



**GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY  
(AUTONOMOUS)**

**NELLORE-524317(A.P)INDIA**

**B.TECH.(Regular-Fulltime)  
ARTIFICIAL INTELLIGENCE & DATA SCIENCE  
COURSE STRUCTURE  
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 (D), 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)

Graduates of B.Tech in Artificial Intelligence & Data Science Program shall be able 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 a 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

## PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

- PO1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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 consequent responsibilities relevant to the professional engineering practice.
- PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Program Specific Outcomes

- PSO1:** Apply Artificial Intelligence and Data Science methodologies to gain useful insights 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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E-Mail: geethanjali@gist.edu.in. Website: www.gist.edu.in

**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	BasicElectricalandElectronicsEn gineering	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
<b>Total</b>							<b>20.5</b>

Category	CREDITS
BasicSciencecourse(BS)	7.5
EngineeringScienceCourses(ES)	13
Humanitiesandsocialscience(HSMC)	-
<b>TOTALCREDITS</b>	<b>20.5</b>

I. Shalini  
Member Secretary

PBL

HEAD OF THE DEPARTMENT  
Department of AI & DS  
GEETHANJALI INSTITUTE OF SCIENCE  
& TECHNOLOGY (AUTONOMOUS)  
SPSR Nellore



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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
<b>TotalCredits</b>							<b>19.5</b>

Category	CREDITS
Basic Science Course(BS)	8.5
Engineering Science Course(ES)	6.5
ProfessionalCoreCourse(PC)	4.5
<b>TOTALCREDITS</b>	<b>19.5</b>

*S. Shalini*  
Member Secretary

*P@L*  
HEAD OF THE DEPARTMENT  
Department of AI & DS  
GEETHANJALI INSTITUTE OF SCIENCE  
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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	<b>Skill Enhancement Course</b> Python programming	0	1	2	2
9	MC	23A0109T	<b>Audit Course</b> Environmental Science	2	0	0	-
<b>TotalCredits</b>							<b>20</b>
<b>Category</b>				<b>CREDITS</b>			
Basic Science Course(BS)				3			
Professional Core Courses(PC)				12			
Humanities and Science Course(HS)				3			
Skill Enhancement Course(SEC)				2			
Audit Course(MC)				-			
<b>TOTALCREDITS</b>				<b>20</b>			

I. Shalini  
Member Secretary

  
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 Department of AI & DS  
 GEETHANJALI INSTITUTE OF SCIENCE  
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## B.Tech. II Year II Semester

SL. No	Category	CourseCode	CourseName	Hoursperweek			Total Credits
				L	T	P	
1	HM	23A0022T 23A0023T 23A0024T	<b>Management Course- I</b> 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	<b>Skill Enhancement Course</b> Full Stack Development-1	0	1	2	2
9	BS&HC	23A0413T	Design Thinking & Innovation	1	0	2	2
<b>Total Credits</b>							<b>21</b>

**Mandatory Community Service Project Internship of 06 to 08 weeks duration during summer 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
<b>TOTAL CREDITS</b>	<b>21</b>

I. Shalini  
Member Secretary

P. S. L.

HEAD OF THE DEPARTMENT  
Department of AI & DS  
GEETHANJALI INSTITUTE OF SCIENCE  
& TECHNOLOGY (AUTONOMOUS)  
SPPB



# **GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY (AUTONOMOUS)**

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## **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.
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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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- **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

### **Program Specific Outcomes**

- O1:** Apply Artificial Intelligence and Data Science methodologies to gain useful insights to find effective solutions to challenging real-life problems.
- O2:** Design and formulate innovative AI based software applications to match the needs and demands of industry and society.

## Program Outcomes

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
<b>PO3</b>	<b>Design/development of solutions:</b> 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.
<b>PO4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO5</b>	<b>Modern tool usage:</b> 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.
<b>PO6</b>	<b>The engineer and society:</b> 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.
<b>PO7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development
<b>PO8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
<b>PO10</b>	<b>Communication:</b> 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.
<b>PO11</b>	<b>Project management and finance:</b> 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.
<b>PO12</b>	<b>Life-long learning:</b> 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
<b>Total Credits</b>							<b>0</b>



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<b>B.tech I year I Semester (Theory-5, Lab-4)</b>							
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
<b>Total</b>				<b>13</b>	<b>00</b>	<b>15</b>	<b>20.5</b>

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





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### B.tech I year I Semester

<b>ENGINEERING PHYSICS</b> (Common to all branches)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0003T</b>	<b>3:0: 0:0</b>	<b>3</b>	<b>CIE: 30 EE:70</b>	<b>3Hours</b>	<b>BS</b>
<b>Prerequisite:</b> Student should know about fundamental and basic principles in physics					
<b>Course Objectives:</b> 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.					
<b>Course Outcomes:</b> 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.					
<b>SYLLABUS</b>					<b>Total Hours:48</b>
<b>Unit- I</b>	<b>WAVEOPTICS</b>				<b>10Hrs</b>
<b>Interference:</b> 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. <b>Diffraction:</b> 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). <b>Polarization:</b> Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction-Nicol’s Prism-Half wave and Quarter wave plates					
<b>Unit- II</b>	<b>CRYSTALLOGRAPHY AND X-RAY DIFFRACTION</b>				<b>8Hrs</b>
<b>Crystallography:</b> 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. <b>X-ray diffraction:</b> Bragg’s law - X-ray Diffracto meter – crystal structure determination by Laue’s and powder methods.					
<b>Unit- III</b>	<b>DIELECTRICAND MAGNETICMATERIALS</b>				<b>10Hrs</b>
<b>Dielectric Materials:</b> 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					

<p><b>Magnetic Materials:</b> Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro &amp; Ferri magnetic materials-Domain concept for Ferromagnetism &amp; Domain walls (Qualitative)-Hysteresis-soft and hard magnetic materials</p>		
<b>Unit- IV</b>	<b>QUANTUM MECHANICS AND FREE ELECTRON THEORY</b>	<b>10Hrs</b>
<p><b>Quantum Mechanics:</b> 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.</p> <p><b>Free Electron Theory:</b> 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.</p>		
<b>Unit- V</b>	<b>SEMI CONDUCTORS</b>	<b>10Hrs</b>
<p><b>Semiconductors:</b> 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.</p> <p><b>Superconductors-</b> Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors–BCS theory–High T<sub>c</sub> superconductors–Applications of super conductors</p>		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. A Textbook of Engineering Physics-M.N.Avadhanulu,P.G.Kshirsagar&amp;TVS ArunMurthy, S.Chand Publications, 11th Edition 2019.</li> <li>2. Engineering Physics-D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).</li> <li>3. Engineering Physics–K.Thyagarajan, McGraw Hill Publishers</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Physics-B.K.Pandey and S.Chaturvedi, Cengage Learning</li> <li>2. Engineering Physics-Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.</li> <li>3. Engineering Physics”-Sanjay D. Jain, D.Sahasrabudhe and Girish, University Press.</li> <li>4. Engineering Physics-M.R.Srinivasan, New Age international publishers (2009).</li> </ol>		
<p><b>E-resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.textbooks.com/Catalog/MG5/Applied-Physics.php">https://www.textbooks.com/Catalog/MG5/Applied-Physics.php</a></li> <li>• <a href="https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs">https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs</a></li> <li>• <a href="https://libguides.ntu.edu.sg/c.php?g=867756&amp;p=6226561">https://libguides.ntu.edu.sg/c.php?g=867756&amp;p=6226561</a></li> <li>• <a href="https://bookauthority.org/books/best-applied-physics-books">https://bookauthority.org/books/best-applied-physics-books</a></li> <li>• <a href="https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2">https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2</a></li> </ul>		



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### B.tech I year I Semester

<b>LINEAR ALGEBRA &amp; CALCULUS</b> (Common to All Branches of Engineering)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0001T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>BS</b>
<b>Course Objectives:</b>					
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.					
<b>Course Outcomes:</b> 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.					
<b>Syllabus</b>					<b>TotalHours:45</b>
<b>Unit-I</b>	<b>MATRICES</b>				<b>9Hrs</b>
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.					
<b>Unit-II</b>	<b>EIGENVALUES, EIGENVECTORS AND ORTHOGONAL TRANSFORMATION</b>				<b>9Hrs</b>
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.					
<b>Unit-III</b>	<b>CALCULUS</b>				<b>9Hrs</b>
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.					
<b>Unit-IV</b>	<b>PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS)</b>				<b>9Hrs</b>
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.					
<b>Unit-V</b>	<b>MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)</b>				<b>9Hrs</b>
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

<b>BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING</b> (Common to All branches of Engineering)					
Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
<b>23A02101T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 &amp; SEE:70</b>	<b>3 Hours</b>	<b>ES</b>
<b>Course Objectives:</b>					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> <li>• To expose to the field of electrical &amp; electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.</li> </ul>					
<b>Course Outcomes (CO):</b>					
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					
<b>Syllabus</b>		<b>PART A: BASIC ELECTRICAL ENGINEERING</b>			<b>Total Hours: 48</b>
<b>Unit-I</b>	<b>DC &amp; AC Circuits</b>				<b>10Hrs</b>
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).					
<b>Unit-II</b>	<b>MACHINES AND MEASURING INSTRUMENTS</b>				<b>8Hrs</b>
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.					
<b>Unit -III</b>	<b>ENERGY RESOURCES, ELECTRICITY BILL &amp; SAFETY MEASURES</b>				<b>6Hrs</b>
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. Bhattacharya, 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.

CO4: 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 INSTRUMENTATION	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, 4<sup>th</sup>Edition,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

<b>ENGINEERING GRAPHICS</b> (Common to All Branches of Engineering)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0301T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>ES</b>
<b>Course Objectives:</b>					
The students completing the course are expected to:					
<ul style="list-style-type: none"> <li>•To introduce the fundamental concepts of machine learning algorithms and their practical relevance.</li> <li>•To explore supervised, unsupervised, semi-supervised, and reinforcement learning techniques.</li> <li>•To equip students with algorithmic and mathematical intuition behind ML models.</li> <li>•To train students in using tools and frameworks for implementing ML models.</li> <li>•To enable application of ML algorithms to solve real-world problems in various domains</li> </ul>					
<b>Course Outcomes:</b> 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: Understand and apply concepts of sectional views to represent details of solids in simple 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: Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.					
<b>Syllabus</b>					<b>Total Hours:45</b>
<b>Unit-I</b>	<b>INTRODUCTION</b>				<b>9Hrs</b>
Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.					
<b>Curves:</b> construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent to Curves.					
<b>Scales:</b> Plain scales, diagonal scales and vernier scales.					
<b>Unit-II</b>	<b>ORTHOGRAPHIC PROJECTIONS</b>				<b>9Hrs</b>
Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.					
<b>Projections of Straight Lines:</b> 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					
<b>Projections of Planes:</b> 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.					
<b>Unit-III</b>	<b>PROJECTIONS OF SOLIDS</b>				<b>9Hrs</b>
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.					

<b>Unit-IV</b>	<b>SECTIONS OF SOLIDS</b>	<b>9Hrs</b>
<p>Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.</p> <p><b>Development of Surfaces:</b> Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone</p>		
<b>Unit-V</b>	<b>CONVERSION OF VIEWS</b>	<b>9Hrs</b>
<p>Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.</p> <p><b>Computer graphics:</b> Creating 2D&amp;3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).</p>		
<p><b>Textbooks:</b></p> <p>1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.</p>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill,2013.</li> <li>2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson EducationInc,2009.</li> <li>3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill,2017.</li> </ol>		



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### B.tech I year I Semester

<b>INTRODUCTION TO PROGRAMMING (Common to All Branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A05101T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>ES</b>
<b>Course Objectives:</b>					
The students completing the course are expected to: <ul style="list-style-type: none"> <li>• To introduce students to the fundamentals of computer programming.</li> <li>• To provide hands-on experience with coding and debugging.</li> <li>• To foster logical thinking and problem-solving skills using programming.</li> <li>• To familiarize students with programming concepts such as data types, control structures, functions and arrays.</li> <li>• To encourage collaborative learning and team work in coding projects</li> </ul>					
<b>Course Outcomes:</b> 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: Develop problem-solving skills and the ability to debug and optimize the code.					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING</b>				<b>10Hrs</b>
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.					
<b>Unit-II</b>	<b>CONTROL STRUCTURES</b>				<b>8Hrs</b>
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.					
<b>Unit-III</b>	<b>ARRAYS AND STRINGS</b>				<b>10Hrs</b>
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings					
<b>Unit-IV</b>	<b>POINTERS &amp; USER DEFINED DATA TYPES</b>				<b>10Hrs</b>
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.					
<b>Unit-V</b>	<b>FUNCTIONS &amp; FILE HANDLING</b>				<b>10Hrs</b>

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 & quot;, 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 TeX and 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 Anfinson 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

<b>ENGINEERING PHYSICS LAB</b>					
<b>(Common to All Branches of Engineering)</b>					
Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0006P</b>	<b>0:0:2:0</b>	<b>1</b>	<b>CIE: 30 EE:70</b>	<b>3Hours</b>	<b>BS</b>
<b>Prerequisite:</b> Student should know about fundamental and basic principles in physics					
<p><b>Course Objectives:</b> 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.</p>					
<p><b>Course Outcomes:</b> 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.</p>					
<b>SYLLABUS</b>					<b>Total Hours : 32</b>
<b>List of Experiments:</b>					
<ol style="list-style-type: none"> <li>1. Determination of radius of curvature of a given plane convex lens by Newton's rings.</li> <li>2. Determination of wave lengths of different spectral lines in mercury spectrum using Diffraction grating in normal incidence configuration.</li> <li>3. Verification of Brewster's law</li> <li>4. Determination of wave length of Laser light using diffraction grating.</li> <li>5. Estimation of Planck's constant using photo electric effect.</li> <li>6. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.</li> <li>7. Determination of dielectric constant using charging and discharging method.</li> <li>8. Study the variation of B versus H by magnetizing the magnetic material(B-Hcurve).</li> <li>9. Determination of magnetic susceptibility by Kundt's tube method.</li> <li>10. Determination of the resistivity of semiconductors by four probe methods.</li> <li>11. Determination of energy gap of a semiconductor using p-n junction diode.</li> <li>12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.</li> <li>13. Determination of temperature coefficients of a thermistor.</li> <li>14. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.</li> <li>15. Determination of young's modulus for the given material of woodenscale by non-uniform bending (or double cantilever) method.</li> <li>16. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.</li> <li>17. Sonometer : Verification of laws of stretched string.</li> <li>18. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.</li> </ol>					

**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](http://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

<b>COMPUTER PROGRAMMING LAB</b> (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
<p><b>Course Objectives:</b> The course aims to give students hands – on experience and train them on the concepts of the C-programming language.</p>					
<p><b>Course Outcomes:</b> 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.</p>					
<b>SYLLABUS</b>					<b>Total Hours : 45</b>
<p><b>UNIT I</b></p> <p><b>WEEK 1</b></p> <p><b>Objective:</b> Getting familiar with the programming environment on the computer and writing the first program.</p> <p><b>Suggested Experiments/Activities:</b></p> <p><b>Tutorial 1:</b> Problem-solving using Computers.</p> <p><b>Lab1:</b> Familiarization with programming environment</p> <ol style="list-style-type: none"> <li>I. Basic Linux environment and its editors like Vi, Vim &amp; Emacs etc.</li> <li>II. Exposure to Turbo C, gcc</li> <li>III. Writing simple programs using printf(), scanf()</li> </ol> <p><b>WEEK 2</b></p> <p><b>Objective:</b> 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.</p> <p><b>Suggested Experiments /Activities:</b></p> <p><b>Tutorial 2:</b> Problem-solving using Algorithms and Flow charts.</p> <p><b>Lab 1:</b> Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs</p> <ol style="list-style-type: none"> <li>i) Sum and average of 3 numbers</li> <li>ii) Conversion of Fahrenheit to Celsius and vice versa</li> <li>iii) Simple interest calculation</li> </ol> <p><b>WEEK 3</b></p> <p><b>Objective:</b> 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.</p> <p><b>Suggested Experiments/Activities:</b></p> <p><b>Tutorial 3:</b> Variable types and type conversions:</p>					

**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:**

**Tutorial 4:** Operators and the precedence and as associativity:

**Lab 4:** Simple computational problems using the operator's 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 be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

#### **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 and for 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 on 1D 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
<b>23ANS01P</b>	<b>0: 0: 1: 0</b>	<b>0.5</b>	100	-	
<b>Course Objectives:</b>					
The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service					
<b>Course Outcomes(CO):</b>					
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.					
<b>Syllabus</b>					
<b>Module-I</b>		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					
<b>Module-II</b>		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.					
<b>Module-III</b>		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					
<b>Reference Books:</b>					

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>B.Tech. – I Year II Semester (Theory-5, Lab-4)</b>							
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
<b>Total</b>				<b>14</b>	<b>00</b>	<b>11</b>	<b>19.5</b>

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



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### B.tech I year II Semester

<b>COMMUNICATIVE ENGLISH</b> (Common to all Branches of Engineering)					
Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
<b>23A0009T</b>	<b>2: 0: 0: 0</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>BS</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• Facilitate effective <b>listening skills</b> for better comprehension of academic lectures and English spoken by native speakers</li> <li>• Help improve <b>speaking skills</b> motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations</li> <li>• Focus on appropriate <b>reading skills</b> for comprehension of various academic texts and authentic materials</li> <li>• Impart effective strategies for good <b>writing skills</b> in summarizing, writing well organized essays, drafting formal letters and designing well-structured reports</li> <li>• Broaden the knowledge base of <b>grammatical structures</b> and <b>vocabulary</b> and encourage their appropriate use in speech and writing</li> </ul>					
<b>Course Outcomes(CO):</b>					
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					
<b>Syllabus</b>					<b>Total Hours:32</b>
<b>Module-I</b>	<b>HUMAN VALUES: Gift of Magi (Short Story)</b>				<b>8Hrs</b>
<p><b>Listening:</b> Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.</p> <p><b>Speaking:</b> Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.</p> <p><b>Reading:</b> Skimming to get the main idea of a text Scanning to look for specific pieces of information.</p> <p><b>Writing:</b> Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.</p> <p><b>Grammar:</b> Parts of Speech, Basic Sentence Structures-forming questions</p> <p><b>Vocabulary:</b> Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.</p>					
<b>Module-II</b>	<b>The Brook by Alfred Tennyson (Poem)</b>				<b>7Hrs</b>
<p><b>Listening:</b> Answering a series of questions about main idea and supporting ideas after listening to audio texts.</p> <p><b>Speaking:</b> Discussion in pairs/small groups on specific topics followed by shortstructured talks.</p> <p><b>Reading:</b> Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.</p> <p><b>Writing:</b> Structure of a paragraph - Paragraph writing (specific topics)</p>					

**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](http://www.bbc.co.uk/learningenglish)

2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. [www.eslpod.com/index.html](http://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](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)



## GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY (AUTONOMOUS)

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### B.tech I year II Semester

<b>CHEMISTRY</b> (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
<b>Prerequisite: Student should know fundamental concepts about Engineering Chemistry</b>					
<b>Course Objectives:</b> This course will enable students to: <ul style="list-style-type: none"> <li>• To familiarize engineering chemistry and its applications</li> <li>• To impart the concept of soft and hard waters, softening methods of hard water</li> <li>• To train the students on the principles and applications of electrochemistry, polymers, and cement</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>WATER TECHNOLOGY</b>				<b>10Hrs</b>
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: <b>Zeolite process</b> , 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					
<b>Unit-II</b>	<b>ELECTROCHEMISTRYANDAPPLICATIONS</b>				<b>10Hrs</b>
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).					
<b>Unit-III</b>	<b>POLYMERS AND FUEL CHEMISTRY</b>				<b>10Hrs</b>
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.					
<b>Unit-IV</b>	<b>MODERN ENGINEERING MATERIALS</b>				<b>8Hrs</b>
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).

<b>Unit-V</b>	<b>SURFACE CHEMISTRY AND NANOMATERIALS</b>	<b>9Hrs</b>
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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. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Juliode Paula and James Keeler, Atkins' Physical chemistry, 10/e, Oxford University Press, 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, Thomas Telford Publications, 1997.
3. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heinemann, 1992.



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### B.tech I year II Semester

<b>DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to All Branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0002T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>ES</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To enlighten the learners in the concept of differential equations and multivariable calculus.</li> <li>• 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.</li> </ul>					
<b>Course Outcomes:</b> 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: Identify solution methods for partial differential equations that model physical processes.					
CO4: Interpret the physical meaning of different operator's such as gradient, curl and divergence.					
CO5: Apply Green's, Stokes and Divergence theorem in work done, circulation, flux and triple integrals.					
<b>Syllabus</b>					<b>Total Hours: 45</b>
<b>Unit-I</b>	<b>DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE</b>				<b>9Hrs</b>
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.					
<b>Unit-II</b>	<b>LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)</b>				<b>9Hrs</b>
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.					
<b>Unit-III</b>	<b>PARTIAL DIFFERENTIAL EQUATIONS</b>				<b>9Hrs</b>
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.					
<b>Unit-IV</b>	<b>VECTOR DIFFERENTIATION</b>				<b>9Hrs</b>
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.					
<b>Unit-V</b>	<b>VECTOR INTEGRATION</b>				<b>9Hrs</b>
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					
<b>Textbooks:</b>					
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

<b>BASIC CIVIL &amp; MECHANICAL ENGINEERING</b> (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
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• Get familiarized with the scope and importance of Civil Engineering sub-divisions</li> <li>• Introduce the preliminary concepts of surveying.</li> <li>• Acquire preliminary knowledge on Transportation and its importance in nation's economy.</li> <li>• Get familiarized with the importance of quality, conveyance and storage of water</li> <li>• Introduction to basic civil engineering materials and construction techniques</li> </ul>					
<b>Syllabus</b>	<b>PART-A</b>				<b>Total Hours:24</b>
<b>Unit-I</b>					<b>8Hrs</b>
<p><b>Basics of Civil Engineering:</b> Role of Civil Engineers in Society- Various Disciplines of Civil Engineering-Structural Engineering-Geo-technical Engineering-Transportation Engineering Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline-Building Construction and Planning-Construction Materials-Cement-Aggregate-Bricks-Cement concrete-Steel.Introduction to Prefabricated construction Techniques</p>					
<b>Unit-II</b>					<b>8Hrs</b>
<p><b>Fluid Mechanics:</b> Properties of fluids and types of fluids. <b>Surveying:</b> Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Leveling instruments used for leveling -Simple problems on leveling and bearings-Contour mapping</p>					
<b>Unit-III</b>					<b>8Hrs</b>
<p><b>Transportation Engineering</b> 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. <b>Water Resources and Environmental Engineering:</b> Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology-Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).</p>					
<b>Text Books:</b>					
<ol style="list-style-type: none"> <li>1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.</li> <li>2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.</li> <li>3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition</li> </ol>					
<b>Reference Books:</b>					

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. 38<sup>th</sup>Edition.
4. Highway Engineering, S.K.Khanna, C.E.G.Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10<sup>th</sup>Edition.
5. Indian Standard DRINKING WATER—SPECIFICATION IS 10500-2012.

