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

i) Implement a queue using arrays and linked lists.

ii) Develop a program to simulate a simple printer queue system.

iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

i) Use a stack to evaluate an infix expression and convert it to postfix.

ii) Create a program to determine whether a given string is a palindrome or not.

iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise8: Binary Search Tree

i) Implementing a BST using Linked List.

ii) Traversing of BST.

Exercise 9: Hashing

i) Implement a hash table with collision resolution techniques.

ii) Write a program to implement a simple cache using hashing.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.

2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

Reference Book(s):

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gorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft

gorithms and Data Structures" by Brad Miller and David Ranum

ıs by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

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B.tech I year II Semester

HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to all Branches of Engineering)

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23A99201	**0: 0: 1: 0**	**0.5**	100	-	BS

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

Syllabus

Module-I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI)of all age groups.
Activities:
i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

Module-II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.
Activities:
Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

Module-III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Common wealth games.
Activities: i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. 1.GordonEdlin,EricGolanty.HealthandWellness,14thEdn.Jones&BartlettLearning,2022

2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, JohnLofty, SAS Survival Hand book: The Ultimate Guide to Surviving Any where ThirdEdition,WilliamMorrowPaperbacks,2014
5. The Sports Rules Book/Human Kinetics with Thomas Hanlon.-- 3rded.HumanKinetics,Inc.2014

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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B.Tech II year I Semester (Theory-5, Lab-2,SEC-1, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BS	23A0015T	Discrete Mathematics &Graph Theory	3	0	0	3
2	HM	23A0021T	Universal Human Values 2UnderstandingHarmony and Ethical human conduct	2	1	0	3
3	PC	23A0512T	Database Management Systems	3	0	0	3
4	PC	23A0506T	Advanced Data Structures & Algorithm Analysis	3	0	0	3
5	PC	23A0507T	Object-Oriented Programming Through JAVA	3	0	0	3
6	PC(Lab)	23A0508P	Advanced Data structures and Algorithms Analysis Lab	0	0	3	1.5
7	PC(Lab)	23A0509P	Object-Oriented Programming Through JAVA Lab	0	0	3	1.5
8	SEC	23A0510P	**Skill Enhancement Course** Python programming	0	1	2	2
9	MC	23A0109T	**Audit Course** Environmental Science	2	0	0	-
Total				**16**	**2**	**8**	**20**

Category	**Credits**
Basic Sciences Course(BS)	3
Professional Core Courses(PC)	12
Humanities and Social Science Course(HM)	3
Skill Enhancement Course(SEC)	2
Audit Course(MC)	-
Total	20

T. Shalini
Member Secretary

HEAD OF THE DEPARTMENT
Department of AI & DS
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B.tech II year I Semester

DISCRETE MATHEMATICS & GRAPH THEORY
(Common to CSE, AI&ML, AI&DS, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0015T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	BS

Course Objectives:

This course will enable students to:

- Introduce the concepts of mathematical logic
- Introduce the concepts of sets, relations, and functions.
- Perform the operations associated with sets, functions, and relations.
- Introduce generating functions and recurrence relations.
- Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- Use Graph Theory for solving problems.

Course Outcomes (CO):

On completion of this course, student will be able to

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems

Syllabus		Total Hours:56
UNIT-I	**Mathematical Logic**	**10Hrs**

Mathematical Logic: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus

UNIT-II	**Set theory and algebraic structures**	**14Hrs**

Set theory: Sets and its operations, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. **Algebraic structures**: Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism**.**

UNIT-III	**Elementary Combinatory**	**10Hrs**

Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT-IV	Recurrence Relations	12Hrs

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of In homogeneous, Recurrence Relations.

UNIT-V	Graphs	10Hrs

Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits, Hamiltonian Graphs

Text Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatories and Graph Theory, 7thEdition, McGraw Hill Education(India)Private Limited.

Reference Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

Web References

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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B.tech II year I Semester

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT
(Common to CSE, AI&ML, AI&DS, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0021T	2:1:0:3	3	CIE:30 SEE:70	3 Hours	HM

Course Objectives:

This course will enable students to:

- help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- facilitate the development of a Holistic perspective among students towards lifeandprofessionaswellastowardshappinessandprosperitybasedonacorrectunderstandingofthe Humanrealityandtherestofexistence.SuchholisticperspectiveformsthebasisofUniversalHuman Valuesandmovementtowardsvalue-basedlivingina natural way.
- Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes (CO):

On completion of this course, student will be able to

- Define the terms like Natural Acceptance, Happiness and Prosperity.
- Identify one's self, and one's surroundings (family, society nature)
- Apply what they have learnt to their own self in different day-to-day settings in real life.
- Relate human values with human relationship and human society.
- Justify the need for universal human values and harmonious existence
- Develop as socially and ecologically responsible engineers

Course Topics

Course Topics

The course has 28 lectures and 14 tutorials in 5 Units. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue

Syllabus		Total Hours:48
UNIT-I	**Introduction to Value Education (6 lectures and 3 tutorials for practice session)**	**9Hrs**

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT-II	**Harmony in the Human Being (6 lectures and 3 tutorials for practice session)**	**10Hrs**

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT-III	**Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)**	**10Hrs**

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal.