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.

<b>Syllabus</b>		<b>Total Hours: 24</b>
<b>Unit-I</b>		<b>8Hrs</b>

**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.

<b>Unit-II</b>		<b>8Hrs</b>
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**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.

<b>Unit-III</b>		<b>8Hrs</b>
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**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 dequeues 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
<b>Unit-I</b>	INTRODUCTION TO LINEAR DATA STRUCTURES	<b>9Hrs</b>
	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	
<b>Unit-II</b>	LINKED LISTS	<b>9Hrs</b>
	Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.	
<b>Unit-III</b>	STACKS	<b>9Hrs</b>
	Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.	
<b>Unit-IV</b>	QUEUES	<b>9Hrs</b>
	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 dequeues (double-ended queues), Operations on dequeues and their applications.	
<b>Unit-V</b>	TREES	<b>9Hrs</b>

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

<b>COMMUNICATIVE ENGLISH LAB (Common to all Branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0010P</b>	<b>0 : 0: 2:0</b>	<b>1</b>	<b>CIE: 30 SEE:70</b>	<b>3Hours</b>	<b>BS</b>
<p><b>Course Objectives:</b> 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.</p>					
<p><b>Course Outcomes:</b> 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 &amp; email writing CO4: Create effective resonate and prepare themselves to face interviews in future</p>					
<b>List of Experiments</b>					<b>Total Hours : 32</b>
<ol style="list-style-type: none"> <li>1. Vowels &amp; Consonants</li> <li>2. Neutralization/ Accent Rules</li> <li>3. Communication Skills &amp; Jam</li> <li>4. Role Play Or Conversational Practice</li> <li>5. Email Writing</li> <li>6. Resume Writing, Cover Letter, Sop</li> <li>7. Group Discussion-Methods &amp; Practice</li> <li>8. Debate - Method &amp; Practice</li> <li>9. PPT Presentation / Poster Presentation</li> <li>10. Interview Skills</li> </ol>					
<b>Suggested Software:</b> Walden Infotech / Young India Films					
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.</li> <li>2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016</li> <li>3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.</li> <li>4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students,(3rd Ed) Trinity Press.</li> </ol>					
<p><b>Online Learning Resources/Virtual Labs:</b> Spoken English:</p> <ol style="list-style-type: none"> <li>1. <a href="http://www.esl-lab.com">www.esl-lab.com</a></li> <li>2. <a href="http://www.englishmedialab.com">www.englishmedialab.com</a></li> </ol>					

3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](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](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](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp\\_IA](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
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• To Verify the fundamental concepts with experiments</li> </ul>					
<b>Course Outcomes(CO):</b>					
At the end of the course, the students will be able to					
CO1: Determine the cell constant and conductance 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.					
<b>Syllabus</b>					<b>Total Hours:32</b>
<b>List of Experiments</b>					
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					
<b>Reference Books</b>					
1. "Vogel's Quantitative Chemical Analysis 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar					



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### B.tech I year II Semester

<b>ENGINEERING WORKSHOP (Common to All branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0302P</b>	<b>0 : 0: 3:0</b>	<b>1.5</b>	<b>CIE: 30 SEE:70</b>	<b>3Hours</b>	<b>ES</b>
<p><b>Course Objectives:</b> To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.</p>					
<p><b>Course Outcomes:</b> 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.</p>					
<b>SYLLABUS</b>					<b>Total Hours : 42</b>
<ol style="list-style-type: none"> <li>1. Demonstration: Safety practices and precautions to be observed in workshop.</li> <li>2. Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints.</li> <li>3. Half – Lap joint      b) Mortise and Tenon joint      c) Corner Dovetail joint or Bridle joint</li> <li>4. Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.</li> <li>5. Tapered tray b) Conical funnel      c) Elbow pipe d) Brazing</li> <li>6. Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises.</li> <li>7. V-fit b) Dovetail fit c) Semi-circular fit      d) Bicycle tire puncture and change of two-wheeler tyre</li> <li>8. Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections.</li> <li>9. Parallel and series      b) Two-way switch      c) Godown lighting</li> <li>10. d) Tube light e) Three phase motor f) Soldering of wires</li> <li>11. Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.</li> <li>12. Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.</li> <li>13. Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.</li> </ol>					
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.</li> <li>2. A Course in Workshop Technology Vol I. &amp; II, B.S. Raghuwanshi, Dhanpath Rai &amp; Co., 2015 &amp; 2017</li> </ol>					
<b>Reference Books:</b>					

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.

<b>Syllabus</b>	<b>TotalHours:48</b>
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**Note:** Students have to perform any 10 of 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.

Exercise 8: 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):**

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

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

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

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

<b>HEALTH AND WELLNESS, YOGA AND SPORTS</b> (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
<b>Course Objectives:</b>					
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.					
<b>Course Outcomes(CO):</b>					
On completion of this course, student will be able to					
<b>CO1:</b> Understand the importance of yoga and sports for Physical fitness and sound health.					
<b>CO2:</b> Demonstrate an understanding of health-related fitness components.					
<b>CO3:</b> Compare and contrast various activities that help enhance their health.					
<b>CO4:</b> Assess current personal fitness levels.					
<b>CO5:</b> Develop Positive Personality					
<b>Syllabus</b>					
<b>Module-I</b>					
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					
<b>Module-II</b>					
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					
<b>Module-III</b>					
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.					
<b>Reference Books:</b>					
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	
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	<b>Skill Enhancement Course</b> Python programming	0	1	2	2
9	MC	23A0109T	<b>Audit Course</b> Environmental Science	2	0	0	-
<b>Total</b>				<b>16</b>	<b>2</b>	<b>8</b>	<b>20</b>

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)	-
<b>Total</b>	<b>20</b>

*I. Shalini*  
Member Secretary

*P. S. L.*  
**HEAD OF THE DEPARTMENT**  
Department of AI & DS  
GEETHANJALI INSTITUTE OF SCIENCE  
& TECHNOLOGY (AUTONOMOUS)  
SPSR Nellore



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### B.tech II year I Semester

<b>DISCRETE MATHEMATICS &amp; GRAPH THEORY</b> (Common to CSE, AI&ML, AI&DS, DS, CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0015T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>BS</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• Introduce the concepts of mathematical logic</li> <li>• Introduce the concepts of sets, relations, and functions.</li> <li>• Perform the operations associated with sets, functions, and relations.</li> <li>• Introduce generating functions and recurrence relations.</li> <li>• Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.</li> <li>• Use Graph Theory for solving problems.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Apply mathematical logic to solve problems.</li> <li>• Understand the concepts and perform the operations related to sets, relations and functions.</li> <li>• Gain the conceptual background needed and identify structures of algebraic nature.</li> <li>• Apply basic counting techniques to solve combinatorial problems.</li> <li>• Formulate problems and solve recurrence relations.</li> <li>• Apply Graph Theory in solving computer science problems</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:56</b>
<b>UNIT-I</b>	<b>Mathematical Logic</b>				<b>10Hrs</b>
<b>Mathematical Logic:</b> 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					
<b>UNIT-II</b>	<b>Set theory and algebraic structures</b>				<b>14Hrs</b>
<b>Set theory:</b> 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. <b>Algebraic structures:</b> Algebraic Systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.					
<b>UNIT-III</b>	<b>Elementary Combinatory</b>				<b>10Hrs</b>

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 Combinatorics and Graph Theory, 7th Edition, 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
<b>23A0021T</b>	<b>2:1:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>HM</b>

#### 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 life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a 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
<b>UNIT-I</b>	<b>Introduction to Value Education (6 lectures and 3 tutorials for practice session)</b>	<b>9Hrs</b>
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)		
Lecture 2: Understanding Value Education		

<p>Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: self-exploration as the Process for Value Education</p> <p>Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations</p> <p>Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario</p> <p>Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance</p>		
<b>UNIT-II</b>	<b>Harmony in the Human Being (6 lectures and 3 tutorials for practice session)</b>	<b>10Hrs</b>
<p>Lecture 7: Understanding Human being as the Co-existence of the self and the body.</p> <p>Lecture 8: Distinguishing between the Needs of the self and the body</p> <p>Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.</p> <p>Lecture 9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self</p> <p>Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body</p> <p>Lecture 12: Programme to ensure self-regulation and Health</p> <p>Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body</p>		
<b>UNIT-III</b>	<b>Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)</b>	<b>10Hrs</b>
<p>Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship</p> <p>Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation</p> <p>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</p> <p>Lecture 18: Vision for the Universal Human Order</p> <p>Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal.</p>		
<b>UNIT-IV</b>	<b>Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)</b>	<b>10Hrs</b>
<p>Lecture 19: Understanding Harmony in the Nature</p> <p>Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature</p> <p>Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels</p> <p>Lecture 22: The Holistic Perception of Harmony in Existence</p> <p>Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.</p>		
<b>UNIT-V</b>	<b>Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)</b>	<b>9Hrs</b>
<p>Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct</p> <p>Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct</p> <p>Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order</p> <p>Lecture 26: Competence in Professional Ethics</p> <p>Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies</p>		

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, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

##### **b. The Teacher's Manual**

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. ISBN 978-93-87034-53-2

### **Reference Books:**

1. *Jeevan Vidya: Ek Parichaya*, ANagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth*-by Mohandas Karamchand Gandhi
5. *Small is Beautiful*-E.F Schumacher.
6. *Slow is Beautiful*-Cecile Andrews
7. *Economy of Permanence*- JCKumarappa
8. *Bharat Mein Angreji Raj*-Pandit Sunderlal
9. *Rediscovering India*-by Dharampal
10. *Hind Swaraj or Indian Home Rule*-by Mohandas K. Gandhi
11. *India Wins Freedom*- Maulana Abdul Kalam Azad
12. *Vivekananda*-Romain Rolland (English)
13. *Gandhi*-Romain Rolland (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%202023.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](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)



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### B.tech II year I Semester

<b>DATABASE MANAGEMENT SYSTEMS</b> (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0512T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• Introduce data base management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra</li> <li>• Introduce the concepts of basic SQL as a universal Data base language</li> <li>• Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization</li> <li>• Provide an overview of physical design of a data base system, by discussing Data base indexing techniques and storage techniques</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Understand the basic concepts of data base management systems(L2)</li> <li>• Analyze a given data base application scenario to use ER model for conceptual design of the data base(L4)</li> <li>• Utilize SQL proficiently to address diverse query challenges (L3).</li> <li>• Employ normalization methods to enhance data base structure(L3)</li> <li>• Assess and implement transaction processing, concurrency control and data base recovery protocols in databases.(L4)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:56</b>
<b>UNIT-I</b>	<b>Introduction</b>				<b>12Hrs</b>
<p><b>Introduction:</b> 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.</p> <p><b>Entity Relationship Model:</b> Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.</p>					
<b>UNIT-II</b>	<b>Relational Model</b>				<b>10Hrs</b>
<p><b>Relational Model:</b> 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).</p>					

UNIT-III	SQL	12Hrs
<p><b>SQL:</b> Basic SQL querying (select and project) using where clause, arithmetic &amp; 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.</p>		
UNIT-IV	Schema Refinement	10Hrs
<p><b>Schema Refinement (Normalization):</b> 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). <b>DeNormalization</b></p>		
UNIT-V	Transaction Concept	12Hrs
<p><b>Transaction Concept:</b> 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:</p>		
<p><b><u>Text Books:</u></b></p> <ol style="list-style-type: none"> <li>1. DatabaseManagementSystems,3<sup>rd</sup>edition,RaghuramaKrishnan,JohannesGehrke,TMH(ForChapters 2, 3, 4)</li> <li>2. DatabaseSystemConcepts,5<sup>th</sup>edition,Silberschatz,Korth,Sudarsan,TMH(ForChapter1andChapter5)</li> </ol>		
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Introduction to Data base Systems, 8<sup>th</sup>edition, CJ Date, Pearson.</li> <li>2. Data base Management System, 6<sup>th</sup>edition,RamezElmasri, Shamkant B.Navathe, Pearson</li> <li>3. Data base Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb,Cengage Learning.</li> </ol>		
<p><b><u>Web References:</u></b></p> <ol style="list-style-type: none"> <li>1.<a href="https://nptel.ac.in/courses/106/105/106105175/">https://nptel.ac.in/courses/106/105/106105175/</a></li> <li>2.<a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_s_hared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_s_hared/overview</a></li> </ol>		



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### B.tech II year I Semester

<b>ADVANCED DATA STRUCTURES &amp; ALGORITHM ANALYSIS</b> (Common to CSE, AI&ML, AI&DS, DS, CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0506T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>● Provide knowledge on advance data structures frequently used in Computer Science domain</li> <li>● Develop skills in algorithm design techniques popularly used</li> <li>● Understand the use of various data structures in the algorithm design</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>● Illustrate the working of the advanced tree data structures and their applications.</li> <li>● Understand the Graph data structure, traversals and apply them in various contexts.</li> <li>● Use various data structures in the design of algorithms.</li> <li>● Recommend appropriate data structures based on the problem being solved.</li> <li>● Analyze algorithms with respect to space and time complexities.</li> <li>● Design new algorithms</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:54</b>
<b>UNIT-I</b>	<b>Introduction</b>				<b>12Hrs</b>
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					
<b>UNIT-II</b>	<b>Heap Trees (Priority Queues)</b>				<b>12Hrs</b>
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					
<b>UNIT-III</b>	<b>Greedy Method</b>				<b>10Hrs</b>
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					
<b>UNIT-IV</b>	<b>Back tracking &amp; Branch and Bound</b>				<b>10Hrs</b>

**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 2<sup>nd</sup> Edition Universities Press

**Reference Books:**

1. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2<sup>nd</sup> 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, Galgottia Pub.
8. Data structures in Java: Thomas Standish, Pearson Education Asia.

**Web References:**

1. [https://onlinecourses.swayam2.ac.in/cec20\\_cs03/preview](https://onlinecourses.swayam2.ac.in/cec20_cs03/preview)
2. [https://www.tutorialspoint.com/advanced\\_data\\_structures/index.asp](https://www.tutorialspoint.com/advanced_data_structures/index.asp)
3. <http://peterindia.net/Algorithms.html>
4. AbdulBari, [1.IntroductiontoAlgorithms\(youtube.com\)](https://www.youtube.com/watch?v=1.IntroductiontoAlgorithms)



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### B.tech II year I Semester

<b>OBJECT-ORIENTED PROGRAMMING THROUGH JAVA</b> (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
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>● Identify Java language components and how they work together in applications</li> <li>● Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.</li> <li>● Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications</li> <li>● Understand how to design applications with threads in Java</li> <li>● Understand how to use Java app is for program development</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>● Analyze problems, design solutions using OOP principles, and implement them efficiently in Java</li> <li>● Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects</li> <li>● Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.</li> <li>● Apply Competence in handling exceptions and errors to write robust and fault-tolerant code</li> <li>● Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.</li> <li>● Choose appropriate data structure of Java to solve a problem</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:61</b>
<b>UNIT-I</b>	<b>Object Oriented Programming</b>				<b>12Hrs</b>
<p><b>Object Oriented Programming:</b> 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.</p> <p><b>Data Types, Variables, and Operators :</b>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,</p> <p><b>Introduction to Operators:</b> Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.</p> <p><b>Control Statements:</b> 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.</p>					

UNIT-II	Classes and Objects & Methods	12Hrs
<p><b>Classes and Objects:</b> 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.</p> <p><b>Abstract Class</b></p> <p><b>Methods:</b> 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.</p>		
UNIT-III	Arrays	14Hrs
<p><b>Arrays:</b> Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another 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.</p> <p><b>Inheritance:</b> 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.</p> <p><b>Interfaces:</b> 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.</p>		
UNIT-IV	Packages and Java Library	12Hrs
<p><b>Packages and Java Library:</b> 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.</p> <p><b>Exception Handling:</b> Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.</p> <p><b>Java I/O and File:</b> Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)</p>		
UNIT-V	String Handling in Java	11Hrs
<p>Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.</p> <p><b>Multi threaded Programming:</b> 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.</p>		

**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, 4<sup>th</sup> Edition, Pearson.

**Reference Books:**

1. The complete Reference Java, 11<sup>th</sup>edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7<sup>th</sup>Edition, 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\\_012880464547618816347\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_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
<b>23A0508P</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>

#### 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, 2<sup>nd</sup>Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2<sup>nd</sup>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](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,

2<sup>nd</sup> Edition, Universities Press

- 2 Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> 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, 11<sup>th</sup> edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7<sup>th</sup> 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](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview)



## GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY (AUTONOMOUS)

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### B.tech II year I Semester

<b>PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)</b> (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0510P</b>	<b>0:1:2:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>SEC</b>
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>● Introduce core programming concepts of Python programming language.</li> <li>● Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries</li> <li>● Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>● Classify data structures of Python</li> <li>● Apply Python programming concepts to solve a variety of computational problems</li> <li>● 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</li> <li>● Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas</li> <li>● Exhibit competence in implementing and manipulating fundamental data structures such as lists,tuples,sets,dictionaries</li> <li>● Propose new solutions to computational problems</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>History of Python Programming Language</b>				<b>9Hrs</b>
<p>History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.</p> <p><b>Parts of Python Programming Language:</b> 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.</p> <p><b>Control Flow Statements:</b> 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.</p> <p><b>Sample Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Write a program to find the largest element among three Numbers.</li> <li>2. Write a Program to display all prime numbers within an interval</li> <li>3. Write a program to swap two numbers without using a temporary variable.</li> <li>4. Demonstrate the following Operators in Python with suitable examples.             <ol style="list-style-type: none"> <li>i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators</li> </ol> </li> </ol>					

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.		
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<b>UNIT-II</b>	<b>Functions, Strings, Lists</b>	<b>10Hrs</b>
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<p><b>Functions:</b> 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.</p> <p><b>Strings:</b> Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.</p> <p><b>Lists:</b> Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.</p> <p><b>Sample Experiments:</b></p> <ol style="list-style-type: none"> <li>7. Write a program to define a function with multiple return values.</li> <li>8. Write a program to define a function using default arguments.</li> <li>9. Write a program to find the length of the string without using any library functions.</li> <li>10. Write a program to check if the substring is present in a given string or not.</li> <li>11. Write a program to perform the given operations on a list: <ol style="list-style-type: none"> <li>i. Addition</li> <li>ii. Insertion</li> <li>iii. Slicing</li> </ol> </li> <li>12. Write a program to perform many built-in functions by taking any list.</li> </ol>		
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<b>UNIT-III</b>	<b>Dictionaries</b>	<b>10Hrs</b>
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<p><b>Dictionaries:</b> Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.</p> <p><b>Tuples and Sets:</b> 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.</p> <p><b>Sample Experiments:</b></p> <ol style="list-style-type: none"> <li>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.</li> <li>14. Write a program to count the number of vowels in a string (No control flow allowed).</li> <li>15. Write a program to check if a given key exists in a dictionary or not.</li> <li>16. Write a program to add a new key-value pair to an existing dictionary.</li> <li>17. Write a program to sum all the items in a given dictionary.</li> </ol>		
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<b>UNIT-IV</b>	<b>Files</b>	<b>10Hrs</b>
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<p><b>Files:</b> 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.</p> <p><b>Object-Oriented Programming:</b> Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes,</p>		
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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,2<sup>nd</sup>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

<b>ENVIRONMENTAL SCIENCE</b> (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
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>● To make the students to get awareness on environment</li> <li>● 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</li> <li>● To save earth from the inventions by the engineers</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>● No Outcomes</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>Multidisciplinary Nature of Environmental Studies</b>			<b>9Hrs</b>	
<p><b>Multidisciplinary Nature of Environmental Studies:</b> – Definition, Scope and Importance – Need for Public Awareness.</p> <p><b>Natural Resources :</b> 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:</p>					
<b>UNIT-II</b>	<b>Ecosystems</b>			<b>10Hrs</b>	
<p><b>Ecosystems:</b> 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:</p> <ol style="list-style-type: none"> <li>a. Forest ecosystem.</li> <li>b. Grassland ecosystem</li> <li>c. Desert ecosystem.</li> <li>d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)</li> </ol> <p>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</p>					

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

**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 Henry and Gary W.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 Wendell P.Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.



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<b>Btech II Year II Semester (Theory-5, Lab-2,SEC-1)</b>							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	HM	23A0022T 23A0023T 23A0024T	<b>Management Course- I</b> 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	<b>Skill Enhancement Course</b> Full Stack Development-1	0	1	2	2
9	BS	23A0413T	Design Thinking & Innovation	1	0	2	2
<b>Total</b>				<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>
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
<b>Total</b>	<b>21</b>



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### B.tech II year II Semester

<b>MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS</b> (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0022T</b>	<b>2:0:0:2</b>	<b>2</b>	<b>CIE: 30 SEE:70</b>	<b>3 Hours</b>	<b>HM</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• To inculcate the basic knowledge of microeconomics and financial accounting</li> <li>• To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost</li> <li>• To Know the Various types of market structure and pricing methods and strategy</li> <li>• To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.</li> <li>• To provide fundamental skills on accounting and to explain the process of preparing financial statements.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Define the concepts related to Managerial Economics, financial accounting and management(L2)</li> <li>• Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)</li> <li>• Apply the Concept of Production cost and revenues for effective Business decision(L3)</li> <li>• Analyze how to invest their capital and maximize returns (L4)</li> <li>• Evaluate the capital budgeting techniques. (L5)</li> <li>• Develop the accounting statements and evaluate the financial performance of business entity (L5)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Managerial Economics</b>				<b>9Hrs</b>
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.					
<b>UNIT-II</b>	<b>Production and Cost Analysis</b>				<b>10Hrs</b>
Introduction – Nature, meaning, significance, functions and advantages. Production Function– 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).					

<b>UNIT-III</b>	<b>Business Organizations and Markets</b>	<b>10Hrs</b>
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		
<b>UNIT-IV</b>	<b>Capital Budgeting</b>	<b>10Hrs</b>
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)		
<b>UNIT-V</b>	<b>Financial Accounting and Analysis</b>	<b>9Hrs</b>
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.		
<p><b><u>Text Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Varshney &amp; Maheswari: Managerial Economics, Sultan Chand.</li> <li>2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.</li> </ol>		
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Ahuja HI Managerial economics Schand.</li> <li>2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, NewAge International.</li> <li>3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.</li> <li>4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.</li> </ol>		
<p><b><u>Web References:</u></b></p> <p><a href="https://www.slideshare.net/123ps/managerial-economics-ppt">https://www.slideshare.net/123ps/managerial-economics-ppt</a>  <a href="https://www.slideshare.net/rossanz/production-and-cost-45827016">https://www.slideshare.net/rossanz/production-and-cost-45827016</a>  <a href="https://www.slideshare.net/darkyla/business-organizations-19917607">https://www.slideshare.net/darkyla/business-organizations-19917607</a>  <a href="https://www.slideshare.net/balarajbl/market-and-classification-of-market">https://www.slideshare.net/balarajbl/market-and-classification-of-market</a>  <a href="https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396">https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396</a>  <a href="https://www.slideshare.net/ashu1983/financial-ccounting">https://www.slideshare.net/ashu1983/financial-ccounting</a></p>		



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### B.tech II year II Semester

<b>ORGANISATIONAL BEHAVIOUR</b> (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0023T</b>	<b>2:0:0:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>HM</b>
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• Enable student's comprehension of organizational behavior</li> <li>• Offer knowledge to students on self-motivation, leadership and management</li> <li>• Facilitate them to become powerful leaders</li> <li>• Impart knowledge about group dynamics</li> <li>• Make them understand the importance of change and development</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>• Define the Organizational Behaviour, its nature and scope.(L2)</li> <li>• Understand the nature and concept of Organizational behavior(L2)</li> <li>• Apply theories of motivation to analyse the performance problems(L3)</li> <li>• Analyse the different theories of leadership(L4)</li> <li>• Evaluate group dynamics(L5)</li> <li>• Develop as powerful leader (L5)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Introduction to Organizational Behavior</b>				<b>9Hrs</b>
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective- Understanding Individual Behaviour–Attitude-Perception-Learning–Personality.					
<b>UNIT-II</b>	<b>Motivation and Leading</b>				<b>10Hrs</b>
Theories of Motivation- Maslow's Hierarchy of Needs - Herzberg'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.					
<b>UNIT-III</b>	<b>Organizational Culture</b>				<b>10Hrs</b>
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid-Transactional Vs Transformational Leadership-Qualities of good Leader- Conflict Management-Evaluating Leader.					
<b>UNIT-IV</b>	<b>Group Dynamics</b>				<b>10Hrs</b>

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, 12<sup>th</sup> 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

<b>BUSINESS ENVIRONMENT</b> (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0024T</b>	<b>2:0:0:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>HM</b>
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• To make the student to understand about the business environment</li> <li>• To enable them in knowing the importance of fiscal and monetary policy</li> <li>• To facilitate them in understanding the export policy of the country</li> <li>• To Impart knowledge about the functioning and role of WTO</li> <li>• To Encourage the student in knowing the structure of stock markets</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>• Define Business Environment and its Importance.(L2)</li> <li>• Understand various types of business environment.(L2)</li> <li>• Apply the knowledge of Money markets in future investment(L3)</li> <li>• Analyse India's Trade Policy(L4)</li> <li>• Evaluate fiscal and monetary policy(L5)</li> <li>• Develop a personal synthesis and approach for identifying business opportunities(L5)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Overview of Business Environment</b>				<b>9Hrs</b>
<b>Introduction</b> – meaning Nature, Scope, significance, functions and advantages. Types-Internal & External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental-analysis.					
<b>UNIT-II</b>	<b>Fiscal &amp; Monetary Policy</b>				<b>10Hrs</b>
<b>Introduction</b> – 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.					
<b>UNIT-III</b>	<b>India's Trade Policy</b>				<b>10Hrs</b>
<b>Introduction</b> – 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
<p><b>Introduction</b> – 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.</p>		
UNIT-V	Money Markets and Capital Markets	9Hrs
<p><b>Introduction</b> – 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.</p>		
<p><b><u>Text Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.</li> <li>2. K. Aswathappa, Essentials of Business Environment: Texts and Cases &amp; Exercises 13th Revised Edition. HPH</li> </ol>		
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. K. V. Sivayya, V. B.MDas, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.</li> <li>2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India , New Delhi, India.</li> <li>3. Chari.S.N, International Business, Wiley India.</li> <li>4. E.Bhattacharya, International Business, Excel Publications, New Delhi.</li> </ol>		
<p><b><u>Web References:</u></b></p> <p><a href="https://www.slideshare.net/ShompaDhali/business-environment-53111245">https://www.slideshare.net/ShompaDhali/business-environment-53111245</a><a href="https://www.slideshare.net/rbalsells/fiscal-policy-ppt">https://www.slideshare.net/rbalsells/fiscal-policy-ppt</a><a href="https://www.slideshare.net/aguness/monetary-policy-presentationppt">https://www.slideshare.net/aguness/monetary-policy-presentationppt</a><a href="https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982">https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982</a><a href="https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt">https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt</a><a href="https://www.slideshare.net/viking2690/wto-ppt-60260883">https://www.slideshare.net/viking2690/wto-ppt-60260883</a><a href="https://www.slideshare.net/prateeknepal3/ppt-mo">https://www.slideshare.net/prateeknepal3/ppt-mo</a></p>		



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### B.tech II year II Semester

<b>STATISTICAL METHODS FOR DATA SCIENCE</b> (Common to CSE(DS), AI&DS, CSE(AIDS))					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3203T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>BS</b>
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• Equip students with a solid foundation in statistical thinking and methodologies essential for Extracting insights from data and making data-driven decisions.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Understand the basic concepts of Statistics.(L2, L3)</li> <li>• Analyze the data and draw conclusion about collection of data under study using Point estimation (L3, L5)</li> <li>• Analyze data and draw conclusion about collection of data under study using Interval estimation. (L3)</li> <li>• Analyze to test various hypotheses included in theory and types of errors for large samples. (L2, L3)</li> <li>• Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.(L3, L5)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:53</b>
<b>UNIT-I</b>	<b>Basic Concepts</b>				<b>9Hrs</b>
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.					
<b>UNIT-II</b>	<b>Point Estimation</b>				<b>10Hrs</b>
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.					
<b>UNIT-III</b>	<b>Interval Estimation</b>				<b>12Hrs</b>

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 Friends, 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](https://onlinecourses.nptel.ac.in/noc21_ma74/preview)
2. [https://onlinecourses.nptel.ac.in/noc22\\_mg31/preview](https://onlinecourses.nptel.ac.in/noc22_mg31/preview)



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### B.tech II year II Semester

<b>ARTIFICIAL INTELLIGENCE</b> (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
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• The student should be made to study the concepts of Artificial Intelligence.</li> <li>• The student should be made to learn the methods of solving problems using Artificial Intelligence.</li> <li>• The student should be made to introduce the concepts of Expert Systems.</li> <li>• To understand the applications of AI, namely game playing, theorem proving, and machine learning.</li> <li>• To learn different knowledge representation techniques</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Understand the concepts of Artificial Intelligence.</li> <li>• <input type="checkbox"/> Apply searching techniques for solving a problem.</li> <li>• <input type="checkbox"/> Implement different knowledge representation techniques.</li> <li>• <input type="checkbox"/> Apply the Logic concepts of Artificial Intelligence.</li> <li>• <input type="checkbox"/> Implement different Learning methods used in Artificial Intelligence.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:52</b>
<b>UNIT-I</b>	<b>INTRODUCTION</b>				<b>9Hrs</b>
<b>Introduction:</b> 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.					
<b>UNIT-II</b>	<b>SEARCHING</b>				<b>12Hrs</b>
<b>Searching-</b> 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.					
<b>UNIT-III</b>	<b>REPRESENTATION OF KNOWLEDGE</b>				<b>12Hrs</b>
<b>Representation of Knowledge:</b> 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
<p><b>Logic concepts:</b> First order logic. Inference in first order logic, propositional vs. first order inference, unification &amp; lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.</p>		
UNIT-V	EXPERT SYSTEMS	9Hrs
<p><b>Expert Systems:</b> Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.</p>		
<p><b><u>Text Books:</u></b></p> <ol style="list-style-type: none"> <li>1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education.</li> <li>2. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill</li> </ol>		
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence: a logical approach”, Oxford University Press.</li> <li>2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.</li> <li>3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.</li> <li>4. Artificial Intelligence, Sansi Kumbhik, CENGAGE Learning</li> </ol>		
<p><b><u>Web References:</u></b></p> <ol style="list-style-type: none"> <li>1. <a href="https://ai.google/">https://ai.google/</a></li> <li>2. <a href="https://swayam.gov.in/nd1_noc19_me71/preview">https://swayam.gov.in/nd1_noc19_me71/preview</a></li> </ol>		



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### B.tech II year II Semester

<b>INTRODUCTION TO DATA SCIENCE</b> (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
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• Knowledge and expertise to become a data scientist.</li> <li>• Essential concepts of statistics and machine learning that are vital for data science;</li> <li>• Significance of exploratory data analysis (EDA) in data science.</li> <li>• Critically evaluate data visualizations presented on the dashboards</li> <li>• Suitability and limitations of tools and techniques related to data science process</li> </ul>					
<b>Course Outcomes(CO):</b>					
On completion of this course, student will be able to <ul style="list-style-type: none"> <li>• Understand significance of Data Science. (L2)</li> <li>• Analyze large data(L4)</li> <li>• Apply machine learning in Data Science (L3)</li> <li>• Perform Data reduction and apply visualization techniques. (L3)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:54</b>
<b>UNIT-I</b>	<b>INTRODUCTION</b>				<b>12Hrs</b>
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					
<b>UNIT-II</b>	<b>HANDLING LARGE DATA</b>				<b>12Hrs</b>
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 <b>Handling large data:</b> 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					
<b>UNIT-III</b>	<b>No SQL MOVEMENT FOR HANDLING BIG DATA</b>				<b>10Hrs</b>
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
<p>Introducing <b>Neo4j</b> for dealing with graph databases, graph query language <b>Cypher</b>, Applications graph databases, Python libraries like <b>nlTK</b> and <b>SQLite</b> for handling Text mining and analytics, case study on classifying Reddit posts</p>		
UNIT-V	DATA VISUALIZATION AND PROTOTYPE APPLICATION DEVELOPMENT	10Hrs
<p>Data Visualization options, Cross filter, the JavaScript Map Reduce library, Creating an interactive dashboard with <b>dc.js</b>, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.</p>		
<p><b><u>Text Books:</u></b>  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</p>		
<p><b><u>Reference Books:</u></b>  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</p>		



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### B.tech II year II Semester

<b>DIGITAL LOGIC &amp; COMPUTER ORGANIZATION</b> (Common to CSE,AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0406T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>• Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals</li> <li>• Describe memory hierarchy concepts</li> <li>• Explain input/output(I/O) systems and their interaction with the CPU, memory, and peripheral devices</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>• Differentiate between combinational and sequential circuits based on their characteristics and functionalities.</li> <li>• Demonstrate an understanding of computer functional units.</li> <li>• Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.</li> <li>• Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability.</li> <li>• Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques.</li> <li>• Design Sequential and Combinational Circuits</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:53</b>
<b>UNIT-I</b>	<b>Data Representation</b>				<b>12Hrs</b>
<p><b>Data Representation:</b> Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes</p> <p><b>Digital Logic Circuits-I:</b> Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers</p>					
<b>UNIT-II</b>	<b>Digital Logic Circuits</b>				<b>10Hrs</b>
<p><b>Digital Logic Circuits-II:</b> Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters</p> <p><b>Basic Structure of Computers:</b> Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von-</p>					

Neumann Architecture		
<b>UNIT-III</b>	<b>Computer Arithmetic</b>	<b>12Hrs</b>
<p><b>Computer Arithmetic:</b> 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.</p> <p><b>Processor Organization:</b> Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control</p>		
<b>UNIT-IV</b>	<b>The Memory Organization</b>	<b>10Hrs</b>
Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage		
<b>UNIT-V</b>	<b>Input /Output Organization</b>	<b>10Hrs</b>
Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces, <b>Arbitration</b>		
<p><b><u>Text Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Computer Organization, Carl Hamacher, Zvonko Vranesic, SafwatZaky, 6<sup>th</sup>edition, McGraw Hill, 2023.</li> <li>2. Digital Design, 6<sup>th</sup>Edition, M. Morris Mano, Pearson Education, 2018.</li> <li>3. Computer Organization and Architecture, William Stallings, 11<sup>th</sup> Edition, Pearson, 2022.</li> </ol>		
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Computer Systems Architecture, M.Moris Mano, 3<sup>rd</sup> Edition, Pearson, 2017.</li> <li>2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.</li> <li>3. Fundamentals of Logic Design, Roth, 5<sup>th</sup> Edition, Thomson, 2003.</li> </ol>		
<p><b>Web References:</b></p> <p><a href="https://nptel.ac.in/courses/106/103/106103068/">https://nptel.ac.in/courses/106/103/106103068/</a></p>		



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### B.tech II year II Semester

<b>ARTIFICIAL INTELLIGENCE LAB</b> (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0525P</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>•The student should be made to study the concepts of Artificial Intelligence.</li> <li>• The student should be made to learn the methods of solving problems using Artificial Intelligence.</li> <li>• The student should be made to introduce the concepts of Expert Systems and machine learning.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>•Understand the Mathematical and statistical prospective of machine learning algorithms through python programming (L2)</li> <li>•Appreciate the importance of visualization in the data analytics solution. (L5)</li> <li>•Derive insights using Machine learning algorithms (L5)</li> <li>•Implement and demonstrate AI and ML algorithms. (L5)</li> </ul>					
<b>Experiments:</b>				<b>Total Hours:48</b>	
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.

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**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](https://onlinecourses.nptel.ac.in/noc19_cs40/preview)
2. [https://onlinecourses.nptel.ac.in/noc19\\_cs41/preview](https://onlinecourses.nptel.ac.in/noc19_cs41/preview)



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### B.tech II year II Semester

<b>DATA SCIENCE USING PYTHON LAB</b>					
(Common to AI&DS, DS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3001P</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<b>This course will enable students to:</b>					
<ul style="list-style-type: none"> <li>•The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<input type="checkbox"/> <input type="checkbox"/> Apply principles and techniques for optimizing the performance of Python applications (L3) <input type="checkbox"/> <input type="checkbox"/> Implement parallel computing applications using Python (L5) <input type="checkbox"/> <input type="checkbox"/> Develop GPU accelerated Python applications (L6)					
<b>Experiments:</b>				<b>Total Hours:48</b>	
<b>Week-1:</b> 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 <b>Week-2:</b> 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 <b>Week-3:</b> 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.</ch01.html>



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### B.tech II year II Semester

<b>FULL STACK DEVELOPMENT-1</b>					
<b><u>(Skill Enhancement Course)</u></b>					
(Common to CSE,AI&ML,AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0516P</b>	<b>0:1:2:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>SEC</b>
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>• Make use of HTML elements and their attributes for designing static web pages</li> <li>• Build a web page by applying appropriate CSS styles to HTML elements</li> <li>• Experiment with Java Script to develop dynamic web pages and validate forms</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>• CO1:Design Websites.(L6)</li> <li>• CO2: Apply Styling to web pages.(L4)</li> <li>• CO3: Make Web pages interactive. (L6)</li> <li>• CO4:Design Forms for applications.(L6)</li> <li>• CO5:Choose Control Structure based on the logic to be implemented.(L3)</li> <li>• CO6: Understand HTMLtags, Attributes and CSS properties(L2)</li> </ul>					
<b>Experiments:</b>				<b>Total Hours:48</b>	
<b>1. Lists, Links and Images</b> <ol style="list-style-type: none"> <li>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.</li> <li>b. Write a HTML program, to explain the working of hyperlinks using &lt;a&gt; tag and href, target Attributes.</li> <li>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.</li> <li>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</li> </ol>					
<b>2. <u>HTML Tables, Forms and Frames</u></b> <ul style="list-style-type: none"> <li>• Write a HTML program, to explain the working of tables.(use tags:&lt;table&gt;,&lt;tr&gt;,&lt;th&gt;, &lt;td&gt;and attributes: border, row span, col span)</li> <li>• Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use &lt;caption&gt; tag to set the caption to the table &amp; also use cell spacing, cell padding, border, rowspan, colspanetc.).</li> </ul>					

- 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>,<div>,<span>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 and 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. Write a program to print 1 to 10 numbers using for, 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.,  $1^3+5^3+3^3=153$ ]
- 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 than 6 characters)
  - ii. Mobile (only numbers and length 10 digits)
  - 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, Robert 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, Vasam Subramanian, 2<sup>nd</sup> 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

<b>DESIGN THINKING FOR INNOVATION</b> (Common to CSE, AI&ML, AI&DS, DS,CS)					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0413T</b>	<b>1:0:2:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>BS</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <p>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.</p>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>● Define the concepts related to design thinking.(L1,L2)</li> <li>● Explain the fundamentals of Design Thinking and innovation(L1,L2)</li> <li>● Apply the design thinking techniques for solving problems in various sectors.(L3)</li> <li>● Analyse to work in a multi-disciplinary environment(L4)</li> <li>● Evaluate the value of creativity(L5)</li> <li>● Formulate specific problem statements of real time issues(L3,L6)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Introduction to Design Thinking</b>				<b>9Hrs</b>
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.					
<b>UNIT-II</b>	<b>Design Thinking Process</b>				<b>10Hrs</b>
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.					
<b>UNIT-III</b>	<b>Innovation</b>				<b>10Hrs</b>
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.					
<b>UNIT-IV</b>	<b>Product Design</b>				<b>10Hrs</b>

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. Shruti 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](https://swayam.gov.in/nd1_noc19_mg60/preview)



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### B.tech II year II Semester

<b>COMMUNITY SERVICE PROJECT</b>					
<b>Experiential learning through community engagement</b>					
(Common to CSE,AI&ML, AI&DS, DS,CS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3006</b>	<b>0:0:0:2</b>	<b>2</b>	<b>CIE:30 SEE:70</b>	<b>-</b>	<b>-</b>
<b>Introduction</b>					
<ul style="list-style-type: none"> <li>● Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.</li> <li>● Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.</li> <li>● 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.</li> </ul>					
<b>Objective</b>					
<p>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;</p> <ul style="list-style-type: none"> <li>● To sensitize the students to the living conditions of the people who are around them,</li> <li>● To help students to realize the stark realities of society.</li> <li>● To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability</li> <li>● To make students aware of their inner strength and help them to find new /out of box solutions to social problems.</li> <li>● To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.</li> <li>● To help students to initiate developmental activities in the community in coordination with public and government authorities.</li> <li>● 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.</li> </ul>					
<b>Implementation of Community Service Project</b>					
<ul style="list-style-type: none"> <li>● Every student should put in 6 weeks for the Community Service Project during the summer vacation.</li> <li>● Each class/section should be assigned with a mentor.</li> </ul>					

- 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.
- Anevaluationtobedonebasedontheactiveparticipationofthestudentandgradecouldbeawardedbythementor/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 outcomes 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 citizenship skills
- Greater involvement in community service after graduation

#### **Career Development**

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership 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. Flourey 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.