UNIT-IV	**Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)**	**10Hrs**

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT-V	**Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)**	**9Hrs**

Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself
PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may

be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Text Books:

Textbook and Teachers Manual

a. The Text book

RRGaur, RAsthana, GPBagaria, *AFoundation Course in HumanValuesandProfessionalEthics*,2nd Revised Edition,ExcelBooks,NewDelhi,2019.ISBN 978-93-87034-47-1

b. TheTeacher'sManual

R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-53-2

Reference Books:

1. *Jeevan Vidya: EkParichaya,* ANagaraj, Jeevan VidyaPrakashan,Amarkantak,1999.
2. *Human Values*, A.N.Tripathi, New Age Intl.Publishers, NewDelhi,2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth*-by Mohandas Karamchand Gandhi
5. *Smallis Beautiful*-E.FSchumacher.
6. *Slowis Beautifu*l-CecileAndrews
7. *Economy of Permanence*- JCKumarappa
8. *Bharat Mein AngrejiRaj*–PanditSunderlal
9. *Redis covering India*-byDharampal
10. *HindSwaraj orIndian HomeRule*-byMohandasK.Gandhi
11. *India Wins Freedom*- Maulana Abdul Kalam Azad
12. *Vivekananda*-Romain Rolland(English)
13. *Gandhi*-RomainRolland(English).

Web References:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf

2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf

5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf

8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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B.tech II year I Semester

DATABASE MANAGEMENT SYSTEMS
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0512T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

- Introduce data base management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Data base language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a data base system, by discussing Data base indexing techniques and storage techniques

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the basic concepts of data base management systems(L2)
- Analyze a given data base application scenario to use ER model for conceptual design of the data base(L4)
- Utilize SQL proficiently to address diverse query challenges (L3).
- Employ normalization methods to enhance data base structure(L3)
- Assess and implement transaction processing, concurrency control and data base recovery protocols in databases.(L4)

Syllabus		Total Hours:56
UNIT-I	**Introduction**	**12Hrs**

Introduction: Database system, Characteristics (Database Vs File System), Data base Users, Advantages of Data base systems, Data base applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Data base system structure, environment, Centralized and Client Server architecture for the data base.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT-II	**Relational Model**	**10Hrs**

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT-III	SQL	12Hrs
SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable),relational set operations.		
UNIT-IV	**Schema Refinement**	**10Hrs**
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF),concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form(5NF). DeNormalization		
UNIT-V	**Transaction Concept**	**12Hrs**
Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+ Trees, Hash Based Indexing:		

Text Books:

1. DatabaseManagementSystems,3rdedition,RaghuramaKrishnan,JohannesGehrke,TMH(ForChapters 2, 3, 4)
2. DatabaseSystemConcepts,5thedition,Silberschatz,Korth,Sudarsan,TMH(ForChapter1andChapter5)

Reference Books:

1. Introduction to Data base Systems, 8thedition, CJ Date, Pearson.
2. Data base Management System, 6thedition,RamezElmasri, Shamkant B.Navathe, Pearson
3. Data base Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb,Cengage Learning.

Web References:

1. **https://nptel.ac.in/courses/106/105/106105175/**
2. **https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview**

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B.tech II year I Semester

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS
(Common to CSE, AI&ML, AI&DS, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0506T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

- Provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

Course Outcomes (CO):

On completion of this course, student will be able to

- Illustrate the working of the advanced tree data structures and their applications.
- Understand the Graph data structure, traversals and apply them in various contexts.
- Use various data structures in the design of algorithms.
- Recommend appropriate data structures based on the problem being solved.
- Analyze algorithms with respect to space and time complexities.
- Design new algorithms

Syllabus		Total Hours:54
UNIT-I	**Introduction**	**12Hrs**

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees – Creation, Insertion, Deletion operations and Applications
B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT-II	**Heap Trees (Priority Queues)**	**12Hrs**

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Bi connected Components, applications
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT-III	**Greedy Method**	**10Hrs**

Greedy Method**:** General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
Dynamic Programming**:** General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT-IV	**Back tracking &Branch and Bound**	**10Hrs**

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem (Hamiltonian Cycle)

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT-V	P and NP Problems	10Hrs

NP Hard and NP Complete Problems: Basic Concepts, Satisfiability Problem, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Text Books:

1.Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press

Reference Books:

1. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press.(added to reference).
2. Data Structures and program design in C, Rober tKruse, Pearson Education Asia.
3. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill.
4. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
5. Data Structures using C& C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995.
6. Algorithms + Data Structures &Programs: N.Wirth, PHI.
7. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta,GalgottiaPub.
8. Data structures in Java: Thomas Standish, Pearson Education Asia.