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## B.Tech. III Year I Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	PC	23A3002T	Data Warehousing and Data Mining	3	0	0	3
2	PC	23A0529T	Machine Learning	3	0	0	3
3	PC	23A3003T	Multi Agent Systems	3	0	0	3
4	PC	23A0522T	Introduction To Quantum Technologies And Applications	3	0	0	3
5	PE	23A3307Ta 23A3307Tb 23A3004Ta 23A3307Tc	<b>Professional Elective-I</b> 1. Data Visualization 2. Soft computing 3. Internet of Things for AI Applications 4. Exploratory Data Analysis with Python	3	0	0	3
6	OE		<b>Open Elective- I</b>	3	0	0	3
7	PC	23A3005P	Data Warehousing and Data Mining Lab	0	0	3	1.5
8	PC	23A0543T	Machine Learning Lab	0	0	3	1.5
9	SE	23A0527P	<b>Skill Enhancement course</b> Full Stack Development-II	0	1	2	2
10	MC	23A0420P	Tinkering Lab	0	0	2	1
11	PR	23A3006	Evaluation of Community Service Internship	-	-	-	2
<b>Total Credits</b>							<b>26</b>

Category	CREDITS
Professional Core Courses (PC)	15
Professional Elective Courses (PE)	3
Open Elective Courses (OE)	3
Skill Enhancement Course (SE)	2
Mandatory Course(MC)	1
Community Service Project (PR)	2
<b>TOTALCREDITS</b>	<b>26</b>



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### Open Elective – I

Sl. No.	Course Code	Course Title	Offered by the Dept
1	23A0148T	Green Buildings	CIVIL
2	23A0149T	Construction Technology and Management	CIVIL
3	23A0222T	Electrical Safety Practices and Standards	EEE
4	23A0319T	Sustainable Energy Technologies	ME
5	23A0442T	Electronic Circuits	ECE
6	23A0547T	Quantum Technologies And Applications	CSE & Allied
7	23A0027T	Mathematics for Machine Learning and AI	Mathematics
8	23A0034T	Materials Characterization Techniques	Physics
9	23A0040T	Chemistry of Energy Systems	Chemistry
10	23A0044T	English for Competitive Examinations	Humanities
11	23A0051T	Entrepreneurship and New Venture Creation	Humanities



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## B.Tech III Year I Semester

<b>Data Warehousing and Data Mining</b> (Professional Core)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3002T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>To introduce the fundamental concepts and architecture of data warehousing.</li> <li>To understand data pre processing, transformation, and integration techniques.</li> <li>To explore data mining techniques such as classification, clustering, and association rules.</li> <li>To provide practical skills for applying data mining in real-world scenarios.</li> <li>To introduce tools and frameworks for data warehousing and mining, such as OLAP and WEKA.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<ul style="list-style-type: none"> <li>Understand data warehouse architecture and OLAP operations.</li> <li>Prepare and pre process large datasets for mining applications.</li> <li>Apply classification, clustering, and association techniques effectively.</li> <li>Evaluate data mining results using proper metrics and validation methods.</li> <li>Utilize data mining tools for knowledge discovery in large datasets.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit -I</b>	<b>Introduction to Data Warehousing and OLAP</b>			<b>9Hrs</b>	
Introduction to Data Warehousing: Concepts and Applications, Data Warehouse Architecture: Components and 3-Tier Architecture, ETL Process: Extraction, Transformation, Loading, OLAP: Multidimensional Data Model, OLAP Operations, Star, Snowflake, and Fact Constellation Schemas, Data Cubes and Roll-Up/Drill-Down Analysis					
<b>Unit -II</b>	<b>Data Pre processing and Data Understanding</b>			<b>10Hrs</b>	
Data Cleaning, Integration, and Transformation, Data Reduction Techniques and Feature Selection, Handling Missing, Noisy, and Inconsistent Data, Data Discretization and Normalization, Measures of Similarity and Dissimilarity, Exploratory Data Analysis and Visualization					

<b>Unit -III</b>	<b>Association Rule Mining and Classification</b>	<b>10Hrs</b>
Basics of Association Rule Mining: Support, Confidence, Lift, Apriori Algorithm and FP-Growth Algorithm, Applications of Association Rule Mining, Classification Techniques: Decision Trees (ID3, C4.5), Bayesian Classifiers and Naïve Bayes, Rule-Based and Model-Based Classification		
<b>Unit -IV</b>	<b>Clustering and Advanced Mining Methods</b>	<b>10Hrs</b>
Introduction to Clustering: Types and Applications, Partitioning Methods: K-Means, K-Medoids, Hierarchical Clustering: Agglomerative and Divisive, Density-Based Clustering: DBSCAN, OPTICS, Evaluation of Clustering Results, Outlier Detection and Handling.		
<b>Unit -V</b>	<b>Data Mining Applications and Tools</b>	<b>9Hrs</b>
Web Mining, Text Mining, and Spatial Data Mining, Temporal and Sequence Data Mining, Introduction to Big Data and Scalable Mining, Data Mining Tools: WEKA, Rapid Miner, Orange, Case Studies: Business Intelligence, Fraud Detection, E-commerce, Ethical and Privacy Issues in Data Mining..		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, 3rd Edition, Elsevier.</li> <li>2. Paulraj Ponniah, Data Warehousing Fundamentals for IT Professionals, Wiley.</li> <li>3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Ralph Kimball, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modelling, Wiley.</li> <li>2. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson.</li> <li>3. Arun K. Pujari, Data Mining Techniques, Universities Press.</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. Coursera - Data Mining Specialization (University of Illinois)</li> <li>2. Data Warehousing for Business Intelligence – Coursera (Duke University)</li> <li>3. WEKA Data Mining Tutorials – University of Waikato</li> <li>4. Data Mining and Analysis – Stanford Online</li> <li>5. Khan Academy: Introduction to Data Mining</li> </ol>		



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## B.Tech III Year I Semester

MACHINE LEARNING (Professional Core)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0529T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<b>This course will enable students to:</b>					
<ul style="list-style-type: none"> <li>• Define machine learning and its different types (supervised and unsupervised) and understand their applications.</li> <li>• Apply supervised learning algorithms including decision trees and k-nearest neighbor (k-NN).</li> <li>• Implement unsupervised learning techniques, such as K-means clustering.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• After completion of the course, students will be able to</li> <li>• Identify machine learning techniques suitable for a given problem</li> <li>• Solve the problems using various machine learning techniques</li> <li>• Apply Dimensionality reduction techniques for data pre-processing</li> <li>• Explain what is learning and why it is essential in the design of intelligent machines</li> <li>• Evaluate Advanced learning models for language, vision, speech, decision making etc</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit-I</b>	<b>Introduction to Machine Learning &amp; Preparing to Model</b>			<b>8Hrs</b>	
Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.					
<b>Unit-II</b>	<b>Modelling and Evaluation &amp; Basics of Feature Engineering</b>			<b>8Hrs</b>	
Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, NonMetric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.					

Unit-III	Bayesian Concept Learning & Supervised Learning: Classification	9Hrs
<p><b>Models Based on Decision Trees:</b> Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.</p> <p><b>The Bayes Classifier:</b> Introduction to the Bayes Classifier, Bayes ‘Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification   Class Conditional Independence and Naive Bayes Classifier (NBC)</p>		
Unit-IV	Supervised Learning: Regression	9Hrs
<p><b>Linear Discriminants for Machine Learning:</b> Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP</p>		
Unit-V	Unsupervised Learning	9Hrs
<p><b>Clustering:</b> Introduction to Clustering, Partitioning of Data, Matrix Factorization   Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Machine Learning Theory and Practicell, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Machine Learningl, Tom M. Mitchell, McGraw-Hill Publication, 2017</li> <li>2. Machine Learning in Actionll, Peter Harrington, DreamTech</li> <li>3. Introduction to Data Miningll, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://onlinecourses.nptel.ac.in/noc20_cs29/preview">https://onlinecourses.nptel.ac.in/noc20_cs29/preview</a></li> <li>2. <a href="https://nptel.ac.in/courses/106106139">https://nptel.ac.in/courses/106106139</a></li> </ol>		



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## B.Tech III Year I Semester

<b>MULTI AGENT SYSTEMS</b> (Professional Core)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3003T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• To introduce the foundational concepts and architectures of intelligent agents and multi-agent systems.</li> <li>• To understand agent communication, coordination, and negotiation strategies.</li> <li>• To explore cooperation, teamwork, and distributed problem-solving in agent-based systems.</li> <li>• To study real-world applications and design methodologies of multi-agent systems.</li> <li>• To impart knowledge on formal models and game theory-based interactions in multi-agent environments.</li> </ul>					
<b>Course Outcomes (CO):</b>					
On completion of this course, student will be able to					
<ul style="list-style-type: none"> <li>• Describe the architecture and functioning of individual intelligent agents. (Remembering)</li> <li>• Analyze communication, coordination, and negotiation among multiple agents. (Analyzing)</li> <li>• Apply distributed problem-solving approaches to real-world multi-agent systems. (Applying)</li> <li>• Design multi-agent systems for practical applications using appropriate methodologies. (Creating)</li> <li>• Evaluate the performance and scalability of multi-agent systems using game-theoretic approaches. (Evaluating)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit -I</b>	<b>Introduction to Intelligent Agents</b>				<b>9Hrs</b>
Definition and Characteristics of Agents, Types of Agents: Reactive, Deliberative, Hybrid, Learning, Agent Architectures: Subsumption, BDI, Layered, Environments: Deterministic/Stochastic, Episodic/Sequential, Rationality and Autonomy, Simple Agent Programming Models.					
<b>Unit -II</b>	<b>Multi-Agent Systems Fundamentals</b>				<b>10Hrs</b>
Definition and Properties of Multi-Agent Systems (MAS), Agent Communication Languages: KQML, FIPA ACL, Interaction Protocols: Contract Net, Auctions, Coordination Techniques: Blackboard, Mediator, Broker, Distributed Problem Solving (DPS) Concepts, Roles and Teamwork					

in MAS.		
<b>Unit -III</b>	<b>Cooperation, Negotiation, and Learning</b>	<b>10Hrs</b>
Cooperative and Non-Cooperative Agents, Negotiation Techniques: Bidding, Bargaining, Argumentation, Game Theory: Basics and Applications in MAS, Reinforcement Learning in Multi-Agent Settings, Case Studies: Multi-Robot Coordination, Resource Allocation, Conflict Resolution and Consensus Building.		
<b>Unit -IV</b>	<b>Agent-Oriented Software Engineering</b>	<b>10Hrs</b>
GAgent-Based System Design Methodologies: Gaia, Tropos, Agent UML: Notations and Modelling, MAS Design Patterns and Best Practices, Ontologies and Semantic Web Integration, Middleware and Frameworks for MAS (JADE, SPADE), Scalability, Fault-Tolerance, and Deployment Challenges.		
<b>Unit -V</b>	<b>Advanced Topics and Applications</b>	<b>9Hrs</b>
Emergence and Self-Organization in MAS, Swarm Intelligence and Distributed Optimization, Trust, Privacy, and Ethics in MAS, Real-Time and Embedded MAS Applications, MAS in Smart Grid, IoT, and Traffic Systems, Case Studies: Amazon Robotics, Autonomous Trading Agents.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Michael Wooldridge, An Introduction to MultiAgent Systems, Wiley, 2nd Edition.</li> <li>2. Gerhard Weiss, Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, MIT Press.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Yoav Shoham and Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press.</li> <li>2. Nikos Vlassis, A Concise Introduction to Multiagent Systems and Distributed Artificial Intelligence, Morgan &amp; Claypool.</li> <li>3. Mehdi Dastani et al., Programming Multi-Agent Systems, Springer.</li> </ol>		
<b>Online Learning Resources:</b>		
<ol style="list-style-type: none"> <li>1. NPTEL - Artificial Intelligence: Knowledge Representation and Reasoning</li> <li>2. Coursera - Multi-Agent Systems by University of Washington</li> <li>3. edX – Principles of AI Planning (covers agent-based modeling)</li> <li>4. MIT OpenCourseWare – Multi-Agent Systems</li> <li>5. YouTube – Multi-Agent Systems Lectures by Stanford, MIT</li> </ol>		



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## B.Tech III Year I Semester

INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (Common to All branches)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0522T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>Introduce fundamental quantum concepts like superposition and entanglement.</li> <li>Understand theoretical structure of qubits and quantum information.</li> <li>Explore conceptual challenges in building quantum computers.</li> <li>Explain principles of quantum communication and computing.</li> <li>Examine real-world applications and the future of quantum technologies.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>Explain core quantum principles in a non-mathematical manner.</li> <li>Compare classical and quantum information systems.</li> <li>Identify theoretical issues in building quantum computers.</li> <li>Discuss quantum communication and computing concepts.</li> <li>Recognize applications, industry trends, and career paths in quantum technology</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit -I</b>	<b>Introduction to Quantum Theory and Technologies</b>			<b>10Hrs</b>	
The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China					
<b>Unit -II</b>	<b>Theoretical Structure of Quantum Information Systems</b>			<b>9Hrs</b>	
What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non engineering view), Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non- locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role					

<b>Unit -III</b>	<b>Building a Quantum Computer – Theoretical Challenges and Requirements</b>	<b>10Hrs</b>
<p>What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what’s working and what remains elusive, The role of quantum software in managing theoretical complexities</p>		
<b>Unit -IV</b>	<b>Quantum Communication and Computing – Theoretical Perspective</b>	<b>9Hrs</b>
<p>Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential</p>		
<b>Unit -V</b>	<b>Applications, Use Cases, and the Quantum Future</b>	<b>10Hrs</b>
<p>Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race</p>		
<p><b>Text Books:</b>  1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.  2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.  3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.</p>		
<p><b>Reference Books:</b>  1. David McMahon, Quantum Computing Explained, Wiley, 2008.  2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.  3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.  4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.  5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.  6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.  7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.  8. GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.  9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.  10. Department of Science &amp; Technology (DST), Government of India, National Mission on Quantum Technologies &amp; Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.</p>		

**Web References:**

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum



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## B.Tech III Year I Semester

DATA VISUALIZATION (Professional Elective-I)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3307Ta	3:0:0:3	3	CIE:30 SEE:70	3Hours	PE
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>To understand the principles, techniques, and tools of data visualization.</li> <li>To develop the ability to transform data into visual insights using different types of charts and plots.</li> <li>To introduce the cognitive and perceptual foundations of effective data visualization.</li> <li>To apply tools and programming environments (like Python, Tableau, or PowerBI) for creating interactive and dynamic visualizations.</li> <li>To analyze real-world datasets and effectively communicate data-driven findings visually</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to: <ul style="list-style-type: none"> <li>Interpret different types of data and recognize the appropriate visualization methods.</li> <li>Design effective and interactive data visualizations using various tools.</li> <li>Apply visual encoding and perceptual principles in presenting complex data.</li> <li>Analyze and visualize real-world data sets using Python libraries and dashboards.</li> <li>Create visual stories and dashboards for effective communication of insights.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit -I</b>	<b>Introduction to Data Visualization &amp; Perception</b>			<b>10Hrs</b>	
Introduction to Data Visualization, Importance and Scope of Data Visualization, Data Types and Sources, Visual Perception: Pre-attentive Processing, Gestalt Principles, Data-Ink Ratio, Data Density, Lie Factor, Visualization Process and Design Principles, Tools Overview: Tableau, PowerBI, Python Libraries					
<b>Unit -II</b>	<b>Visualization Techniques for Categorical &amp; Quantitative Data</b>			<b>9Hrs</b>	
Charts for Categorical Data: Bar Charts, Pie Charts, Column Charts, Charts for Quantitative Data: Histograms, Line Charts, Box plots, Scatter Plots, Bubble Charts, Heat maps, Choosing the Right Chart Type, Best Practices in Labeling, Coloring, and Scaling.					
<b>Unit -III</b>	<b>Multidimensional, Temporal and Hierarchical Data Visualization</b>			<b>10Hrs</b>	

Visualizing Multivariate Data: Parallel Coordinates, Radar Charts, Time-Series Visualization: Time Plots, Animation over Time, Geographic Data Visualization: Maps, Choropleths, Hierarchical Data: Treemaps, Sunburst Charts, Network and Graph Visualization.

**Unit -IV**

**Data Visualization Using Python and Dashboards**

**9Hrs**

Introduction to Matplotlib, Seaborn, and Plotly, Creating Static and Interactive Charts, Pandas Visualization Capabilities, Dashboards with Dash, Streamlit, Power BI, Case Studies: Real-world Dataset Visualization.

**Unit -V**

**Storytelling with Data and Ethical Visualization**

**10Hrs**

Storytelling and Narrative Techniques in Visualization, Dashboards and Reporting, Misleading Visualizations and Bias, Ethical Principles in Data Visualization, Final Project: Create a Storytelling Dashboard with Real Data.

**Textbooks:**

- Tamara Munzner, Visualization Analysis and Design, CRC Press, 2014.
- Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013

**Reference Books:**

- Alberto Cairo, The Truthful Art: Data, Charts, and Maps for Communication, New Riders, 2016.
- Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, 2015.
- Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly, 2019.
- Rohan Chopra, Hands-On Data Visualization with Bokeh, Packt Publishing, 2019.

**Online Learning Resources:**

- NPTEL: Data Visualization - IIT Madras
- Coursera: Data Visualization with Python by IBM



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## B.Tech III Year I Semester

SOFT COMPUTING (Professional Elective-I)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3307Tb	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PE
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>Understand the concepts of soft computing techniques and how they differ from traditional AI techniques.</li> <li>Introduce the fundamentals of fuzzy logic and fuzzy systems.</li> <li>Familiarize with artificial neural networks and their architectures.</li> <li>Learn genetic algorithms and their role in optimization.</li> <li>Explore hybrid systems integrating fuzzy logic, neural networks, and genetic algorithms.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to: <ul style="list-style-type: none"> <li>Understand the components and applications of soft computing.</li> <li>Apply fuzzy logic concepts to real-world problems.</li> <li>Build and train various neural network models.</li> <li>Implement genetic algorithms for problem-solving and optimization.</li> <li>Design hybrid systems using soft computing techniques.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours: 48 Hrs</b>	
<b>Unit -I</b>	<b>Introduction to Soft Computing and Fuzzy Logic</b>			<b>10 Hrs</b>	
Introduction to Soft Computing: Definition, Components, Differences with Hard Computing, Applications of Soft Computing, Fuzzy Logic: Crisp Sets vs Fuzzy Sets, Membership Functions, Fuzzy Set Operations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems: Mamdani and Sugeno Models, Defuzzification Techniques.					
<b>Unit -II</b>	<b>Artificial Neural Networks – I</b>			<b>9 Hrs</b>	
Introduction to Neural Networks: Biological Neurons vs Artificial Neurons, Architecture of Neural Networks: Feed forward, Feedback, Learning Rules: Hebbian, Delta, Perceptron Learning Rule, Single Layer Perceptron and its Limitations, Multi-Layer Perceptron: Back propagation Algorithm, Applications of Neural Networks.					

Unit -III	Artificial Neural Networks – II	10 Hrs
Hopfield Networks and Associative Memories, Radial Basis Function Networks, Self-Organizing Maps (SOM), Recurrent Neural Networks (RNNs) – Basic Concepts, Convolutional Neural Networks (CNNs) – Overview and Applications, Practical Use Cases in Image and Pattern Recognition,		
Unit -IV	Genetic Algorithms and Optimization	10 Hrs
Introduction to Genetic Algorithms, GA Operators: Selection, Crossover, Mutation, Fitness Function and Evaluation, Schema Theorem, Elitism, Applications in Function Optimization, Scheduling, and Robotics, Introduction to Particle Swarm Optimization (PSO).		
Unit -V	Hybrid Systems and Advanced Topics	9 Hrs
Hybrid Systems: Neuro-Fuzzy Systems, Fuzzy-GA, GA-ANN, ANFIS: Architecture and Learning, Case Studies on Hybrid Systems, Introduction to Deep Learning in Soft Computing, Real-World Applications: Forecasting, Control Systems, Medical Diagnosis, Image Processing.		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. S. N. Sivanandam, S. N. Deepa, “Principles of Soft Computing”, Wiley India, 3rd Edition</li> <li>2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley, 4th Edition</li> <li>3. S. Rajasekaran and G. A. VijayalakshmiPai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications”, PHI</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. LaureneFausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson</li> <li>2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Pearson</li> <li>3. Simon Haykin, “Neural Networks and Learning Machines”, Pearson, 3rd Edition</li> <li>4. Bart Kosko, “Neural Networks and Fuzzy Systems”, Prentice Hall</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. NPTEL – Soft Computing by Prof. S. Sengupta (IIT Kharagpur)</li> <li>2. Coursera – Neural Networks and Deep Learning (Andrew Ng)</li> </ol>		



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## B.Tech III Year I Semester

<b>INTERNET OF THINGS for AI (Professional Elective-I)</b>					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3004Ta	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• Understand the basics of Internet of Things and protocols.</li> <li>• Discuss the requirement of IoT technology</li> <li>• Introduce some of the application areas where IoT can be applied.</li> <li>• Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>• Understand general concepts of Internet of Things.</li> <li>• Apply design concept to IoT solutions</li> <li>• Analyze various M2M and IoT architectures</li> <li>• Evaluate design issues in IoT applications</li> <li>• Create IoT solutions using sensors, actuators and Devices</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48 Hrs</b>
<b>Unit-I</b>	<b>Introduction to IoT</b>				<b>8Hrs</b>
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates					
<b>Unit-II</b>	<b>Prototyping IoT Objects using Microprocessor/Microcontroller</b>				<b>9Hrs</b>
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.					
<b>Unit-III</b>	<b>IoT Architecture and Protocols</b>				<b>8Hrs</b>
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.					

Unit-IV	Device Discovery and Cloud Services for IoT	8Hrs
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.		
Unit-V	UAV IoT	10Hrs
Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Vijay Madiseti and ArshdeepBahga, — Internet of Things ( A Hands-on-Approach)ll, 1st Edition, VPT, 2014.</li> <li>2. Handbook of unmanned aerial vehicles, <i>K Valavanis;George J Vachtsevanos</i>, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, — From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligencel, 1st Edition, Academic Press, 2014.</li> <li>2. ArshdeepBahga, Vijay Madiseti - Internet of Things: A Hands-On Approach, Universities Press, 2014.</li> <li>3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.</li> <li>4. Francis daCosta, —Rethinking the Internet of Things: A Scalable Approach to Connecting Everythingll, 1st Edition, Apress Publications, 2013</li> <li>5. CunoPfister, Getting Started with the Internet of Things, O‘Reilly Media, 2011, ISBN: 9781-4493-9357-1</li> <li>6. DGCA RPAS Guidance Manual, Revision 3 – 2020</li> <li>7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://www.arduino.cc/">https://www.arduino.cc/</a></li> <li>2. <a href="https://www.raspberrypi.org/">https://www.raspberrypi.org/</a></li> <li>3. <a href="https://nptel.ac.in/courses/106105166/5">https://nptel.ac.in/courses/106105166/5</a></li> <li>4. <a href="https://nptel.ac.in/courses/108108098/">https://nptel.ac.in/courses/108108098/</a></li> </ol>		



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## B.Tech III Year I Semester

Exploratory Data Analysis with Python (Professional Elective-I)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3307Tc	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PE
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>To introduce the principles and practices of Exploratory Data Analysis (EDA) using Python.</li> <li>To teach techniques for data cleaning, pre-processing, transformation, and visualization.</li> <li>To apply statistical techniques and visual methods to discover patterns and relationships.</li> <li>To gain experience using popular Python libraries such as NumPy, Pandas, Matplotlib, and Seaborn.</li> <li>To prepare datasets for further machine learning and predictive modeling.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>Understand and apply key concepts of EDA and data pre-processing. (Cognitive Level: Understand, Apply)</li> <li>Perform exploratory analysis using Python libraries and interpret results. (Cognitive Level: Apply, Analyze)</li> <li>Handle missing data, outliers, and categorical features effectively. (Cognitive Level: Apply)</li> <li>Create meaningful visualizations to support data-driven insights. (Cognitive Level: Analyze, Evaluate)</li> <li>Use EDA as a foundation for data science workflows. (Cognitive Level: Apply, Create)</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48 Hrs</b>
<b>Unit-I</b>	<b>Introduction to EDA and Python Environment</b>				<b>8Hrs</b>
Introduction to Data Science and EDA, Importance of EDA in Data Science Life Cycle, Setting up Python Environment: Jupyter, Anaconda, VS Code, Introduction to NumPy and Pandas: Arrays, Series, DataFrames, Data loading, viewing, basic operations (info, describe, shape)					
<b>Unit-II</b>	<b>Data Wrangling and Preprocessing</b>				<b>9Hrs</b>

Handling Missing Data (mean, median, drop, interpolation), Dealing with Duplicates, Outliers, and Anomalies, Encoding Categorical Variables (Label, One-hot), Data Transformation: Scaling, Normalization, Binning, Data Types Conversion and Data Type Casting.