Web References:

1. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
2. https://www.tutorialspoint.com/advanced_data_structures/index.asp
3. http://peterindia.net/Algorithms.html
4. AbdulBari,1.IntroductiontoAlgorithms(youtube.com)

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B.tech II year I Semester

OBJECT-ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0507T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java app is for program development

Course Outcomes (CO):

On completion of this course, student will be able to

- Analyze problems, design solutions using OOP principles, and implement them efficiently in Java
- Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
- Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
- Apply Competence in handling exceptions and errors to write robust and fault-tolerant code
- Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
- Choose appropriate data structure of Java to solve a problem

Syllabus		Total Hours:61
UNIT-I	**Object Oriented Programming**	**12Hrs**

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final,

Introduction to Operators: Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT-II	Classes and Objects & Methods	12Hrs

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. Abstract Class

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT-III	Arrays	14Hrs

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to A12other Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT-IV	Packages and Java Library	12Hrs

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT-V	String Handling in Java	11Hrs

Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multi threaded Programming: Introduction, Need for Multiple Threads Multi threaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. Introduction to Java programming, 7thEdition, YDaniel Liang, Pearson

Web References:

1.https://nptel.ac.in/courses/106/105/106105191/

2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview

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B.tech II year I Semester

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB
(Common to CSE, AI&ML, AI&DS, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0508P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes (CO):

On completion of this course, student will be able to

- Design and develop programs to solve real world problems with the popular algorithm design methods
- Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs
- Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.
- Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems
- Compare the performance of different of algorithm design strategies
- Design algorithms to new real world problems

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs:

Week-1:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.

Week-2:

2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement

searching, insertion and deletion operations.

Week-3:

3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.

Week-4:

4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists

Week-5:

5. Write a program for finding the bi-connected components in a given graph.

Week-6:

6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).

Week-7:

7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists

Week-8:

8. Implement Job sequencing with deadlines using Greedy strategy.

Week-9:

9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.

Week-10:

10. Implement N-Queens Problem Using Backtracking.

Week-11:

11. Use Back tracking strategy to solve 0/1 Knapsack problem.

Week-12:

12. Implement Traveling Sales Person problem using Branch and Bound approach

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Web References:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html
3. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview

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B.tech II year I Semester

OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0509P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The aim of this course is to:

- Practice object-oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

Course Outcomes (CO):

On completion of this course, student will be able to

- Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling.
- Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.
- Familiar with commonly used Java libraries and APIs, including the Collections Frame work, Java I/O, JDBC, and other utility classes.
- Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.
- Proficiently construct graphical user interface (GUI) applications using JavaFX.
- Develop new programs for solving typical computer science problems.

Experiments covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

Sample Programs:

Week-1:

1. Develop a java program to display default value of all primitive data type of JAVA
2. Develop a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Week-2:

3. Develop a JAVA program to search for an element in a given list of elements using binary search mechanism.
4. Develop a JAVA program to sort for an element in a given list of elements using bubble sort

Week-3:

5. Develop a JAVA program using String Buffer to delete, remove character.

Week-4:

6. Develop a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
7. Develop a JAVA program implement method overloading.

Week-5:

8. Write a JAVA program to implement constructor.
9. Write a JAVA program to implement constructor overloading.

Week-6:

10. Write a JAVA program to implement Single Inheritance
11. Write a JAVA program to implement multi level Inheritance

Week-7:

12. Write a JAVA program for abstract class to find areas of different shapes
13. Write a JAVA program give example for "super" keyword.

Week-8:

14. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
15. Write a JAVA program that implements Run time polymorphism

Week-9:

16. Write a JAVA program that describes exception handling mechanism
17. Write a JAVA program Illustrating Multiple catch clauses

Week-10:

18. Write a JAVA program for creation of Java Built-in Exceptions
19. Write a JAVA program for creation of User Defined Exception

Week-11:

20. Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3seconds, (Repeat the same by implementing Runnable)
21. Write a program illustrating **isAlive** and **join()**

Week-12:

22. Write a Program illustrating Daemon Threads.
23. Write a JAVA program Producer Consumer Problem

Week-13:

24. Write a JAVA program that import and use the user defined packages
25. Without writing any code, build a GUI that display text in label and image in an Image View(use Java FX)

Week-14:

26. Build a Tip Calculator app using several Java FX components and learn how to respond to user interactions with the GUI
27. Write a java program that connects to a data base using JDBC

Week-15:

28. Write a java program to connect to a data base using JDBC and insert values into it.
29. Write a java program to connect to a data base using JDBC an delete values from it

Text Books:

1 Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh,

2nd Edition, Universities Press

2 Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press

3 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

4 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

Reference Books:

1. The complete Reference Java, 11th edition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Web References:

1. https://nptel.ac.in/courses/106/105/106105191/

2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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B.tech II year I Semester

PYTHON PROGRAMMING
(SKILL ENHANCEMENT COURSE)
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0510P	0:1:2:2	2	CIE:30 SEE:70	3 Hours	SEC

Course Objectives:

This course will enable students to:

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes (CO):

On completion of this course, student will be able to

- Classify data structures of Python
- Apply Python programming concepts to solve a variety of computational problems
- Understand the principles of object-oriented programming(OOP)in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs
- Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas
- Exhibit competence in implementing and manipulating fundamental data structures such as lists,tuples,sets,dictionaries
- Propose new solutions to computational problems

Syllabus		Total Hours:48
UNIT-I	**History of Python Programming Language**	**9Hrs**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type ( ) Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators

v) Bit wise Operators vi) Ternary Operator vii) Membership Operators
viii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II	Functions, Strings, Lists	10Hrs

Functions: Built-In Functions, Commonly Used UNITs, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments**.**

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i. Addition ii. Insertion iii. Slicing
12. Write a program to performany5built-in functions by taking any list.

UNIT-III	Dictionaries	10Hrs

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement**.**

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozen set**.**

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT-IV	Files	10Hrs

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle UNIT, Reading and Writing CSV Files, Python os and os.path UNITs.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes,

Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V	Introduction to Data Science	9Hrs

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array ( ) function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head ( ) function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Text Books:

1. Gowri shankarS, VeenaA., Introduction to Python Programming, CRC Press

Reference Books:

1. PythonProgramming,SSridhar,JIndumathi,VMHariharan,2nd Edition,Pearson,2024
2. Introduction to Programming Using Python, Y.Daniel Liang,Pearson.

Web References:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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B.tech II year I Semester

ENVIRONMENTAL SCIENCE
(Common to CSE, AI&ML, AI&DS, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0109T	2:0:0:-	-	CIE:30	2 Hours	MC

Course Objectives:

This course will enable students to:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers

Course Outcomes(CO):

On completion of this course, student will be able to

- No Outcomes

Syllabus		Total Hours:48
UNIT-I	**Multidisciplinary Nature of Environmental Studies**	**9Hrs**

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT-II	Ecosystems	10Hrs

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India

as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III	Environmental Pollution	10Hrs

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT-IV	Social Issues and the Environment	10Hrs

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, and watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT-V	Human Population and the Environment	9Hrs

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. DeekshaDaveandE.SaiBabaReddy,“TextbookofEnvironmentalScience”,Cengage Publications.

2. M.Anji Reddy, “Text book of Environmental Sciences and Technology” ,BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J.Glynn Henryand GaryW.Heinke,“Environmental Sciences and Engineering”, Prentice hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies ”Himalaya Publishing House
6. Gilbert M.Masters and WendellP.Ela, “Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

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Btech II Year II Semester (Theory-5, Lab-2,SEC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	HM	23A0022T 23A0023T 23A0024T	**Management Course- I** 1. Managerial Economics and Financial Analysis 2. Organizational Behavior 3. Business Environment	2	0	0	2
2	BS	23A3203T	Statistical methods for Data Science	3	0	0	3
3	PC	23A3301T	Artificial Intelligence	3	0	0	3
4	PC	23A3201T	Introduction to Data Science	3	0	0	3
5	PC	23A0406T	Digital Logic and Computer Organization	3	0	0	3
6	PC(Lab)	23A0525P	Artificial Intelligence Lab	0	0	3	1.5
7	PC(Lab)	23A3001P	Data Science using Python Lab	0	0	3	1.5
8	SEC	23A0516P	**Skill Enhancement Course** Full Stack Development-1	0	1	2	2
9	BS	23A0413T	Design Thinking & Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 06 to 08 weeks duration during summer vacation							

Category	**Credits**
Professional Core Courses (PC)	12
Humanities and Social Science Course(HM)	2
Basic Science Course(BS)	5
Skill Enhancement Course(SEC)	2
Total	21

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B.tech II year II Semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0022T	2:0:0:2	2	CIE: 30 SEE:70	3 Hours	HM

Course Objectives:

This course will enable students to:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learnhow to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes(CO):

On completion of this course, student will be able to

- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision(L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of businessentity (L5)

Syllabus		Total Hours:48
UNIT-I	**Managerial Economics**	**9Hrs**
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.		
UNIT-II	**Production and Cost Analysis**	**10Hrs**
Introduction – Nature, meaning, significance, functions and advantages. ProductionFunction– Least-cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).		

UNIT-III	Business Organizations and Markets	10Hrs
Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies		
UNIT-IV	**Capital Budgeting**	**10Hrs**
Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)		
UNIT-V	**Financial Accounting and Analysis**	**9Hrs**
Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, TrialBalance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.		

Text Books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, NewAge International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e,New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Web References:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-ccounting

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B.tech II year II Semester

ORGANISATIONAL BEHAVIOUR
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0023T	2:0:0:2	2	CIE:30 SEE:70	3 Hours	HM

Course Objectives:

This course will enable students to:

- Enable student's comprehension of organizational behavior
- Offer knowledge to students on self-motivation, leadership and management
- Facilitate them to become powerful leaders
- Impart knowledge about group dynamics
- Make them understand the importance of change and development

Course Outcomes(CO):

On completion of this course, student will be able to

- Define the Organizational Behaviour, its nature and scope.(L2)
- Understand the nature and concept of Organizational behavior(L2)
- Apply theories of motivation to analyse the performance problems(L3)
- Analyse the different theories of leadership(L4)
- Evaluate group dynamics(L5)
- Develop as powerful leader (L5)

Syllabus		Total Hours:48
UNIT-I	**Introduction to Organizational Behavior**	**9Hrs**
Meaning, definition, nature, scope and functions - Organizing Process – Making organizingeffective-UnderstandingIndividualBehaviour–Attitude-Perception-Learning–Personality.		
UNIT-II	**Motivation and Leading**	**10Hrs**
Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory -Vroom's theory of expectancy – Mc Cleland's theory of needs–McGregor's theory X and theory Y–Adam's equity theory.		
UNIT-III	**Organizational Culture**	**10Hrs**
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - TraitsTheory–ManagerialGrid-TransactionalVsTransformationalLeadership-QualitiesofgoodLeader-ConflictManagement-EvaluatingLeader.		
UNIT-IV	**Group Dynamics**	**10Hrs**