<b>Unit-III</b>	<b>Univariate and Bivariate Analysis</b>	<b>8Hrs</b>
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Measures of Central Tendency and Dispersion, Distribution Plots: Histograms, Boxplots, KDE, Bar Charts, Count Plots, Pie Charts, Bivariate Analysis: Scatter Plots, Pair Plots, Heatmaps, Correlation and Covariance Analysis

<b>Unit-IV</b>	<b>Data Visualization Techniques</b>	<b>8Hrs</b>
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Visualization with Matplotlib and Seaborn, Customizing Plots: Titles, Legends, Labels, Themes, Advanced Visuals: Violin Plots, Strip Plots, Swarm Plots, Multivariate Visualization and Subplots, Plotly and Interactive Visualizations (basic overview)

<b>Unit-V</b>	<b>EDA Case Studies and Real-Time Datasets</b>	<b>10Hrs</b>
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Step-by-step EDA on Sample Datasets (Titanic, Iris, Sales, etc.), Outlier Detection Techniques, Feature Engineering Techniques in EDA, EDA Report Generation using Python Notebooks, Preparing Data for Machine Learning Models

**Textbooks:**

1. Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly, 2016.
2. Wes McKinney, Python for Data Analysis, 2nd Edition, O'Reilly, 2018.

**Reference Books:**

1. Joel Grus, Data Science from Scratch, O'Reilly, 2019.
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, 2nd Edition, O'Reilly, 2019.
3. Allen B. Downey, Think Stats: Probability and Statistics for Programmers, O'Reilly, 2014.

**Online Learning Resources:**

1. NPTEL Course – Data Science for Engineers
2. Coursera – Applied Data Science with Python Specialization (University of Michigan)



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## B.Tech III Year I Semester

<b>GREEN BUILDINGS</b> (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0148T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE: 30 SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>• To understand the fundamental concepts of green buildings, their necessity, and Sustainable features.</li> <li>• To analyze green building concepts, rating systems, and their benefits in India.</li> <li>• To apply green building design principles, energy efficiency measures, and Renewable energy sources.</li> <li>• To evaluate air conditioning systems, HVAC designs, and energy modeling for Sustainable buildings.</li> <li>• To assess material conservation strategies, waste management, and indoor environmental quality in green buildings.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>• Understand the importance of green buildings, their necessity, and sustainable features.</li> <li>• Analyze various green building practices, rating systems, and their impact on environmental sustainability.</li> <li>• Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.</li> <li>• Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.</li> <li>• Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Introduction</b>				<b>9Hrs</b>
Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.					
<b>UNIT -II</b>	<b>Green Building Concepts and Practices</b>				<b>9Hrs</b>
Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED					

India Rating System, and Energy Efficiency.		
<b>UNIT -III</b>	<b>Green Building Design</b>	<b>10Hrs</b>
Green Building Design– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.		
<b>UNIT -IV</b>	<b>Air Conditioning</b>	<b>10Hrs</b>
Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.		
<b>UNIT -V</b>	<b>Material Conservation</b>	<b>10Hrs</b>
<b>Material Conservation</b> – Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.</li> <li>2. Green Building Hand Book by tom woolley and Sam kimings, 2009.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Complete Guide to Green Buildings by Trish riley</li> <li>2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009</li> <li>3. Energy Conservation Building Code –ECBC-2020, published by BEE</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://archive.nptel.ac.in/courses/105/102/105102195/">https://archive.nptel.ac.in/courses/105/102/105102195/</a></li> </ol>		



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## B.Tech III Year I Semester

<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b> (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0149T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE: 30 SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>● To understand project management fundamentals, organizational structures, and leadership principles in construction.</li> <li>● To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.</li> <li>● To apply planning, scheduling, and project management techniques such as CPM and PERT.</li> <li>● To evaluate various contract types, contract formation, and legal aspects in construction management.</li> <li>● To assess safety management practices, accident prevention strategies, and quality management systems in construction.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>● Understand (Cos) project management fundamentals, organizational structures, and leadership principles in construction.</li> <li>● Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.</li> <li>● Apply planning, scheduling, and project management techniques such as CPM and PERT.</li> <li>● Evaluate various contract types, contract formation, and legal aspects in construction management.</li> <li>● Assess safety management practices, accident prevention strategies, and quality management systems in construction.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT -I</b>	<b>Introduction</b>				<b>9Hrs</b>
<b>Introduction:</b> Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.					
<b>UNIT-II</b>	<b>Man and Machine</b>				<b>10Hrs</b>
<b>Man and Machine:</b> Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.					
<b>UNIT -III</b>	<b>Planning, Scheduling and Project Management</b>				<b>9Hrs</b>
<b>Planning, Scheduling and Project Management:</b> Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network- Formulation and Time Computation.					

<b>UNIT -IV</b>	<b>Contracts</b>	<b>10Hrs</b>
<p>Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract For Labour, Material, Design, and Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.</p>		
<b>UNIT -V</b>	<b>Safety Management</b>	<b>10Hrs</b>
<p>Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.</li> <li>2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019</li> <li>3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Brien, J.O. and Plotnick, F.L., CPM in Construction Management, Mcgraw Hill, 2010.</li> <li>2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.</li> <li>3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.</li> <li>4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley Blackwell, 2016.</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="#">NPTEL :: Civil Engineering - NOC:Principles of Construction Management</a></li> <li>2. <a href="#">NPTEL :: Civil Engineering - Construction Planning and Management</a></li> </ol>		



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## B.Tech III Year I Semester

ELECTRICAL SAFETY PRACTICES AND STANDARDS (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0222T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
<b>This course will enable students to:</b>					
<ul style="list-style-type: none"> <li>To impart knowledge of electrical hazards and safety standards applicable in industrial and domestic systems.</li> <li>To train students in safe work practices, risk assessment, and use of protective devices/PPE.</li> <li>To develop competence in accident prevention, emergency response, and compliance with electrical codes.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>After completion of the course, students will be able to</li> <li>Understanding the Fundamentals of Electrical Safety.</li> <li>Identifying and Applying Safety Components.</li> <li>Analyzing Grounding Practices and Electrical Bonding</li> <li>Applying Safety Practices in Electrical Installations and Environments</li> <li>Evaluating Electrical Safety Standards and Regulatory Compliance</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Introduction To Electrical Safety</b>				<b>9Hrs</b>
Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.					
<b>UNIT -II</b>	<b>Safety Components</b>				<b>9Hrs</b>
Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment's - Fire extinguishers for electrical safety.					
<b>UNIT -III</b>	<b>Grounding</b>				<b>10Hrs</b>
General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.					
<b>UNIT -IV</b>	<b>Safety Practices</b>				<b>10Hrs</b>
General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations Case studies					
<b>UNIT -V</b>	<b>Standards For Electrical Safety</b>				<b>10Hrs</b>

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards- National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

**Text Books:**

1. Massimo A.G.Mitolo, —Electrical Safety of Low-Voltage Systems, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, —Electric Safety - Practice and Standards, CRC Press, USA, 2014

**Reference Books:**

1. Kenneth G.Mastrullo, Ray A. Jones, —The Electrical Safety Program Book, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, —Electrical Safety-Related Work Practices, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., —Electrical Safety Engineering, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, —Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012.



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## B.Tech III Year I Semester

SUSTAINBLE ENERGY TECHNOLOGIES					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0319T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<p><b>This course will enable students to:</b></p> <ul style="list-style-type: none"> <li>To demonstrate the importance the impact of solar radiation, solar PV modules</li> <li>To understand the principles of storage in PV systems</li> <li>To discuss solar energy storage systems and their application ns.</li> <li>To get knowledge in wind energy and bio-mass</li> <li>To gain insights in geothermal energy, ocean energy and fuel cells.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>Illustrate the importance of solar radiation and solar PV modules.</li> <li>Discuss the storage methods in PV systems</li> <li>Explain the solar energy storage for different applications</li> <li>Understand the principles of wind energy, and bio-mass energy.</li> <li>Attain knowledge in geothermal energy, ocean energy and fuel cells.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>SOLAR RADIATION &amp; SOLAR PV MODULES AND PV SYSTEMS</b>			<b>9Hrs</b>	
<p><b>SOLAR RADIATION:</b> Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.</p> <p><b>SOLAR PV MODULES AND PV SYSTEMS:</b> PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.</p>					
<b>UNIT -II</b>	<b>STORAGE IN PV SYSTEMS</b>			<b>10Hrs</b>	
<p><b>STORAGE IN PV SYSTEMS:</b> Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.</p>					

UNIT -III	SOLAR ENERGY COLLECTION	10Hrs
<p><b>SOLAR ENERGY COLLECTION:</b> Flat plate and concentrating collectors, classification of concentrating collectors, orientation.</p> <p><b>SOLAR ENERGY STORAGE AND APPLICATIONS:</b> Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.</p>		
UNIT -IV	WIND ENERGY & BIO-MASS	10Hrs
<p><b>WIND ENERGY:</b> Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.</p> <p><b>BIO-MASS:</b> Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.</p>		
UNIT -V	GEOTHERMAL ENERGY	9Hrs
<p><b>GEOTHERMAL ENERGY:</b> Origin, Applications, Types of Geothermal Resources, Relative Merits</p> <p><b>OCEAN ENERGY:</b> Ocean Thermal Energy; Open Cycle &amp; Closed Cycle OTEC Plants, Environmental Impacts, Challenges</p> <p><b>FUEL CELLS:</b> Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH</li> <li>2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth&amp; John F Kreider / Taylor &amp;Francis</li> <li>2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd</li> <li>3. Renewable Energy Technologies -Ramesh &amp; Kumar /Narosa</li> <li>4. Non-conventional Energy Source- G.D Roy/Standard Publishers</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/112106318">https://nptel.ac.in/courses/112106318</a></li> <li>2. <a href="https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&amp;si=-mwIa2X-SuSiNy13">https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&amp;si=-mwIa2X-SuSiNy13</a></li> <li>3. <a href="https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&amp;si=Apfjx6oDfz1Rb_N3">https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&amp;si=Apfjx6oDfz1Rb_N3</a> <a href="https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF">https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF</a> <b>III</b></li> </ol>		



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## B.Tech III Year I Semester

ELECTRONIC CIRCUITS (Common to CSE,AI&ML,DS,CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0442T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>To understand semiconductor diodes, their characteristics and applications.</li> <li>To explore the operation, configurations, and biasing of BJTs.</li> <li>To study the operation, analysis, and coupling techniques of BJT amplifiers.</li> <li>To learn the operation, applications and uses of feedback amplifiers and oscillators.</li> <li>To analyze the characteristics, configurations, and applications of operational amplifiers.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>Understand semiconductor diodes, their characteristics and applications.</li> <li>Explore the operation, configurations, and biasing of BJTs.</li> <li>Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.</li> <li>Learn the operation, applications and uses of feedback amplifiers and oscillators.</li> <li>Analyze the characteristics, configurations, and applications of operational amplifiers.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>Semiconductor Diode and Applications</b>			<b>9Hrs</b>	
Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only). <b>Special Diodes:</b> Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.					
<b>UNIT -II</b>	<b>Bipolar Junction Transistor (BJT)</b>			<b>10Hrs</b>	
Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.					
<b>UNIT -III</b>	<b>Single and Multi stage amplifiers</b>			<b>10Hrs</b>	
<b>Single stage amplifiers:</b> Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.					
<b>Multistage amplifiers:</b> Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier					

(Qualitative treatment only).		
<b>UNIT -IV</b>	<b>Feedback amplifiers</b>	<b>10Hrs</b>
<p>Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).</p> <p><b>Oscillators:</b> Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.</p>		
<b>UNIT -V</b>	<b>Op-amp</b>	<b>9Hrs</b>
<p>Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.</p> <p><b>Applications of op-amp:</b> Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Electronics Devices and Circuits, J. Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.</li> <li>2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008..</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Electronics Devices and Circuits Theory, R.L.Boylestad, LouisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.</li> <li>2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012</li> <li>3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.</li> </ol>		



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## B.Tech III Year I Semester

QUANTUM TECHNOLOGIES AND APPLICATIONS					
(Common to all branches)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0547T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
This course will enable students to: <ul style="list-style-type: none"> <li>To introduce the fundamentals of quantum mechanics relevant to quantum technologies.</li> <li>To explain key quantum phenomena and their role in enabling novel technologies.</li> <li>To explore applications in quantum computing, communication, and sensing.</li> <li>To encourage understanding of emerging quantum-based technologies and innovations.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>Understand key quantum mechanical concepts and phenomena.</li> <li>Comprehend the structure and function of quantum algorithms and circuits.</li> <li>Explore applications in quantum communication and cryptography.</li> <li>Appreciate the role of quantum technologies in modern engineering systems.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit-I</b>	Fundamentals of Quantum Mechanics			<b>8Hrs</b>	
<ul style="list-style-type: none"> <li>Classical vs Quantum Paradigm</li> <li>Postulates of Quantum Mechanics</li> <li>Wave function and Schrödinger Equation (Time-independent)</li> <li>Quantum states, Superposition, Qubits</li> <li>Measurement, Operators, and Observables</li> <li>Entanglement and Non-locality</li> </ul>					
<b>Unit-II</b>	Quantum Computing			<b>10Hrs</b>	
<ul style="list-style-type: none"> <li>Qubits and Bloch Sphere</li> <li>Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates</li> <li>Quantum Circuits</li> <li>Basic Algorithms: Deutsch-Jozsa, Grover's, Shor's (conceptual)</li> <li>Error Correction and Decoherence</li> </ul>					
<b>Unit-III</b>	Quantum Communication and Cryptography			<b>8Hrs</b>	
<ul style="list-style-type: none"> <li>Teleportation &amp; No-Cloning and BB84 Protocol</li> <li>Quantum Networks &amp; Repeaters</li> </ul>					

<ul style="list-style-type: none"> <li>• Classical vs Quantum Cryptography</li> <li>• Challenges in Implementation</li> </ul>		
<b>Unit-IV</b>	<b>Quantum Sensors and Metrology</b>	<b>9Hrs</b>
<ul style="list-style-type: none"> <li>• Quantum Sensing: Principles and Technologies</li> <li>• Quantum-enhanced Measurements</li> <li>• Atomic Clocks, Gravimeters</li> <li>• Magnetometers, NV Centers</li> <li>• Industrial Applications</li> </ul>		
<b>Unit-V</b>	<b>Quantum Materials and Emerging Technologies</b>	<b>8Hrs</b>
<ul style="list-style-type: none"> <li>• Quantum Materials: Superconductors, Topological Insulators</li> <li>• Quantum Devices: Qubits, Josephson Junctions</li> <li>• National Quantum Missions (India, EU, USA, China)</li> <li>• Quantum Careers and Industry Initiatives</li> </ul>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press)</li> <li>2. "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books)</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)</li> <li>2. "Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae</li> <li>3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca</li> <li>4. IBM Quantum Experience and Qiskit Documentation (<a href="https://qiskit.org/">https://qiskit.org/</a>)</li> </ol>		



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## B.Tech III Year I Semester

### MATHEMATICS FOR MACHINE LEARNING AND AI

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0027T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
This course will enable students: <ul style="list-style-type: none"> <li>To provide a strong mathematical foundation for understanding and developing AI/ML</li> <li>To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.</li> <li>To equip students with optimization techniques and graph-based methods used in AI applications.</li> <li>To develop critical problem-solving skills for analyzing mathematical formulations in AI/ML.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b> <ul style="list-style-type: none"> <li>Apply linear algebra concepts to ML techniques like PCA and regression.</li> <li>Analyze probabilistic models and statistical methods for AI applications.</li> <li>Implement optimization techniques for machine learning algorithms.</li> <li>Utilize vector calculus and transformations in AI-based models.</li> <li>Develop graph-based AI models using mathematical representations.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>Linear Algebra for Machine Learning</b>			<b>9Hrs</b>	
Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).					
<b>UNIT -II</b>	<b>Probability and Statistics for AI</b>			<b>10Hrs</b>	
Probability distributions: Gaussian, Binomial, Poisson. Bayes' Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP). Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.					
<b>UNIT -III</b>	<b>Optimization Techniques for ML</b>			<b>10Hrs</b>	
Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.					
<b>UNIT -IV</b>	<b>Vector Calculus &amp; Transformations</b>			<b>10Hrs</b>	
Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.					

<b>UNIT -V</b>	<b>Graph Theory for AI</b>	<b>9Hrs</b>
Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).		
<p>Text Books:</p> <ol style="list-style-type: none"><li>1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.</li><li>2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer.</li></ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"><li>1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.</li><li>2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.</li></ol>		



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## B.Tech III Year I Semester

### MATERIALS CHARACTERIZATION TECHNIQUES

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

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0034T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE

#### Course Objectives:

##### This course will enable students to:

- To provide exposure to different characterization techniques.
- To explain the basic principles and analysis of different spectroscopic techniques.
- To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
- To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

#### Course Outcomes(CO):

##### On completion of this course, student will be able to

- Analyze the crystal structure and crystallite size by various methods
- Analyze the morphology of the sample by using a Scanning Electron Microscope Electron Microscope
- Analyze the morphology and crystal structure of the sample by using Transmission
- Explain the principle and experimental arrangement of various spectroscopic Techniques
- Identify the construction and working principle of various Electrical & Magnetic Characterization technique

Syllabus		Total Hours:48
<b>UNIT-I</b>	<b>Structure analysis by Powder X-Ray Diffraction</b>	<b>10Hrs</b>
Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).		
<b>UNIT -II</b>	<b>Microscopy technique -1 –Scanning Electron Microscopy (SEM)</b>	<b>9Hrs</b>
Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.		

<b>UNIT -III</b>	<b>Microscopy Technique -2 - Transmission Electron Microscopy (TEM)</b>	<b>9Hrs</b>
Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy		
<b>UNIT -IV</b>	<b>Spectroscopy techniques</b>	<b>10Hrs</b>
Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).		
<b>UNIT -V</b>	<b>Electrical &amp; Magnetic Characterization techniques</b>	<b>10Hrs</b>
Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley &amp; Sons (Asia) Pvt. Ltd. 2013</li> <li>2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley &amp; Sons Ltd., 2008</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008</li> <li>2. Elements of X-ray diffraction – Bernard Dennis Cullity &amp; Stuart R Stocks, Prentice Hall , 2001 – Science.</li> <li>3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.</li> <li>4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="#">NPTEL :: Civil Engineering - NOC:Principles of Construction Management</a></li> <li>2. <a href="#">NPTEL :: Civil Engineering - Construction Planning and Management</a></li> </ol>		



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## B.Tech III Year I Semester

CHEMISTRY OF ENERGY SYSTEMS (Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0040T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
This course will enable students: <ul style="list-style-type: none"> <li>To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.</li> <li>To understand the basic concepts of processing and limitations of Fuel cells &amp; their applications.</li> <li>To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications</li> <li>Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.</li> <li>To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquefaction method.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to:</b> <ul style="list-style-type: none"> <li>Solve the problems based on electrode potential, Describe the Galvanic Cell</li> <li>Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer</li> <li>Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell</li> <li>Discuss about the Basic design of fuel cells, Classify the fuel cell</li> <li>Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions,</li> <li>Interpret advantages of photoelectron catalytic conversion.</li> <li>Apply the photo voltaic technology, Demonstrate about solar energy and prospects</li> <li>Illustrate the Solar cells, Discuss about concentrated solar power</li> <li>Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures</li> <li>Describe the liquefaction methods.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>Electrochemical Systems</b>			<b>9Hrs</b>	
Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid ,Nickel- cadmium, Lithium ion batteries and their applications.					
<b>UNIT -II</b>	<b>Fuel Cells</b>			<b>9Hrs</b>	

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

**UNIT -III**

**Photo and Photo electrochemical Conversions**

**10Hrs**

Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

**UNIT -IV**

**Solar Energy**

**10Hrs**

Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.

**UNIT -V**

**Hydrogen Storage**

**10Hrs**

Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

**Text Books:**

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

**Reference Books:**

1. Fuel Cell Hand Book 7<sup>th</sup> Edition, by US Department of Energy (EG&G technical services And corporation)
2. Hand book of solar energy and applications by ArvindTiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al. Hydrogen storage by Levine Klebonoff



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## B.Tech III Year I Semester

ENGLISH FOR COMPETITIVE EXAMINATIONS					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0044T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
This course will enable students: <ul style="list-style-type: none"> <li>To enable the students to learn about the structure of competitive English</li> <li>To understand the grammatical aspects and identify the errors</li> <li>To enhance verbal ability and identify the errors</li> <li>To improve word power to answer competitive challenges</li> <li>To make them ready to crack competitive exams</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to:</b> <ul style="list-style-type: none"> <li>Identify the basics of English grammar and its importance L1, L2</li> <li>Explain the use of grammatical structures in sentences L1, L2</li> <li>Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams L3</li> <li>Analyze an unknown passage and reach conclusions about it. L4</li> <li>Choose the appropriate form of verbs in framing sentences L5</li> <li>Develop speed reading and comprehending ability thereby perform better in competitive exams L3</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>UNIT-I</b>	<b>GRAMMAR-1</b>			<b>10Hrs</b>	
Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite- indefinite- Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage-Prepositions-usage- Tag Questions, types-identifying errors- Practice					
<b>UNIT -II</b>	<b>GRAMMAR-2</b>			<b>9Hrs</b>	
Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause- Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals- Spotting Errors-Practices					
<b>UNIT -III</b>	<b>VERBAL ABILITY</b>			<b>9Hrs</b>	
Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by					

reading a given paragraph.		
<b>UNIT -IV</b>	<b>READING COMPREHENSION AND VOCUBULARY</b>	<b>10Hrs</b>
Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes- Prefix & Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases- Homophones-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering– Elimination methods		
<b>UNIT -V</b>	<b>WRITING FOR COMPETITIVE EXAMINATIONS</b>	<b>10Hrs</b>
Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs- Essay writing-types		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Wren &amp; Martin, English for Competitive Examinations, S.Chand &amp; Co, 2021</li> <li>2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.</li> <li>2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016</li> <li>3. Shalini Verma , Word Power Made Handy, S Chand Publications</li> <li>4. Neira, Anjana Dev &amp; Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.</li> <li>5. Abhishek Jain, Vocabulary Learning Techniques Vol.I&amp;II,RR Global Publishers 2013.</li> <li>6. Michel Swan, Practical English Usage, Oxford, 2006.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://www.grammar.cl/english/parts-of-speech.htm">https://www.grammar.cl/english/parts-of-speech.htm</a></li> <li>2. <a href="https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech">https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech</a></li> <li>3. <a href="https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice">https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice</a></li> <li>4. <a href="https://languagetool.org/insights/post/verb-tenses/">https://languagetool.org/insights/post/verb-tenses/</a></li> <li>5. <a href="https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council">https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council</a></li> <li>6. <a href="https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx">https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx</a></li> </ol>		



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## B.Tech III Year I Semester

<b>ENTREPRENEURSHIP AND NEW VENTURE CREATION</b>					
(Common to CSE, AI&ML, DS, CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0051T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE: 30 SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• To foster an entrepreneurial mind-set for venture creation and entrepreneurial leadership.</li> <li>• To encourage creativity and innovation</li> <li>• To enable them to learn pitching and presentation skills</li> <li>• To make the students understand MVP development and validation techniques to Determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.</li> <li>• To enhance the ability of analyzing Customer and Market segmentation, estimate</li> <li>• Market size, develop and validate Customer Persona.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship.</li> <li>• Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution.</li> <li>• Analyze and refine business models to ensure sustainability and profitability.</li> <li>• Build Prototype for Proof of Concept and validate MVP of their practice venture idea.</li> <li>• Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture.</li> <li>• Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>UNIT-I</b>	<b>Entrepreneurship Fundamentals and context</b>				<b>9Hrs</b>
<p>Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus. Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students –16industries to choose from), Venture Activity.</p>					
<b>UNIT -II</b>	<b>Problem &amp; Customer Identification</b>				<b>9Hrs</b>

Understanding and analysing the macro-Problem and Industry perspective technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

**Core Teaching Tool:** Several types of activities including Class, game, Gen AI, ‘Get out of the Building’ and Venture Activity

**UNIT -III**

**Solution design, Prototyping & Opportunity Assessment and Sizing**

**10Hrs**

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer’s needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

**UNIT -IV**

**Business & Financial Model, Go-to-Market Plan**

**10Hrs**

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach. Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.

**Core Teaching Tool:** Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities

**UNIT -V**

**Scale Outlook and Venture Pitch readiness**

**10Hrs**

Understand and identify potential and aspiration for scale vis-a-vis your venture idea.Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

**Core Teaching Tool:** Expert talks; Cases; Class activity and discussions; Venture Activities.

**Text Books:**

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha,Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous
3. Innovation to Create Radically Successful Businesses. Crown Business,(2011).
4. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for
5. Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

**Reference Books:**

1. Simon Sinek,Start with Why, Penguin Books limited. (2011)
2. Brown Tim,Change by Design Revised & Updated: How Design Thinking
3. Transforms Organizations and Inspires Innovation, Harper Business.(2019)
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

**Web References:**

- Learning resource- Ignite 5.0 Course Wadhvani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)



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## B.Tech III Year I Semester

DATA WAREHOUSING AND DATA MINING LAB (ProfessionalCore)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3005P	0:0:3 :1.5	1.5	CIE:30 SEE:70	3 Hours	PCC
The objectives of the course are to					
<ul style="list-style-type: none"> <li>To enable students to construct and query data warehouses using OLAP operations.</li> <li>To implement classification, clustering, and association rule mining algorithms.</li> <li>To explore real-world datasets for data preprocessing and pattern discovery.</li> <li>To develop hands-on experience with data mining tools and frame works.</li> <li>To evaluate the performance and accuracy of various mining techniques.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<ul style="list-style-type: none"> <li>Design and implement a data warehouse schema and perform OLAP operations.</li> <li>Preprocess raw datasets for mining tasks using suitable techniques.</li> <li>Apply classification, clustering, and association rule mining on datasets.</li> <li>Use tools such as WEKA, Python (Scikit-learn, pandas), or for data mining.</li> <li>Interpret, visualize, and evaluate results obtained from mining models.</li> </ul>					
<b>Syllabus</b>					
<b>List of experiments</b>					
<p><b>Week 1</b></p> <p>1. Create a Star and Snowflake schema for a sample sales data set using SQL</p> <p><b>Week2</b></p> <p>2. Perform OLAP operations (Roll-up, Drill-down, Slice, Dice, Pivot) using SQL</p> <p><b>Week3</b></p> <p>3. Import a CSV data set and perform data cleaning, missing value handling, and normalization</p> <p><b>Week4</b></p> <p>4. Implement Apriori algorithm to find frequent item sets and generate association rules</p> <p><b>Week5</b></p> <p>5. Use FP-Growth algorithm for mining frequent patterns from a retail dataset</p> <p><b>Week6</b></p> <p>6. Implement Naïve Bayes classifier and evaluate it using accuracy, precision, and recall</p> <p><b>Week7</b></p> <p>7. Build a Decision Tree using ID3 or C4.5 algorithm and visualize the result</p> <p><b>Week8</b></p>					

8. Perform classification using K-Nearest Neighbors (KNN) and analyze the results

**Week9**

9. Apply K-Means clustering on a dataset and visualize cluster separation

**Week10**

10. Use Hierarchical clustering and dendrogram visualization

**Week11**

11. Perform Principal Component Analysis (PCA) on a high-dimensional dataset

**Week12**

12. Mini-project: Apply classification/clustering/association on a real-world dataset and present findings

**Tools/Technologies to be used:**

- Python(pandas, scikit-learn, matplotlib, seaborn)
- R/RStudio
- WEKA/Orange Data Mining Tool
- SQL for OLAP operations
- Jupyter Notebook/Google Colab



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## B.Tech III Year I Semester

<b>Machine Learning Lab (Professional Core)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0534P</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PCC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• To learn about computing central tendency measures and Data pre-processing techniques</li> <li>• To learn about classification and regression algorithms</li> <li>• To apply different clustering algorithms for a problem.</li> </ul>					
<b>Experiments:</b>					<b>Total Hours:48</b>
<p><b>WEEK-1</b> 1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.</p> <p><b>WEEK-2</b> 2. Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers.</p> <p><b>WEEK-3</b> 3. Apply KNN algorithm for classification and regression</p> <p><b>WEEK-4</b> 4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results.</p> <p><b>WEEK-5</b> 5. Demonstrate decision tree algorithm for a regression problem.</p> <p><b>WEEK-6</b> 6. Apply Random Forest algorithm for classification and regression.</p> <p><b>WEEK-7</b> 7. Demonstrate Naïve Bayes Classification algorithm.</p>					

**WEEK-8**

8. Apply Support Vector algorithm for classification.

**WEEK-9**

9. Demonstrate simple linear regression algorithm for a regression problem.

**WEEK-10**

10. Apply Logistic regression algorithm for a classification problem.

**WEEK-11**

11. Demonstrate Multi-layer Perceptron algorithm for a classification problem

**WEEK-12**

12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

**WEEK-13**

13. Demonstrate the use of Fuzzy C-Means Clustering

**WEEK-14**

14. Demonstrate the use of Expectation Maximization based clustering algorithm



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## B.Tech III Year I Semester

FULL STACK DEVELOPMENT-II (Skill Enhancement course) (Common to CSE,AI&ML, AI&DS, CS, DS)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0527P	0: 1:2:0	2	CIE:30 SEE:70	3 Hours	SE
<b>Course Objectives:</b>					
This course will enable students: <ul style="list-style-type: none"> <li>• Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages</li> <li>• Building robust &amp; responsive User Interfaces using popular JavaScript library <code>_React.js_</code>. Building robust backend APIs using <code>_Express. js_</code></li> <li>• Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL</li> <li>• Familiarize students with GitHub for remote repository hosting and collaborative development.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to:</b> <ul style="list-style-type: none"> <li>• CO1: Building fast and interactive UIs</li> <li>• CO2: Applying Declarative approach for developing web apps</li> <li>• CO3: Understanding ES6 features to embrace modern JavaScript</li> <li>• CO4: Building reliable APIs with Express. Js</li> <li>• CO5: Create and manage Git repositories, track changes, and push code to GitHub.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours: 48</b>	
<b>Experiments covering the Topics:</b> <ul style="list-style-type: none"> <li>• Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.</li> <li>• Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.</li> <li>• Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript <code>map()</code> function.</li> <li>• JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)</li> <li>• Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.</li> </ul> Introduction to Git and GitHub and upload project& team collaboration					

## Sample Experiments:

### 1. Introduction to Modern JavaScript and DOM

- a. Write a JavaScript program to link JavaScript file with the HTML page
- b. Write a JavaScript program to select the elements in HTML page using selectors
- c. Write a JavaScript program to implement the event listeners
- d. Write a JavaScript program to handle the click events for the HTML button elements
- e. Write a JavaScript program to With three types of functions
  - i. Function declaration
  - ii. Function definition
  - iii. Arrow functions

### 2. Basics of React. Js

- a. Write a React program to implement a counter button using react class components
- b. Write a React program to implement a counter button using react functional components
- c. Write a React program to handle the button click events in functional component
- d. Write a React program to conditionally render a component in the browser
- e. Write a React program to display text using String literals

### 3. Important concepts of React. js

- a. Write a React program to implement a counter button using React use State hook
- b. Write a React program to fetch the data from an API using React use Effect hook
- c. Write a React program with two react components sharing data using Props.
- d. Write a React program to implement the forms in react
- e. Write a React program to implement the iterative rendering using map() function.

### 4. Introduction to Git and GitHub

#### a. Setup

- Install Git on local machine.
- Configure Git (user name, email).
- Create GitHub account and generate a personal access token.

#### b. Basic Git Workflow

- Create a local repository using git init
- Create and add files → git add .
- Commit files → git commit -m "Initial commit"
- Connect to GitHub remote → git remote add origin
- Push to GitHub → git push -u origin main

#### c. Branching and Collaboration

- Create a branch → git checkout -b feature1
- Merge branch to main → git merge feature1
- Resolve merge conflicts (guided)

### 5. Upload React Project to GitHub

- Create a new React app using npx create-react-app myapp
- Initialize a git repo and push to GitHub
- Use gitignore to exclude node\_modules

- Create multiple branches: feature/navbar, feature/form
- Practice merge and pull requests (can use GitHub GUI)

## 6. Introduction to Node. js and Express. js

- Write a program to implement the `_hello world_` message in the route through the browser using Express
- Write a program to develop a small website with multiple routes using Express. js
- Write a program to print the `_hello world_` in the browser console using Express. js
- Write a program to implement the CRUD operations using Express. Js
- Write a program to establish the connection between API and Database using Express –My SQL driver

## 7. Introduction to My SQL

- Write a program to create a Database and table inside that database using My SQL Command line client
  - Write a My SQL queries to create table, and insert the data, update the data in the table
  - Write a My SQL queries to implement the subqueries in the My SQL command line client
  - Write a My SQL program to create the script files in the My SQL workbench
  - Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API
8. Team Collaboration Using GitHub
- Form groups of 2–3 students
  - Create a shared GitHub repo
  - Assign tasks and work in branches
  - Use Issues, Pull Requests, and Code Reviews o Document code with README.md

### Text Books:

- Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
- John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
- Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
- Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
- AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.jsand Mongo DB.2015

### Reference Books:

- Full-Stack JavaScript Development by Eric Bush.
- Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
- Tomasz Dyl , Kamil Przeorski , Maciej Czarnecki, Mastering Full Stack React Web Development 2017.



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Unit of USHODAYA EDUCATIONAL SOCIETY

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## B.Tech III Year I Semester

TINKERING LAB					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0420P	0:0:2:1	1	CIE:30 SEE:70	3 Hours	MC
<b>AIM:</b>					
The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.					
<b>Course Objectives:</b>					
The objectives of the course are to					
<ul style="list-style-type: none"> <li>• Encourage Innovation and Creativity</li> <li>• Provide Hands-on Learning and Impart Skill Development</li> <li>• Foster Collaboration and Teamwork</li> <li>• Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship</li> <li>• Impart Problem-Solving mind-set</li> </ul>					
<b>Course Outcomes (CO):</b>					
<ul style="list-style-type: none"> <li>• These labs bridge the gap between academia and industry, providing students with the practical experience.</li> <li>• Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers.</li> <li>• Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.</li> <li>• The students will be able to experiment, innovate, and solve real-world challenges.</li> </ul>					
<b>Syllabus</b>					
<b>List of experiments</b>					
<b>WEEK-1</b>					
1) Make your own parallel and series circuits using breadboard for any application of your choice.					
<b>WEEK-2</b>					
2) Demonstrate a traffic light circuit using breadboard.					
<b>WEEK-3</b>					
3) Build and demonstrate automatic Street Light using LDR.					
<b>WEEK-4</b>					
4) Simulate the Arduino LED blinking activity in Tinker cad.					
<b>WEEK-5</b>					
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.					

**WEEK-6**

6) Interfacing IR Sensor and Servo Motor with Arduino.

**WEEK-7**

7) Blink LED using ESP32.

**WEEK-8**

8) LDR Interfacing with ESP32.

**WEEK-9**

9) Control an LED using Mobile App.

**WEEK-10**

10) Design and 3D print a Walking Robot

**WEEK-11**

11) Design and 3D Print a Rocket.

**WEEK-12**

12) Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.

**WEEK-13**

13) Demonstrate all the steps in design thinking to redesign a motor bike.

**Web References:**

1. <https://aim.gov.in/pdf/equipment-manual-pdf.pdf>
2. <https://atl.aim.gov.in/ATL-Equipment-Manual/>
3. <https://aim.gov.in/pdf/Level-1.pdf>
4. <https://aim.gov.in/pdf/Level-2.pdf>
5. <https://aim.gov.in/pdf/Level-3.pdf>



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## B.Tech. III Year II Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	PC	23A3007T	Big Data Analytics	3	0	0	3
2	PC	23A0537T	Deep Learning	3	0	0	3
3	PC	23A3008T	Natural Language Processing	2	0	2	3
4	PE	23A3009Ta 23A3314Tc 23A3315Tb 23A3010Tb	<b>Professional Elective-II</b> 1. Reinforcement learning 2. Recommender Systems 3. Predictive Analytics 4. AI for Finance	3	0	0	3
5	PE	23A3315Ta 23A0539Tc 23A3311T 23A3315Tc	<b>Professional Elective-III</b> 1. Introduction to Quantum Computing 2. Computer Vision 3. Cloud Computing for AI 4. Social Network Analysis	3	0	0	3
6	OE		<b>Open Elective – II</b>	3	0	0	3
7	PC	23A3011P	Deep Learning Lab	0	0	3	1.5
8	PC	23A3012P	Big data Analytics and Data Visualization Lab	0	0	3	1.5
9	SE	23A0026T	<b>Skill Enhancement course</b> Soft skills	0	1	2	2
10	MC	23A0053T	<b>Audit Course</b> Technical Paper Writing & IPR	2	0	0	-
11	PC	23A3013	Workshop	0	0	0	0
<b>Total Credits</b>							<b>23</b>
<b>Category</b>				<b>CREDITS</b>			
Professional Core Courses (PC)				12			
Professional Elective Courses (PE)				6			
Open Elective Courses (OE)				3			
Skill Enhancement Course (SE)				2			
Mandatory Course(MC)				-			
<b>TOTALCREDITS</b>				<b>23</b>			



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## Open Elective - II

SI.No	Course Code	Course Title	Offered by the Dept
1	23A0150T	Disaster Management	CIVIL
2	23A0151T	Sustainability In Engineering Practices	CIVIL
3	23A0232T	Renewable Energy Sources	EEE
4	23A0334Tb	Automation and Robotics	ME
5	23A0443T	Digital Electronics	ECE
6	23A0030T	Optimization Techniques for Engineers	Mathematics
7	23A0029T	Mathematical Foundation Of Quantum Technologies	Mathematics
8	23A0035T	Physics Of Electronic Materials And Devices	Physics
9	23A0041T	Chemistry Of Polymers And Applications	Chemistry
10	23A0045T	Academic Writing and Public Speaking	Humanities



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## B.Tech. III Year II Semester

<b>BIG DATA ANALYTICS</b>					
<b>(Professional Core)</b>					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3007T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<b>This course will enable students to:</b>					
<ul style="list-style-type: none"> <li>• To introduce the fundamental concepts and characteristics of Big Data.</li> <li>• To equip students with knowledge of Hadoop, Spark, and distributed computing systems.</li> <li>• To develop the ability to process, store, and analyze Big Data using modern tools.</li> <li>• To implement various big data analytics techniques on real-world data.</li> <li>• To apply big data tools and frameworks in domains such as finance, health, and e-commerce</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to:</b>					
<ul style="list-style-type: none"> <li>• Understand the characteristics, challenges, and tools of Big Data.</li> <li>• Implement storage and retrieval mechanisms in HDFS and NoSQL databases.</li> <li>• Develop Map Reduce and Spark-based applications.</li> <li>• Apply big data analytics techniques to process real-world large-scale datasets.</li> <li>• Integrate big data platforms with machine learning and business intelligence solutions.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit-I</b>	<b>Introduction to Big Data and Hadoop Ecosystem</b>			<b>9Hrs</b>	
Definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Value), Types of Data: Structured, Semi-Structured, and Unstructured, Traditional vs Big Data Systems, Big Data Challenges and Benefits, Introduction to Hadoop: Architecture and Components, Hadoop Distributed File System (HDFS): Features, Design, Blocks, YARN and Map Reduce Overview, Hadoop Ecosystem Components: Pig, Hive, HBase, Sqoop, Flume					
<b>Unit-II</b>	<b>Map Reduce Programming and Hadoop Tools</b>			<b>10Hrs</b>	
Map Reduce Programming Model: Mapper, Reducer, Partitioner, Input Split and Record Reader, Combiner, Writing Map Reduce Programs in Java, Advanced Map Reduce Concepts: Counters, Joins, Secondary Sort, Hive: Data Warehousing Concepts, HiveQL, Partitions, Buckets, Pig: Data Flow, Pig Latin					

Scripts, Data Import & Export with Sqoop, Real-Time Data Collection using Flume.		
<b>Unit-III</b>	<b>NoSQL Databases and HBase</b>	<b>10Hrs</b>
Introduction to Nasal Databases, Types of Nasal: Key-Value, Document, Column, Graph, Differences between RDBMS and Nasal, HBase Data Model: Column Families, Regions, Tables, HBase Architecture and Internals, HBase CRUD Operations using Java, Integration of HBase with Hadoop, Case Study: Big Data Storage in Social Media.		
<b>Unit-IV</b>	<b>Apache Spark and Big Data Analytics</b>	<b>10Hrs</b>
Apache Spark: RDDs and DAG Execution Model, Spark Core and Spark SQL, Data Frames and Datasets in Spark, Spark Streaming: Architecture and DStreams, Spark MLlib: Machine Learning on Big Data, GraphX: Graph Processing in Spark, Performance Tuning and Optimization in Spark, Case Study: Building a Spark Application for Real-Time Analytics		
<b>Unit-V</b>	<b>Applications and Case Studies in Big Data</b>	<b>9Hrs</b>
Big Data in Healthcare: Predictive Analysis, Genomics, Big Data in Finance: Fraud Detection, Risk Analytics, Big Data in E-Commerce: Customer Behavior, Personalization, Sentiment Analysis using Big Data, Big Data for Smart Cities and IoT, Big Data and Cloud Computing Integration (AWS, GCP, Azure), Data Privacy, Security, and Ethical Issues – (E), Mini-Project: Design and Development of a Big Data Solution		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Tom White, <b>Hadoop: The Definitive Guide</b>, O'Reilly Media.</li> <li>2. V. Srinivasa Subramanian, <b>Big Data Analytics</b>, Wiley India.</li> <li>3. An and Rajaraman and Jeffrey D. Ullman, <b>Mining of Massive Datasets</b>, Cambridge University Press.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Chuck Lam, <b>Hadoop in Action</b>, Manning Publications.</li> <li>2. Bill Franks, <b>Taming the Big Data Tidal Wave</b>, Wiley.</li> <li>3. Alex Holmes, <b>Hadoop in Practice</b>, Manning Publications.</li> <li>4. Michael Minelli, <b>Big Data, Big Analytics: Emerging Business Intelligence</b>, Wiley.</li> </ol>		
<b>Online Learning Resources:</b>		
<ol style="list-style-type: none"> <li>1. Coursera – Big Data Specialization by UC San Diego</li> <li>2. edX – Big Data Analysis with Apache Spark (UC Berkeley)</li> <li>3. Udacity – Data Engineering Nano degree</li> </ol>		



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## B.Tech. III Year II Semester

<b>DEEP LEARNING</b>					
(Common to CSE)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0537T</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• Demonstrate the major technology trends driving Deep Learning</li> <li>• Build, train, and apply fully connected deep neural networks</li> <li>• Implement efficient (vector zed) neural networks</li> <li>• Analyse the key parameters and hyper parameters in a neural network's architecture</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>• Demonstrate the mathematical foundation of neural network</li> <li>• Describe the machine learning basics</li> <li>• Differentiate architecture of deep neural network</li> <li>• Build a convolution neural network</li> <li>• Build and train RNN and LSTMs</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>Linear Algebra</b>				8Hrs
<b>Linear Algebra:</b> Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bays'Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.					
<b>Unit-II</b>	<b>Machine Learning</b>				9Hrs
<b>Machine Learning:</b> Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.					