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness -Small Groups - Group decision making - Team building – Conflict in the organization–Conflict resolution

UNIT-V	Organizational Change and Development	9Hrs

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture -Changing the Culture – Change Management – Work Stress Management – Organizational management– Managerial implications of organization's change and development

Text Books:

1. Luthans, Fred, Organisational Behavior, McGraw-Hill, 12th edition.
2. PSubbaRan, Organisational Behavior, Himalya Publishing House.

Reference Books:

1. McShane, Organizational Behavior, TMH
2. Nelson, Organisational Behavior, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, Organizational Behavior, Pearson.
4. Aswathappa, Organisational Behavior, Himalaya.

Web References:

1. https://www.slideshare.net/Knight1040/organizational-culture9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714 https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
2. https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

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B.tech II year II Semester

BUSINESS ENVIRONMENT
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0024T	2:0:0:2	2	CIE:30 SEE:70	3 Hours	HM

Course Objectives:

This course will enable students to:

- To make the student to understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

Course Outcomes(CO):

On completion of this course, student will be able to

- Define Business Environment and its Importance.(L2)
- Understand various types of business environment.(L2)
- Apply the knowledge of Money markets in future investment(L3)
- Analyse India's Trade Policy(L4)
- Evaluate fiscal and monitory policy(L5)
- Develop a personal synthesis and approach for identifying business opportunities(L5)

Syllabus		Total Hours:48
UNIT-I	**Overview of Business Environment**	**9Hrs**

Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis-advantages & limitations of environmental-analysis.

UNIT-II	**Fiscal & Monetary Policy**	**10Hrs**

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues -Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget-Monetary Policy-Demand and Supply of Money–RBI-Objectives of monetary and credit policy-Recent trends-Role of Finance Commission.

UNIT-III	**India's Trade Policy**	**10Hrs**

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements -EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components- Causes for Disequilibrium in Balance of Payments- Correction measures.

UNIT-IV	World Trade Organization	10Hrs

Introduction – Nature, significance, functions and advantages. Organization and Structure -Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round – TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT-V	Money Markets and Capital Markets	9Hrs

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets- Reforms and recent development–SEBI–Stock Exchanges – Investor protection and role of SEBI, Introduction to international finance.

Text Books:

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13thRevisedEdition.HPH

Reference Books:

1. **K. V. Sivayya, V. B.MDas, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.**
2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India , New Delhi, India.
3. Chari.S.N, International Business, Wiley India.
4. E.Bhattacharya, International Business, Excel Publications, New Delhi.

Web References:

https://www.slideshare.net/ShompaDhali/business-environment-53111245https://www.slideshare.net/rbalsells/fiscal-policy-ppthttps://www.slideshare.net/aguness/monetary-policy-presentationppthttps://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppthttps://www.slideshare.net/viking2690/wto-ppt-60260883https://www.slideshare.net/prateeknepal3/ppt-mo

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B.tech II year II Semester

STATISTICAL METHODS FOR DATA SCIENCE (Common to CSE(DS), AI&DS, CSE(AIDS))					
Course Code	**L:T:P:C**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A3203T	**3:0:0:3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**BS**

Course Objectives:

This course will enable students to:

- Equip students with a solid foundation in statistical thinking and methodologies essential for Extracting insights from data and making data-driven decisions.

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the basic concepts of Statistics.(L2, L3)
- Analyze the data and draw conclusion about collection of data under study using Point estimation (L3, L5)
- Analyze data and draw conclusion about collection of data under study using Interval estimation. (L3)
- Analyze to test various hypotheses included in theory and types of errors for large samples. (L2, L3)
- Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.(L3, L5)

Syllabus		**Total Hours:53**
UNIT-I	**Basic Concepts**	**9Hrs**
Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Probability distributions: Binomial, Poisson and Normal-their properties. Population, sample, parameter and statistic; characteristics of a good estimator; Consistency –Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency.		
UNIT-II	**Point Estimation**	**10Hrs**
Point Estimation-Estimator, Estimate, Methods of point estimation –Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator (without proof)-applications, Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.		
UNIT-III	**Interval Estimation**	**12Hrs**

Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT-IV	Testing of hypotheses	12Hrs

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests -Application to standard distributions.

UNIT-V	Small sample tests	10Hrs

Student's t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances, Chi-square test for goodness of fit and test for independence of attributes, $\chi 2$ test for testing variance of a normal distribution.

Text Books:

1 . Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.

2 Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference –Testing of Hypotheses, Prentice Hall of India, 2014

Reference Books:

1 .S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

2. S. Ross, a First Course in Probability, Pearson Education India, 2002.

3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

4. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference, 9th edition, Pearson publishers,2013.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

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B.tech II year II Semester

ARTIFICIAL INTELLIGENCE
(Common to CSE(DS), AI&DS, AI&ML)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3301T	**3:0:0:3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**ES**

Course Objectives:

This course will enable students to:

- •The student should be made to study the concepts of Artificial Intelligence.
- • The student should be made to learn the methods of solving problems using Artificial Intelligence.
- • The student should be made to introduce the concepts of Expert Systems.
- • To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- • To learn different knowledge representation techniques

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the concepts of Artificial Intelligence.
- □ Apply searching techniques for solving a problem.
- □ Implement different knowledge representation techniques.
- □ Apply the Logic concepts of Artificial Intelligence.
- □ Implement different Learning methods used in Artificial Intelligence.

Syllabus		**Total Hours:52**
UNIT-I	**INTRODUCTION**	**9Hrs**

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II	**SEARCHING**	**12Hrs**

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT-III	**REPRESENTATION OF KNOWLEDGE**	**12Hrs**

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, Rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interference's and dempster Shafer theory.

UNIT-IV	LOGIC CONCEPTS	10Hrs

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT-V	EXPERT SYSTEMS	9Hrs

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Text Books:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

Reference Books:

1.David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence: a logical approach", Oxford University Press.
ess 2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning

Web References:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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B.tech II year II Semester

INTRODUCTION TO DATA SCIENCE
(Common to CSE(DS), AI&DS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3201T	**3:0:0:3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PC**

Course Objectives:

This course will enable students to:

- •Knowledge and expertise to become a data scientist.
- • Essential concepts of statistics and machine learning that are vital for data science;
- • Significance of exploratory data analysis (EDA) in data science.
- • Critically evaluate data visualizations presented on the dashboards
- • Suitability and limitations of tools and techniques related to data science process

Course Outcomes(CO):

On completion of this course, student will be able to

- • Understand significance of Data Science. (L2)
- • Analyze large data(L4)
- • Apply machine learning in Data Science (L3)
- • Perform Data reduction and apply visualization techniques. (L3)

Syllabus		**Total Hours:54**
UNIT-I	**INTRODUCTION**	**12Hrs**

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

UNIT-II	**HANDLING LARGE DATA**	**12Hrs**

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems

UNIT-III	**No SQL MOVEMENT FOR HANDLING BIG DATA**	**10Hrs**

Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL data bases, types of NoSQL databases, case study on disease diagnosis and profiling

UNIT-IV	TOOLS AND APPLICATIONS OF DATA SCIENCE	10Hrs
Introducing **Neo4j**for dealing with graph databases, graph query language **Cypher**, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts		
UNIT-V	**DATA VISUALIZATION AND PROTOTYPE APPLICATION DEVELOPMENT**	**10Hrs**
Data Visualization options, Cross filter, the JavaScript Map Reduce library, Creating an interactive dashboard with dc.js, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.		

Text Books:

1)Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dreamtech press, 2016

2) Prateek Gupta, "Data Science with Jupyter" BPB publishers, 2019 for basics

Reference Books:

1.Joel Grus, "Data Science From Scratch", OReilly, 2019

2) Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

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B.tech II year II Semester

DIGITAL LOGIC & COMPUTER ORGANIZATION
(Common to CSE,AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0406T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output(I/O) systems and their interaction with the CPU, memory, and peripheral devices

Course Outcomes (CO):

On completion of this course, student will be able to

- Differentiate between combinational and sequential circuits based on their characteristics and functionalities.
- Demonstrate an understanding of computer functional units.
- Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.
- Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability.
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques.
- Design Sequential and Combinational Circuits

Syllabus		Total Hours:53
UNIT-I	**Data Representation**	**12Hrs**

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT-II	Digital Logic Circuits	10Hrs

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers**:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von-

Neumann Architecture

UNIT-III	Computer Arithmetic	12Hrs

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT-IV	The Memory Organization	10Hrs

Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT-V	Input /Output Organization	10Hrs

Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces, Arbitration

Text Books:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings,11th Edition, Pearson,2022.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano,3rd Edition, Pearson,2017.
2. Computer Organization and Design, David A.Paterson, John L.Hennessy,Elsevier,2004.
3. Fundamentals of Logic Design, Roth, 5th Edition,Thomson,2003.

Web References:

https://nptel.ac.in/courses/106/103/106103068/

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B.tech II year II Semester

ARTIFICIAL INTELLIGENCE LAB
(Common to CSE, AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0525P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

•The student should be made to study the concepts of Artificial Intelligence.

• The student should be made to learn the methods of solving problems using Artificial Intelligence.

• The student should be made to introduce the concepts of Expert Systems and machine learning.

Course Outcomes(CO):

On completion of this course, student will be able to

•Understand the Mathematical and statistical prospective of machine learning algorithms through python programming (L2)

•Appreciate the importance of visualization in the data analytics solution. (L5)

•Derive insights using Machine learning algorithms (L5)

•Implement and demonstrate AI and ML algorithms. (L5)

Experiments: **Total Hours:48**

Week-1:

1. Write a Program to Implement Breadth First Search using Python.

Week-2:

2.Write a program to implement Best First Searching Algorithm

Week-3:

3.Write a Program to Implement Depth First Search using Python.