<b>Unit-III</b>	<b>Regularization for Deep Learning</b>	8Hrs
<p><b>Regularization for Deep Learning:</b> Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.</p>		
<b>Unit-IV</b>	<b>Convolution Networks</b>	9Hrs
<p><b>Convolution Networks:</b> The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolution Networks.</p>		
<b>Unit-V</b>	<b>Sequence Modelling</b>	8Hrs
<p><b>Sequence Modelling:</b> Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.</p>		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Ian Good fellow, Joshua Bagnio, Aaron Carville, —Deep Learning, MIT Press,2016.</li> <li>2. Josh Patterson and Adam Gibson, —Deep learning: A practitioner's approach, O'Reilly Media, First Edition,2017.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Baume, O'Reilly, Sheriff Publishers,2019.</li> <li>2. Deep learning Cook Book, Practical recipes to get started Quickly, Douse Using, O'Reilly, Sheriff Publishers, 2019</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://keras.io/datasets/">https://keras.io/datasets/</a></li> <li>2. <a href="http://deeplearning.net/tutorial/deeplearning.pdf">http://deeplearning.net/tutorial/deeplearning.pdf</a></li> <li>3. <a href="https://arxiv.org/pdf/1404.7828v4.pdf">https://arxiv.org/pdf/1404.7828v4.pdf</a></li> <li>4. <a href="https://www.cse.iitm.ac.in/~miteshk/CS7015.html">https://www.cse.iitm.ac.in/~miteshk/CS7015.html</a></li> <li>5. <a href="https://www.deeplearningbook.org">https://www.deeplearningbook.org</a></li> <li>6. <a href="https://nptel.ac.in/courses/106105215">https://nptel.ac.in/courses/106105215</a></li> </ol>		



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## B.Tech. III Year II Semester

Natural Language processing (Professional Core)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3008T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>Basics of NLP, Morphology, Tokenization, N-gram Models</li> <li>POS Tagging, Parsing, Treebanks, Ambiguity Handling</li> <li>Word Sense Disambiguation, Semantic Parsing, Sentiment Analysis</li> <li>Machine Translation, Transformers, BERT/GPT, Ethical NLP</li> <li>Speech Recognition, Feature Extraction, Discourse Analysis</li> </ul>					
<b>Course Outcomes (CO):</b>					
Upon completion of this course, the student will be able to:					
<ul style="list-style-type: none"> <li>Understand morphological processing and the structure of words and documents.</li> <li>Analyze syntactic structures using various parsing algorithms.</li> <li>Apply semantic parsing techniques to interpret natural language text.</li> <li>Understand predicate-argument structures and meaning representation systems.</li> <li>Apply cross-lingual language models and speech recognition techniques in NLP applications</li> </ul>					
<b>Syllabus</b>				<b>Total Hours: 48 Hrs</b>	
<b>Unit-I</b>	<b>Introduction to NLP</b>			<b>10 Hrs</b>	
Introduction to NLP: Origins and Challenges, Language and Grammar in NLP, Regular Expressions and Finite-State Automata, Tokenization: Text Segmentation and Sentence Splitting, Morphological Parsing: Stemming and Lemmatization, Spelling Error Detection and Correction, Minimum Edit Distance and Applications, Statistical Language Models: Unigram, Bigram, and Trigram Models, Processing Indian Languages in NLP.					
<b>Unit-II</b>	<b>Word-Level and Syntactic Analysis</b>			<b>9 Hrs</b>	
Introduction, Part-of-Speech (POS) Tagging: Rule-Based, Stochastic and Transformation-Based Approaches, Hidden Markov Models (HMM) and Maximum Entropy Models for POS Tagging, Context-Free Grammar (CFG) and Constituency Parsing, Treebanks and Normal Forms for Grammar, Top-Down and Bottom-Up Parsing Strategies, CYK Parsing Algorithm, Probabilistic Context-Free Grammars (PCFGs), Feature Structures and Unification.					

<b>Unit-III</b>	<b>Text Classification and Information Retrieval</b>	<b>10 Hrs</b>
<p>Naïve Bayes Classifier for Text Classification, Training and Optimization for Sentiment Analysis, Information Retrieval: Basic Concepts and Design Features, Information Retrieval Models: Classical, Non-Classical, and Alternative Models, Cluster Model, Fuzzy Model, and LSTM-Based Information, Retrieval, Word Sense Disambiguation (WSD) Methods: Supervised and Dictionary-Based Approaches.</p>		
<b>Unit-IV</b>	<b>Machine Translation and Semantic Processing</b>	<b>10 Hrs</b>
<p>Introduction to Machine Translation (MT), Language Divergence and Typology in MT Encoder-Decoder Model for Machine Translation, Translating in Low-Resource Scenarios, MT Evaluation Metrics and Techniques, Bias and Ethical Issues in NLP and Machine Translation, Semantic Analysis and First-Order Logic in NLP, Thematic Roles and Selectional Restrictions in Semantics, Word Senses and Relations Between Senses</p>		
<b>Unit-V</b>	<b>Speech Processing and Advanced NLP Models</b>	<b>9 Hrs</b>
<p>Speech Fundamentals: Phonetics and Acoustic Phonetics, Digital Signal Processing in Speech Analysis, Feature Extraction in Speech: Short-Time Fourier Transform (STFT), Mel-Frequency Cepstral Coefficients (MFCC) and Perceptual Linear Prediction (PLP), Hidden Markov Models (HMMs) in Speech Recognition.</p>		
<p><b>Textbooks(Core Learning Materials):</b></p> <ol style="list-style-type: none"> <li>1. Daniel Jurafsky &amp; James H. Martin – Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Pearson Education, 2023.</li> <li>2. Tanveer Siddiqui &amp; U.S. Tiwary – Natural Language Processing and Information Retrieval, Oxford University Press.</li> </ol>		
<p><b>Reference Books(Supplementary Learning)</b></p> <ol style="list-style-type: none"> <li>1. T.V. Geetha – Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives, Pearson, 2024.</li> <li>2. Akshay Kulkarni &amp; Adarsha Shivananda – Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python, Apress, 2019.</li> </ol>		
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://www.youtube.com/watch?v=M7SWr5xObkA">https://www.youtube.com/watch?v=M7SWr5xObkA</a></li> <li>2. <a href="https://onlinecourses.nptel.ac.in/noc23_cs45/preview">https://onlinecourses.nptel.ac.in/noc23_cs45/preview</a></li> <li>3. <a href="https://archive.nptel.ac.in/courses/106/106/106106211/">https://archive.nptel.ac.in/courses/106/106/106106211/</a></li> </ol>		



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## B.Tech. III Year II Semester

### REINFORCEMENT LEARNING (Professional Elective -II)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3009Ta</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To understand the foundational concepts of Reinforcement Learning (RL) and its mathematical formulations.</li> <li>• To explore dynamic programming, Monte Carlo methods, and temporal-difference learning.</li> <li>• To study the advanced function approximation methods using neural networks.</li> <li>• To apply RL algorithms to real-world decision-making problems.</li> <li>• To introduce policy gradient methods and deep reinforcement learning techniques.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p>Upon completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Explain the core principles of reinforcement learning and its interaction model.</li> <li>• Apply tabular and approximate solution methods for prediction and control.</li> <li>• Evaluate and compare Monte Carlo, TD, and policy gradient methods.</li> <li>• Design reinforcement learning models for real-world environments.</li> <li>• Integrate neural networks with reinforcement learning techniques.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Introduction to Reinforcement Learning</b>				<b>10Hrs</b>
Introduction to Machine Learning and RL, Agent-environment interface, Goals and rewards, Returns: episodic and continuing tasks, Markov Decision Processes (MDP), Value functions: state-value and action-value functions.					
<b>Unit-II</b>	<b>Dynamic Programming and Monte Carlo Methods</b>				<b>9Hrs</b>
Policy evaluation and improvement, Policy iteration and value iteration, Generalized policy iteration, Monte Carlo prediction and control, On-policy and off-policy MC methods.					
<b>Unit-III</b>	<b>Temporal-Difference Learning and Eligibility Traces</b>				<b>10Hrs</b>
TD Prediction (TD(0)), SARSA and Q-Learning, Expected SARSA, n-step returns, Eligibility traces, TD( $\lambda$ ) methods.					

<b>Unit-IV</b>	<b>Function Approximation and Deep RL</b>	<b>10Hrs</b>
<p>Linear and non-linear function approximation, Feature construction, Deep Q Networks (DQN), Experience replay and fixed Q-targets, Double DQN and Dueling DQN, Challenges in deep RL</p>		
<b>Unit-V</b>	<b>Policy Gradient and Actor-Critic Methods</b>	<b>9Hrs</b>
<p>Policy gradient theorem, REINFORCE algorithm, Variance reduction techniques, Actor-Critic architecture, Proximal Policy Optimization (PPO), Applications in Robotics and Games</p>		
<p><b>Textbooks:</b>  1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, MIT Press, 2018. <b>(Free online at <a href="http://incompleteideas.net/book/the-book-2nd.html">http://incompleteideas.net/book/the-book-2nd.html</a>)</b></p>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Csaba Szepesvári, "Algorithms for Reinforcement Learning", Morgan &amp; Claypool, 2010.</li> <li>2. Marco Wiering and Martijn van Otterlo, "Reinforcement Learning: State-of-the-Art", Springer, 2012.</li> <li>3. David Silver, Reinforcement Learning Lecture Series, University College London (UCL).</li> <li>4. François-Lavet et al., "An Introduction to Deep Reinforcement Learning", Foundations and Trends® in Machine Learning, 2018.</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. NPTEL Online Course: <a href="https://nptel.ac.in/courses/106106143">https://nptel.ac.in/courses/106106143</a> – Reinforcement Learning by Prof. Balaraman Ravindran, IIT Madras</li> <li>2. DeepMind &amp; UCL Lectures (David Silver): <a href="https://www.davidsilver.uk/teaching/">https://www.davidsilver.uk/teaching/</a></li> </ol>		



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## B.Tech III Year II Semester

### RECOMMENDER SYSTEMS

(Professional Elective-II)

Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3314Tc	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PE

#### Course Objectives:

This course will enable students to:

- To provide students with basic concepts and its application in various domain
- To make the students understand different techniques that a data scientist needs to know for analysing big data
- To design and build a complete machine learning solution in many application domains.

#### Course Outcomes (CO):

**On completion of this course, student will be able to**

- Aware of various issues related to Personalization and Recommendations.
- Design and implement a set of well-known Recommender System approaches used in E commerce and Tourism industry.
- Develop new Recommender Systems for a number of domains especially, Education, Health-care.

Syllabus		Total Hours:48
<b>Unit-I</b>	<b>An Introduction to Recommender Systems, Neighborhood-Based Collaborative Filtering</b>	<b>9Hrs</b>
Introduction, Goals of Recommender Systems, Basic Models of Recommender Systems, Domain Specific Challenges in Recommender Systems. Advanced Topics and Applications. Introduction, Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood- Neighborhood-Based Collaborative Filtering: Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, Graph Models for Neighborhood-Based Methods, A Regression Modelling View of Neighborhood Methods.		
<b>Unit-II</b>	<b>Model-Based Collaborative Filtering, Content-Based Recommender Systems</b>	<b>10Hrs</b>
Introduction, Decision and Regression Trees, Rule-Based Collaborative Filtering, Naive Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-Box, Latent Factor Models, Integrating Factorization and Neighborhood Models. Content-Based Recommender		

Systems: Introduction, Basic Components of Content-Based Systems, Pre-processing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations, Using Content-Based Models for Collaborative Filtering, Summary.		
<b>Unit-III</b>	<b>Knowledge-Based Recommender Systems, Ensemble Based and Hybrid Recommender Systems</b>	<b>10Hrs</b>
Introduction, Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems, Summary. Introduction, Ensemble Methods from the Classification Perspective, Weighted Hybrids, Switching Hybrids, Cascade Hybrids, Feature Augmentation Hybrids, Meta-Level Hybrids, Feature Combination Hybrids, Summary.		
<b>Unit-IV</b>	<b>Evaluating Recommender Systems, Context-Sensitive Recommender Systems</b>	<b>10Hrs</b>
Introduction, Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures, Limitations of Evaluation Measures. Introduction, The Multidimensional Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Modelling.		
<b>Unit-V</b>	<b>Time- and Location-Sensitive Recommender Systems</b>	<b>9Hrs</b>
Introduction, Temporal Collaborative Filtering, Discrete Temporal Models, Location-Aware Recommender Systems, Location-Aware Recommender Systems Location-Aware Recommender Systems, Summary.		
<b>Text Books:</b>		
1. Charu C. Aggarwal, —Recommender Systems, Springer, 2016. <b>Reference</b>		
<b>Reference Books:</b>		
1. Francesco Ricci, Lior Rokach, —Recommender Systems Handbook, 2nd ed., Springer, 2015 Edition		
<b>Web References:</b>		
1. Recommendation System -Understanding The Basic Concepts (analyticsvidhya.com)		
2. Recommender Systems   Coursera		



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## B.Tech. III Year II Semester

<b>PREDICTIVE ANALYTICS</b>					
<b>(Professional Elective-II)</b>					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3315Tb</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> <li>• To introduce the fundamental concepts and techniques of predictive analytics.</li> <li>• To apply statistical models and machine learning algorithms for prediction.</li> <li>• To interpret model performance using evaluation metrics.</li> <li>• To explore feature engineering, model tuning, and cross-validation.</li> <li>• To implement predictive solutions for real-world business and research problems.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p><b>On completion of this course, student will be able to</b></p> <ul style="list-style-type: none"> <li>• Understand the principles and importance of predictive analytics.</li> <li>• Apply regression and classification models for predictive tasks.</li> <li>• Perform data preprocessing, feature selection, and transformation.</li> <li>• Evaluate and validate models using standard metrics.</li> <li>• Design predictive solutions to solve domain-specific challenges.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
<b>Unit-I</b>	<b>Introduction to Predictive Analytics</b>			<b>9Hrs</b>	
Introduction to Predictive Analytics and Business Intelligence, Types of Predictive Models: Classification, Regression, Time Series, Supervised vs Unsupervised Learning, Predictive Modeling Workflow, Applications in Marketing, Finance, Healthcare, Challenges in Predictive Analytics.					
<b>Unit-II</b>	<b>Data Preparation and Feature Engineering</b>			<b>10Hrs</b>	
Data Cleaning: Handling Missing, Noisy, and Inconsistent Data, Feature Selection and Dimensionality Reduction (PCA, LDA), Feature Scaling: Normalization, Standardization, Encoding Categorical Variables, Feature Extraction and Construction, Dealing with Imbalanced Datasets.					
<b>Unit-III</b>	<b>Predictive Modeling with Regression and Classification</b>			<b>10Hrs</b>	
Linear Regression and Polynomial Regression, Logistic Regression for Binary Classification, Decision Trees and Random Forest, k-Nearest Neighbors (k-NN) and Naïve Bayes, Support Vector Machines (SVM), Model Selection and Comparison.					

Unit-IV	Model Evaluation and Validation	10Hrs
<p>Training, Testing, and Validation Sets, Cross-Validation Techniques (k-Fold, Stratified, LOOCV), Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC-AUC, Confusion Matrix and Classification Report, Bias-Variance Trade-off and Over fitting, Hyper parameter Tuning: Grid Search, Random Search.</p>		
Unit-V	Advanced Topics and Applications	9Hrs
<p>Ensemble Learning: Bagging, Boosting (AdaBoost, XGBoost), Predictive Analytics with Time Series (ARIMA, Prophet), Deep Learning for Predictive Modeling (ANNs, LSTM), Use of Predictive Analytics in IoT, Retail, and Healthcare, Ethics and Privacy in Predictive Analytics, Building and Deploying End-to-End Predictive Systems.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Dean Abbott, Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, Wiley, 2014.</li> <li>2. John D. Kelleher, Brendan Tierney, Data Science: Predictive Analytics and Data Mining, MIT Press, 2018.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Galit Shmueli et al., Data Mining for Business Analytics: Concepts, Techniques, and Applications in R, Wiley, 2017.</li> <li>2. Eric Siegel, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2016.</li> <li>3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer, 2009.</li> </ol>		
<p><b>Web References:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://www.coursera.org/specializations/predictive-analytics">https://www.coursera.org/specializations/predictive-analytics</a> – Coursera Specialization/</li> <li>2. <a href="https://www.edx.org/course/data-science-and-machine-learning-capstone">https://www.edx.org/course/data-science-and-machine-learning-capstone</a> – edX Predictive Analytics Courses/</li> <li>3. <a href="https://www.kaggle.com/learn/intro-to-machine-learning">https://www.kaggle.com/learn/intro-to-machine-learning</a> – Kaggle Tutorials/</li> </ol>		



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## B.Tech. III Year II Semester

<b>AI FOR FINANCE</b>					
(Professional Elective-II)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3010Tb</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• To introduce the role of Artificial Intelligence (AI) in financial applications and decision making.</li> <li>• To understand financial data types, sources, and processing methods.</li> <li>• To apply machine learning and deep learning models in various finance sectors.</li> <li>• To analyze risk, fraud detection, credit scoring, and portfolio management using AI.</li> <li>• To evaluate ethical and regulatory challenges in AI-enabled finance.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>• Describe the fundamentals of AI techniques applicable to finance.</li> <li>• Analyze financial time series data using AI-based models.</li> <li>• Apply machine learning for fraud detection and credit risk analysis.</li> <li>• Build predictive models for stock prices, trading, and customer segmentation.</li> <li>• Evaluate the limitations and ethical implications of AI in financial systems.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>Introduction to Finance and AI Applications</b>				<b>9Hrs</b>
Introduction to Financial Markets and Instruments, Overview of AI Techniques in Finance, Types of Financial Data: Market, Transactional, Customer, Financial Statements and Key Indicators, AI Use Cases in Banking, Insurance, and Investment, FinTech and the Rise of Robo-Advisors.					
<b>Unit-II</b>	<b>Machine Learning in Finance</b>				<b>10Hrs</b>
Supervised Learning for Credit Scoring, Unsupervised Learning for Customer Segmentation, Feature Engineering for Financial Data, Handling Imbalanced Datasets in Fraud Detection, Time Series Forecasting with Regression and ARIMA, Model Validation and Back testing in Finance.					
<b>Unit-III</b>	<b>Deep Learning and NLP in Finance</b>				<b>10Hrs</b>
Introduction to Deep Learning for Finance, Stock Price Prediction using LSTM and RNNs, Sentiment Analysis from Financial News and Tweets, NLP for Document Classification: Earnings Reports,					

Chatbots and Virtual Assistants in Banking, Reinforcement Learning for Portfolio Optimization.

**Unit-IV**

**AI-Driven Financial Applications**

**10Hrs**

Fraud Detection Systems using ML and DL, Credit Risk and Loan Default Prediction, AI in Algorithmic and High-Frequency Trading, Robo-Advisors: Architecture and Optimization, Block chain and AI Integration for Financial Security, Case Studies: AI in Wealth Management & Insurance.

**Unit-V**

**Ethics, Regulation, and Future of AI in Finance**

**9Hrs**

Regulatory Frameworks in AI-based Finance, Explain ability and Interpretability of Financial Models, Ethical Issues: Bias, Fairness, Transparency, Data Privacy and GDPR in Financial AI, Responsible AI Practices in Finance, Emerging Trends: Quantum AI, Decentralized Finance (DeFi).

**Text Books:**

1. Yves Hilpisch, Artificial Intelligence in Finance: A Python-Based Guide, O'Reilly, 2020.
2. Yves Hilpisch, Python for Finance: Mastering Data-Driven Finance, O'Reilly, 2018.
3. Markus Loecher, Machine Learning for Finance, Packt Publishing, 2021.

**Reference Books:**

1. W. Lo, The Evolution of Technical Analysis, Wiley Finance, 2010.
2. Tony Guida, Big Data and Machine Learning in Quantitative Investment, Wiley, 2019.
3. Tucker Balch, AI for Trading – Georgia Tech Specialization, Coursera.

**Web References:**

1. Coursera: AI for Trading – by NYIF and Google Cloud
2. edX: Artificial Intelligence in Finance – NYIF
3. Udemy: Machine Learning and AI in Finance
4. DataCamp: Financial Trading with Python
5. YouTube: AI for Finance by Sentdex, Two Minute Papers, and Data Professor



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## B.Tech. III Year II Semester

<b>INTRODUCTION TO QUANTUM COMPUTING</b> (Professional Elective-III)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A3315Ta</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To introduce the principles and mathematical foundations of quantum computation.</li> <li>• To understand quantum gates, circuits, and computation models.</li> <li>• To explore quantum algorithms and their advantages over classical ones.</li> <li>• To develop the ability to simulate and write basic quantum programs.</li> <li>• To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.</li> </ul>					
<b>Course Outcomes (CO):</b>					
Upon completion of this course, the student will be able to:					
<ul style="list-style-type: none"> <li>• Explain the fundamental concepts of quantum mechanics used in computing.</li> <li>• Construct and analyze quantum circuits using standard gates.</li> <li>• Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.</li> <li>• Develop simple quantum programs using Qiskit or similar platforms.</li> <li>• Analyze applications and challenges of quantum computing in real-world domains.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:</b>
<b>Unit-I</b>	<b>Fundamentals of Quantum Mechanics and Linear Algebra</b>				<b>10Hrs</b>
Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.					
<b>Unit-II</b>	<b>Quantum Gates and Circuits</b>				<b>9Hrs</b>
Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.					
<b>Unit-III</b>	<b>Quantum Algorithms and Complexity</b>				<b>9Hrs</b>
Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.					

<b>Unit-IV</b>	<b>Quantum Programming and Simulation Platforms</b>	<b>10Hrs</b>
Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.		
<b>Unit-V</b>	<b>Applications and Future of Quantum Computing</b>	<b>10Hrs</b>
Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions		
<p><b>Textbooks</b></p> <ol style="list-style-type: none"> <li>1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.</li> <li>2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.</li> <li>3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.</li> </ol>		
<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. David McMahan, Quantum Computing Explained, Wiley, 2008.</li> <li>2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.</li> <li>3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.</li> </ol>		
<p><b>Online Learning Courses:</b></p> <ol style="list-style-type: none"> <li>1. IBM Quantum Experience and Qiskit Tutorials</li> <li>2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley</li> <li>3. edX – The Quantum Internet and Quantum Computers</li> <li>4. YouTube – Quantum Computing for the Determined by Michael Nielsen</li> <li>5. Qiskit Textbook – IBM Quantum</li> </ol>		



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## B.Tech. III Year II Semester

<b>COMPUTER VISION</b>					
<b>(Professional Elective-III)</b>					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0539Tc</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PE</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.</li> </ul>					
<b>Course Outcomes (CO):</b>					
Upon successful completion of this course, students will be able to: <ul style="list-style-type: none"> <li>• Identify basic concepts, terminology, theories, models and methods in the field of computer vision,</li> <li>• Describe known principles of human visual system,</li> <li>• Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,</li> <li>• Suggest a design of a computer vision system for a specific problem.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:48</b>	
Unit-I	<b>LINEAR FILTERS</b>			8Hrs	
Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.					
Unit-II	<b>EDGE DETECTION</b>			9Hrs	
Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.					
Unit-III	<b>TEXTURE</b>			9Hrs	
Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes.					