Week-4:

4.Write a program to implement the Heuristic Search

Week-5:

5.Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)

Week-6:

6.Write a Program to Implement Water-Jug problem using Python.

Week-7:

7.Write a Program to Implement Alpha-Beta Pruning using Python.

Week-8:

8.Write a Program to implement 8-Queens Problem using Python.

Week-9:

9.Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.

Week-10:

10.Write a program to implement the Unification algorithm

Week-11:

11.Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain

Week-12:

12 .Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.

Textbooks:

1. Prateek Joshi, Artificial Intelligence with Python, Packt Publishing, 2017.

2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022.

-

Reference Books:

1.Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020

2.Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition, 2018

3. R. NageswaraRao , "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

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B.tech II year II Semester

DATA SCIENCE USING PYTHON LAB
(Common to AI&DS, DS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3001P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

This course will enable students to:

•The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

Course Outcomes(CO):

On completion of this course, student will be able to

□□Apply principles and techniques for optimizing the performance of Python applications (L3)

□□Implement parallel computing applications using Python (L5)

□□Develop GPU accelerated Python applications (L6)

Experiments: **Total Hours:48**

Week-1:

1. Creating a NumPy Array

a. Basic ndarray

b. Array of zeros

c. Array of ones

d. Random numbers in ndarray

e. An array of your choice

f. I matrix in NumPy

g. Evenly spaced ndarray

Week-2:

The Shape and Reshaping of NumPy Array

a. Dimensions of NumPy array

b. Shape of NumPy array

c. Size of NumPy array

d. Reshaping a NumPy array

e. Flattening a NumPy array

f. Transpose of a NumPy array

Week-3:

Expanding and Squeezing a NumPy Array

a. Expanding a NumPy array

b. Squeezing a NumPy array
c. Sorting in NumPy Arrays
Week-4:
Indexing and Slicing of NumPy Array
a. Slicing 1-D NumPy arrays
b. Slicing 2-D NumPy arrays
c. Slicing 3-D NumPy arrays
d. Negative slicing of NumPy arrays

Week-5:
Stacking and Concatenating Numpy Arrays
a. Stacking ndarrays
b. Concatenating ndarrays
c. Broadcasting in Numpy Arrays
Week-6:
Perform following operations using pandas
a. Creating data frame
b. concat()
c. Setting conditions
d. Adding a new column
Week-7:
Perform following operations using pandas
a. Filling NaN with string
b. Sorting based on column values
c. group by()
Week-8:
Read the following file formats using pandas
a. Text files
b. CSV files
c. Excel files
d. JSON files
Week-9:
Read the following file formats
a. Pickle files
b. Image files using PIL
c. Multiple files using Glob
d. Importing data from database
Week-10:
Demonstrate web scraping using python
Week-11:
Perform following preprocessing techniques on loan prediction dataset
a. Feature Scaling
b. Feature Standardization
c. Label Encoding

d. One Hot Encoding

Week-12:

Perform following visualizations using matplotlib

a. Bar Graph

b. Pie Chart

c. Box Plot

d. Histogram

e. Line Chart and Subplots

f. Scatter Plot

Week-13:

Getting started with NLTK, install NLTK using PIP

Week-14:

Python program to implement with Python Sci Kit-Learn & NLTK

Week-15:

Python program to implement with Python NLTK/Spicy/Py NLPI.

Web References:

1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-datascience-beginners/

2. https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutesguide-to-key-concepts/

3. https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formatspython/

4. https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessingpython-scikit-learn/

5. https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-datavisualization-exploration-python/6.

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B.tech II year II Semester

FULL STACK DEVELOPMENT–1
(Skill Enhancement Course)
(Common to CSE,AI&ML,AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0516P	0:1:2:2	2	CIE:30 SEE:70	3 Hours	SEC

Course Objectives:

This course will enable students to:

- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with Java Script to develop dynamic web pages and validate forms

Course Outcomes(CO):

On completion of this course, student will be able to

- CO1:Design Websites.(L6)
- CO2: Apply Styling to web pages.(L4)
- CO3: Make Web pages interactive. (L6)
- CO4:Design Forms for applications.(L6)
- CO5:Choose Control Structure based on the logic to be implemented.(L3)
- CO6: Understand HTMLtags, Attributes and CSS properties(L2)

Experiments: **Total Hours:48**

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.
Note: It should have an ordered list, un ordered list, nested lists and ordered list in an un ordered list and definition lists.

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page,the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

- Write a HTML program, to explain the working of tables.(use tags:<table>,<tr>,<th>, <td>and attributes: border, row span, col span)
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspanetc.).

- Write a HTML program, to explain the working of forms by designing Registration form.(Note: Include text field, password field, number field, date of birth field, check boxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame □ hyper link. And also make sure of using "no frame" attribute such that frames to be fixed).

3. HTML5 and Cascading Style Sheets, Types of CSS

a. Write a HTML program, that makes use of<article>,<aside>,<figure>,<figcaption>, <footer>,<header>,<main>,<nav>,<section>, ,tags.
b. Write a HTML program, to embed audio and video in to HTML web page.
c. Write a program to apply different types(or levels of styles or style specification formats) -in line, internal, external styles to HTML elements.(identify selector, property and value).

4. Selector forms

a. Write a program to apply different types of selector forms
   - Simple selector(element, id, class, group, universal)
   - Combinator selector(descendant,child,adjacent sibling,general sibling)
   - Pseudo-class selector
   - Pseudo-element selector
   - Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a back ground image half way down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. Write a program using the following terms related to CSS font and text:
   i.font-size ii. Font-weight iii. font-style
   iv. text-decoration v. text-transformation vi. text-alignment
d. Write a program to explain the importance of CSS Box model using
   i.Content ii. Border iii. Margin iv. padding

6. Applying Java Script-internal and external, I/O, Type Conversion

a. Write a program to embed internal and external Java Script in a web page.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a web page which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. Java Script Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.

f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors an display.

8. Java Script Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Writeaprogramtoprint1to10numbersusingfor, while and do-while loops.
d. Write a program to print data in object using for-in, for-each and for-of loops
e. Develop a program to determine whether a given number is an'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13+53+33= 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's,1-50's,1-10's,1-2's &1-1's)

9. Java script Functions and Events

a. Design a appropriate function should be called to display
   - Factorial of that number
   - Fibonacci series up to that number
   - Prime numbers up to that number
   - Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
   11. Factorial of that number
   12. Fibonacci series up to that number
   13. Prime numbers up to that number
   14. Is it palindrome or not

c. Write a program to validate the following fields in a registration page
   i. Name (start with alphabet and followed by alphanumeric and the length should not be less than6characters)
   ii. Mobile(onlynumbersandlength10digits)
   iii. E-mail(should contain format like xxxxxxx@xxxxxx.xxx)

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML5 and Cascading Style Sheets, Types of CSS
- Select or forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying Java Script-internal and external, I/O, Type Conversion
- Java Script Conditional Statements and Loops, Pre-defined and User-defined Objects

- Java Script Functions and Events
- Node.js

Text Books:

1. Programming the World Wide Web, 7thEdition, Robet WSebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and Java Script, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web References:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

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B.tech II year II Semester

DESIGN THINKING FOR INNOVATION (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	**L: T:P:C**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
23A0413T	**1:0:2:2**	**2**	**CIE:30 SEE:70**	**3 Hours**	**BS**

Course Objectives:

This course will enable students to:

The objective of this course is to familiarize students with design thinking process as a tool for break through innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes (CO):

On completion of this course, student will be able to

- Define the concepts related to design thinking.(L1,L2)
- Explain the fundamentals of Design Thinking and innovation(L1,L2)
- Apply the design thinking techniques for solving problems in various sectors.(L3)
- Analyse to work in a multi-disciplinary environment(L4)
- Evaluate the value of creativity(L5)
- Formulate specific problem statements of real time issues(L3,L6)

Syllabus		**Total Hours:48**
UNIT-I	**Introduction to Design Thinking**	**9Hrs**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT-II	**Design Thinking Process**	**10Hrs**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT-III	**Innovation**	**10Hrs**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT-IV	**Product Design**	**10Hrs**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications-Innovation towards product design-Case studies
Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT-V	Design Thinking in Business Processes	9Hrs

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business–Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups-Defining and testing Business Models and Business Cases-Developing& testing prototypes.
Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Text Books:

1. Tim Brown, Change by design, Harper Bollins(2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013,JohnWiley&Sons.

Reference Books:

1. David Lee, Design Thinking in the Class room, Ulyssespress
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design-Kritinaholden, Jill Butter.
4. Chesbrough.H,TheEraofOpenInnovation–2013

Web References:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

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B.tech II year II Semester

COMMUNITY SERVICE PROJECT
Experiential learning through community engagement
(Common to CSE,AI&ML, AI&DS, DS,CS)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3006	0:0:0:2	2	CIE:30 SEE:70	-	-

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastage's and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.

- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like-youth, women, house wives, etc
- A log book must be maintained by each of the students, where the activities under taken/involved to be recorded.
- The log book has to be counter signed by the concerned mentor/faculty incharge.
- Anevaluationtobedonebasedontheactiveparticipationofthestudentandgradecouldbeawardedbythemento r/facultymember.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/ NCC/Green Corps/Red Ribbon Club,etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/on the job training.

Procedure

- A group of student or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one–
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/ scould take up a social activity, concerning their domain or subject area. The different areas, could be like–
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law &Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in " the real world"
- Positive impact on academic out comes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

Greater sense of personal efficacy, personal identity, spiritual growth, and moral development

Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizen ship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leader ship skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFIT OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aquaculture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture

28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level-observation.

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program(Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality/Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch(Sexual abuse)
7. Awareness Program on Socially relevant themes. Programs for

Women Empowerment

1. Government Guide lines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes

12. Commemoration and Celebration of important days Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like–
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law &Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.

program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity	

1. **Preliminary Survey(One Week)**
    - A preliminary survey including the socioeconomic conditions of the allotted habitation to be conducted.
    - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty.(However, a template could be designed for different habitations, rural/urban.
    - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.
2. **Community Awareness Campaigns (One Week)**
    - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken in to consideration.
3. **Community Immersion Programme (Three Weeks)**

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**
    - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be counter signed by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.