Unit-IV	<b>SEGMENTATION BY CLUSTERING</b>	8Hrs
<p>What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves</p>		
Unit-V	<b>RECOGNIZATION BY RELATIONS BETWEEN TEMPLATES</b>	8Hrs
<p>Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.</p>		
<p><b>Text Books:</b></p> <p>1. David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.</p>		
<p><b>Reference Books:</b></p> <p>1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer; 1 edition, 2001 by Sommer.</p> <p>2. Digital Image Processing and Computer Vision, 1/e, by Sonka.</p> <p>3. Computer Vision and Applications: Concise Edition (With CD) by Jack Academy Press, 2000.</p>		
<p><b>Online Learning Resources:</b></p> <p><a href="https://nptel.ac.in/courses/106105216">https://nptel.ac.in/courses/106105216</a><a href="https://nptel.ac.in/courses/108103174">https://nptel.ac.in/courses/108103174</a></p>		



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B.Tech. III Year II Semester

<b>Cloud Computing for AI</b> (Professional Elective-III)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3311T	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PE
<b>Course Objectives:</b>					
<ol style="list-style-type: none"> <li>1. To introduce the concepts, models, and services of cloud computing and its role in AI.</li> <li>2. To explore the architecture and deployment of AI applications on cloud platforms.</li> <li>3. To equip students with skills in using cloud-based tools and services for AI/ML workloads.</li> <li>4. To understand data storage, processing, and security in cloud for AI tasks.</li> <li>5. To apply cloud computing principles to real-world AI-based solutions.</li> </ol>					
<b>Course Outcomes (CO):</b>					
<b>After completion of this course, students will be able to:</b>					
<ol style="list-style-type: none"> <li>1. Explain cloud computing architecture, services, and deployment models.</li> <li>2. Utilize cloud platforms (AWS, GCP, Azure) for training and deploying AI models.</li> <li>3. Handle large-scale data storage and processing in the cloud environment.</li> <li>4. Integrate AI workflows using server less and container-based architectures.</li> <li>5. Analyze challenges in security, cost, scalability, and performance of cloud-based AI systems</li> </ol>					
<b>Syllabus</b>					<b>48Hrs</b>
<b>Unit-I</b>	<b>Introduction to Cloud Computing and AI Integration</b>				<b>10Hrs</b>
Basics of Cloud Computing: Characteristics, Models, and Services, Cloud Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, Hybrid, Community, AI and Cloud Convergence: Benefits and Challenges, Use Cases of AI in Cloud: NLP, Vision, Analytics, Overview of Cloud Providers for AI: AWS, Azure, GCP.					
<b>Unit-II</b>	<b>Storage, Computing, and Data Processing in the Cloud</b>				<b>10Hrs</b>
Cloud Storage Services: S3, Blob, Big Query, Virtualization and Elastic Computing, Distributed Computing with Hadoop and Spark, Data Ingestion and Processing Pipelines, Data Lakes and Warehousing in the Cloud, Cost Optimization for Storage and Compute Resources.					
<b>Unit-III</b>	<b>Cloud-based Machine Learning and Deep Learning</b>				<b>10Hrs</b>
ML Services on AWS (Sage Maker), Azure ML, GCP Vertex AI, Training and Deploying Models on Cloud, AutoML and Custom ML Model Workflows, GPUs/TPUs for Model Training, Experiment Tracking and Model Evaluation, Integration of Notebooks (Jupyter, Colab) with Cloud Storage..					

<b>Unit-IV</b>	<b>Advanced Cloud Concepts for AI Applications</b>	<b>9Hrs</b>
Containers and Docker for AI Applications, Kubernetes and Cloud-native AI Workflows, Serverless Computing: AWS Lambda, Azure Functions, CI/CD Pipelines for AI Models in Cloud, Scaling AI Applications using Load Balancers and Auto-Scaling. Monitoring and Logging in Cloud for AI Workflows		
<b>Unit-V</b>	<b>Security, Ethics, and Case Studies in Cloud AI</b>	<b>9Hrs</b>
Security and Privacy in Cloud-based AI, Identity and Access Management (IAM) in Cloud, Cost Management and Billing for AI Services, Ethical Issues and Fairness in Cloud AI, Case Study: AI in Healthcare Cloud Solutions, Case Study: Real-Time Analytics in Financial Cloud Services.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill.</li> <li>2. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley.</li> <li>3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow, O'Reilly.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, Morgan Kaufmann.</li> <li>2. Tomasz Kajdanowicz et al., Practical Cloud AI, Springer.</li> <li>3. Mark Wilkins, AI and Machine Learning for Coders in Cloud, Packt Publishing.</li> </ol>		
<b>Online Learning Resources</b>		
<ol style="list-style-type: none"> <li>1. AWS Cloud Practitioner &amp; Machine Learning Path – AWS Training</li> <li>2. Google Cloud AI and ML Specialization – Coursera</li> <li>3. Microsoft Azure AI Engineer Associate – Learn Portal</li> </ol>		



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## B.Tech. III Year II Semester

SOCIAL NETWORK ANALYSIS (Professional Elective-III)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3315Tc	3:0:0:3	3	CIE:30 SEE:70	3Hours	PE
<b>Course Objectives:</b>					
This course will enable students: <ul style="list-style-type: none"> <li>To introduce the fundamentals and key concepts of social network theory and graph theory.</li> <li>To analyze the structure and properties of large-scale social networks.</li> <li>To apply centrality, influence, and community detection measures.</li> <li>To model information diffusion and network dynamics.</li> <li>To implement real-world social network analysis using tools and datasets.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to:</b> <ul style="list-style-type: none"> <li>Understand basic network models and social network structures.</li> <li>Analyze key properties like centrality, clustering, and small-world effect.</li> <li>Apply community detection algorithms and influence maximization.</li> <li>Interpret diffusion models for viral marketing and information spread.</li> <li>Use tools such as Gephi, NetworkX, or SNAP for real-world SNA</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48</b>
<b>Unit-I</b>	<b>Introduction to Social Networks and Graph Theory</b>				<b>10Hrs</b>
Basic Concepts: Graphs, Nodes, Edges, Directed/Undirected Graphs, Real-world Examples: Face book, Twitter, LinkedIn, Adjacency Matrix and Graph Representation, Types of Social Networks: Ego, Bipartite, Multilayer, Degree Distribution, Path Length, and Connectivity, Random Graph Models: Erdős–Rényi and Watts-Strogatz.					
<b>Unit-II</b>	<b>Structural Properties of Networks</b>				<b>9Hrs</b>
Network Centrality Measures: Degree, Closeness, Betweenness, Eigenvector Centrality and PageRank, Network Clustering and Community Detection Basics, Triadic Closure and Clustering Coefficient, Small-world Phenomenon and Milgram's Experiment, Homophily, Influence, and Structural Balance.					
<b>Unit-III</b>	<b>Community Detection and Subgroup Analysis</b>				<b>10Hrs</b>
Girvan–Newman Algorithm and Modularity, Label Propagation and Louvain Method, Clique Detection and k-Core Decomposition, Overlapping Communities and Fuzzy Clustering, Cohesive Subgroups and Structural Equivalence, Evaluation Metrics: NMI, Modularity Score.					

Unit-IV	Information Diffusion and Influence in Networks	9Hrs
Models of Diffusion: Linear Threshold and Independent Cascade, Influence Maximization and Viral Marketing, Contagion Models and Epidemic Spreading, Rumor Propagation and Cascade Models, Information Bottlenecks and Bridges, Measuring Influence and Reach.		
Unit-V	Tools, Applications, and Ethics in SNA	10Hrs
SNA Tools: Gephi, Pajek, NetworkX, SNAP, Case Study: Twitter and Hashtag Analysis, LinkedIn Network Mining and Graph Features, Applications in Marketing, Security, and Epidemiology, Ethical Issues in Social Network Data Mining, Building and Visualizing Your Own Social Graph.		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Wasserman, S., &amp; Faust, K., Social Network Analysis: Methods and Applications, Cambridge University Press, 1994.</li> <li>2. Easley, D., &amp; Kleinberg, J., Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.</li> <li>3. Newman, M., Networks: An Introduction, Oxford University Press, 2010.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Borgatti, S. P., Everett, M. G., &amp; Johnson, J. C., Analyzing Social Networks, SAGE Publications, 2018.</li> <li>2. Barabási, A.-L., Linked: How Everything Is Connected to Everything Else, Basic Books, 2014.</li> <li>3. Hansen, D., Shneiderman, B., &amp; Smith, M. A., Analyzing Social Media Networks with NodeXL, Elsevier, 2020</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. Coursera – Social Network Analysis (University of Michigan)</li> <li>2. [YouTube – NetworkX and Gephi Tutorials (free Code Camp, The Net Ninja)]</li> <li>3. edX – Networks: Friends, Money, and Bytes (University of California, Berkeley)</li> <li>4. Khan Academy – Graph Theory</li> </ol>		



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## B.Tech. III Year II Semester

<b>DISASTER MANAGEMENT (CSE, ECE, EEE, ME)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0150T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
<p><b>The objectives of the course are to make the students learn about</b></p> <ul style="list-style-type: none"> <li>• To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.</li> <li>• To Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.</li> <li>• To apply wind engineering principles and computational techniques in designing wind-resistant structures.</li> <li>• To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.</li> <li>• To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p><b>Upon completion of this course, students should be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.</li> <li>• Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.</li> <li>• Apply wind engineering principles and computational techniques in designing wind-resistant structures.</li> <li>• Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.</li> <li>• Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:42</b>
<b>Unit – I</b>	<b>Introduction to Natural Disasters</b>				<b>9 Hrs</b>
<p>Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).</p>					
<b>Unit – II</b>	<b>Cyclones and Their Impact</b>				<b>9Hrs</b>
<p>Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and</p>					

Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.		
<b>Unit – III</b>	<b>Wind Engineering and Structural Response</b>	<b>8 Hrs</b>
Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.		
<b>Unit - IV</b>	<b>Seismology and Earthquake Effects</b>	<b>8 Hrs</b>
Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.		
<b>Unit - V</b>	<b>Planning and Design Considerations for Seismic Safety</b>	<b>8 Hrs</b>
General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.</li> <li>2. Edward A. Keller and Duane E. De Vecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.</li> <li>2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.</li> <li>3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.</li> </ol>		
<b>Online Learning Resources:</b>		
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/124107010">https://nptel.ac.in/courses/124107010</a></li> <li>2. <a href="https://onlinecourses.swayam2.ac.in/cec19_hs20/preview">https://onlinecourses.swayam2.ac.in/cec19_hs20/preview</a></li> </ol>		



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## B.Tech. III Year II Semester

<b>SUSTAINABILITY IN ENGINEERING PRACTICES (CSE, ECE, EEE, ME)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0151T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
<p><b>The objectives of the course are to make the students learn about</b></p> <ul style="list-style-type: none"> <li>• To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.</li> <li>• To Analyse sustainable construction materials, their durability, and life cycle assessment.</li> <li>• To apply energy calculations in construction materials and assess their embodied energy.</li> <li>• To evaluate green building standards, energy codes, and performance ratings.</li> <li>• To assess the environmental effects of energy use, climate change, and global warming.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p><b>Upon completion of this course, students should be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.</li> <li>• Analyse sustainable construction materials, their durability, and life cycle assessment.</li> <li>• Apply energy calculations in construction materials and assess their embodied energy.</li> <li>• Evaluate green building standards, energy codes, and performance ratings.</li> <li>• Assess the environmental effects of energy use, climate change, and global warming.</li> </ul>					
<b>Syllabus</b>				<b>Total Hours:42</b>	
<b>Unit – I</b>	<b>Introduction</b>			<b>9 Hrs</b>	
Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO2 Contribution From Cement and Other Construction Materials.					
<b>Unit – II</b>	<b>Materials Used in Sustainable Construction</b>			<b>9Hrs</b>	
Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.					
<b>Unit – III</b>	<b>Energy Calculations</b>			<b>8 Hrs</b>	
Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in					

Conditioned Building - Life Cycle Energy Use		
<b>Unit – IV</b>	<b>Green Buildings</b>	<b>8 Hrs</b>
Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building		
<b>Unit – V</b>	<b>Environmental Effects</b>	<b>8 Hrs</b>
Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Charles J Kibert, Sustainable Construction: Green Building Design &amp; Delivery, 4th Edition , Wiley Publishers 2016.</li> <li>2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Craig A. Langston &amp; Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.</li> <li>2. William P Spence, Construction Materials, Methods &amp; Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://archive.nptel.ac.in/courses/105/105/105105157/">https://archive.nptel.ac.in/courses/105/105/105105157/</a></li> </ul>		



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## B.Tech. III Year II Semester

### RENEWABLE ENERGY SOURCES

(Common To All Branches Except EEE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0232T	3:0:0:0	3	CIE:30 & SEE:70	3 Hours	OE

#### Course Objectives:

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

- To understand solar radiation principles, measurement techniques, and geometric relationships for solar energy applications.
- To analyze flat plate and concentrating solar collectors for thermal energy conversion and storage systems.
- To comprehend photovoltaic effect principles in crystalline silicon and various PV technologies.
- To design and analyze stand-alone and grid-connected photovoltaic systems with proper electrical characteristics.
- To understand wind energy conversion principles and aerodynamic forces acting on wind turbine blades.
- To evaluate wind data, site selection criteria, and design considerations for horizontal and vertical axis wind machines.
- To estimate geothermal energy resources and understand various geothermal sources including hydrothermal and hot dry rock systems.
- To assess advantages, limitations, and applications of geothermal energy with focus on Indian prospects.
- To analyze ocean energy systems including tidal and wave energy conversion principles and their operational methods.
- To understand biomass conversion technologies, biogas generation, and fuel cell principles with their performance characteristics and applications.

#### Course Outcomes(CO):

After the completion of the course students will able to:

- Understand principle operation of various renewable energy sources.
- Identify site selection of various renewable energy sources.
- Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies
- Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
- Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for

generation of power.		
<b>Syllabus</b>		<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Solar Energy</b>	<b>10Hrs</b>
Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.		
<b>Unit-II</b>	<b>PV Energy Systems</b>	<b>9Hrs</b>
Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems..		
<b>Unit -III</b>	<b>Wind Energy</b>	<b>10Hrs</b>
Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations..		
<b>Unit -IV</b>	<b>Geothermal Energy</b>	<b>10Hrs</b>
Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.		
<b>Unit -V</b>	<b>Miscellaneous Energy Technologies</b>	<b>9Hrs</b>
<p>Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.</p> <p>Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.</p>		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. G. D. Rai, Non-Conventional Energy Sources, 4th Edition, Khanna Publishers, 2000.</li> <li>2. Chetan Singh Solanki, Solar Photovoltaics fundamentals, technologies and applications, 2nd Edition PHI Learning Private Limited. 2012</li> </ol>		

**Reference Books:**

1. Stephen Peake, Renewable Energy Power for a Sustainable Future, Oxford International Edition, 2018.
2. S. P. Sukhatme, Solar Energy, 3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
3. B H Khan , Non-Conventional Energy Resources, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma, Non-Conventional Energy Resources, 3rd Edition, S.K.Kataria & Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, Renewable Energy Resource: Basic Principles and Applications, Narosa Publishing House, 2004.

**Online Learning Resources:**

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/108108078>



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## B.Tech. III Year II Semester

### AUTOMATION AND ROBOTICS (Common To All Branches Except ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0334Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE

#### Course Objectives:

This course will enable students to:

- Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
- Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation
- Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
- Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
- Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

#### Course Outcomes (CO):

After completion of the course, students will be able to:

- Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.
- Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.
- Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.
- Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.
- Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.

#### Syllabus

Unit-I	Introduction to Automation	10 Hrs
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Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing

Unit -II	Automated flow lines	10 Hrs
<p>Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.</p>		
Unit-III	Introduction to Industrial Robotics	10 Hrs
<p>Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.</p> <p>Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric &amp; Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.</p>		
Unit-IV	Manipulator Kinematics	9 Hrs
<p>Manipulator Kinematics, Homogenous transformations as applicable to rotation and translation - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.</p>		
Unit-V	Robot Programming	9 Hrs
<p>Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding &amp; spray painting - Assembly and Inspection.</p>		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Automation , Production systems and CIM,M.P. Groover /Pearson Edu.</li> <li>2. Industrial Robotics - M.P. Groover, TMH.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Robotics , Fu K S, McGraw Hill, 4th edition, 2010.</li> <li>2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.</li> <li>3. Robotic Engineering , Richard D. Klafter, Prentice Hall</li> <li>4. Robotics, Fundamental Concepts and analysis – Ashitave Ghosal ,Oxford Press, 1/e, 2006</li> <li>5. Robotics and Control , Mittal R K &amp;Nagrath I J , TMH.</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://www.youtube.com/watch?v=yxZm9WQJUA0&amp;list=PLRLB5WCqU54UJG45UnazSYmmhl-gt76o">https://www.youtube.com/watch?v=yxZm9WQJUA0&amp;list=PLRLB5WCqU54UJG45UnazSYmmhl-gt76o</a></li> <li>2. <a href="https://www.youtube.com/watch?v=6f3bvIhSWyM&amp;list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE">https://www.youtube.com/watch?v=6f3bvIhSWyM&amp;list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE</a></li> </ol>		



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## B.Tech. III Year II Semester

<b>DIGITAL ELECTRONICS</b>					
<b>(Common To All Branches of Engineering Except ECE)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
<b>23A0443T</b>	<b>3:0:0:0</b>	<b>3</b>	<b>CIE:30 &amp; SEE:70</b>	<b>3 Hours</b>	<b>OE</b>
<b>Course Objectives:</b>					
The objectives of the course are to make the students learn about: <ul style="list-style-type: none"> <li>• To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.</li> <li>• To analyze combinational circuits like adders, subtractors, and code converters.</li> <li>• To explore combinational logic circuits and their applications in digital design.</li> <li>• To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.</li> <li>• To gain knowledge about programmable logic devices and digital IC's.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After the completion of the course students will able to: <ul style="list-style-type: none"> <li>• Understand the Boolean algebra, logic simplification techniques</li> <li>• Implement the minimization techniques for combinational circuit design</li> <li>• Analyze the combinational circuits like adders, subtractors, multipliers and code converters</li> <li>• Explore the combinational logic circuits and their applications in digital design</li> <li>• Understand the sequential logic circuits, including latches, flip-flops, counters, and shift registers</li> <li>• Understand the programmable logic devices and digital IC's</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Solar Energy</b>				<b>10Hrs</b>
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.					
<b>Unit-II</b>	<b>PV Energy Systems</b>				<b>9Hrs</b>
Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Binary Multipliers, Code converters- Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.					
<b>Unit -III</b>	<b>Wind Energy</b>				<b>10Hrs</b>
Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.					

<b>Unit -IV</b>	<b>Geothermal Energy</b>	<b>10Hrs</b>
Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.		
<b>Unit -V</b>	<b>Miscellaneous Energy Technologies</b>	<b>9Hrs</b>
Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL). Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Digital Design, M. Morris Mano &amp; Michel D. Ciletti, 5th Edition, Pearson Education, 1999.</li> <li>2. Switching theory and Finite Automata Theory, Zvi Kohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Fundamentals of Logic Design, Charles H Roth, Jr.,5th Edition, Brooks/cole Cengage Learning,2004.</li> </ol>		



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## B.Tech. III Year II Semester

### OPTIMIZATION TECHNIQUES

(Common to all branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0030T	3:0:0:0	3	CIE:30 & SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> <li>Define machine learning and its different types (supervised and unsupervised) and understand their applications.</li> <li>Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).</li> <li>Implement unsupervised learning techniques, such as K-means clustering</li> </ul>					
<b>Course Outcomes(CO):</b>					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> <li>Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.</li> <li>Interpret the transportation models' solutions and infer solutions to the real-world problems.</li> <li>Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.</li> <li>Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives</li> <li>Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Linear programming I</b>				<b>10Hrs</b>
Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method					
<b>Unit-II</b>	<b>Linear programming II: Duality in Linear Programming</b>				<b>9Hrs</b>
Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem					

<b>Unit -III</b>	<b>Non-linear programming: Unconstrained optimization techniques</b>	<b>10Hrs</b>
Introduction: Classification of Unconstrained minimization methods, Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method		
<b>Unit -IV</b>	<b>Non-linear programming: Constrained optimization techniques</b>	<b>10Hrs</b>
Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.		
<b>Unit –V</b>	<b>Geometric Programming</b>	<b>9Hrs</b>
Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.		
Constrained minimization Problems: Solution of a constrained geometric programming problem, primal dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.</li> <li>2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.</li> <li>2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.</li> </ol>		
<p><b>Web Reference:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://onlinecourses.nptel.ac.in/noc24_ee122/preview">https://onlinecourses.nptel.ac.in/noc24_ee122/preview</a></li> <li>2. <a href="https://archive.nptel.ac.in/courses/111/105/111105039/">https://archive.nptel.ac.in/courses/111/105/111105039/</a></li> <li>3. <a href="https://onlinecourses.nptel.ac.in/noc21_ce60/preview">https://onlinecourses.nptel.ac.in/noc21_ce60/preview</a></li> </ol>		



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## B.Tech. III Year II Semester

MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (EEE,ME,ECE,CSE,AI ML,DS,CS)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0029T	3:0:0:0	3	CIE:30 & SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
<p>The objectives of the course are to make the students learn about:</p> <ul style="list-style-type: none"> <li>To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.</li> <li>To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.</li> <li>To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.</li> <li>To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.</li> <li>To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p>After the completion of the course students will able to:</p> <ul style="list-style-type: none"> <li>Understand vector spaces, inner products, and linear operators with applications to quantum systems.</li> <li>Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.</li> <li>Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.</li> <li>Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.</li> <li>Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Linear Algebra Foundation for Quantum Mechanics</b>				<b>10Hrs</b>
<p>Vector spaces definition and examples (<math>R^2</math>, <math>R^3</math>, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (<math>2 \times 2</math> matrices, spin-1/2 systems), Dirac notation introduction (<math> \psi\rangle</math>, <math>\langle\phi </math>, <math>\langle\phi \psi\rangle</math>), Change of basis (transformations, unitary matrices).</p>					

Unit-II	From Finite to Infinite Dimensions	9Hrs
Function spaces ( $L^2$ space, square-integrable functions), Inner products for functions ( $\int \psi^* \phi dx$ ), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).		
Unit-III	Quantum Mechanical Formalism	10Hrs
Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).		
Unit -IV	Applications and Statistical Interpretation	10Hrs
Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).		
Unit -V	Advanced Topics	9Hrs
Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>David J. Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press (2018).</li> <li>R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>George. F. Simmons, Introduction to Topology and Modern Analysis, MedTech Science Press.</li> <li>Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).</li> <li>John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).</li> </ol>		
<p><b>Web Reference:</b></p> <ol style="list-style-type: none"> <li><a href="https://eclass.uoa.gr/Units/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf">https://eclass.uoa.gr/Units/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf</a></li> <li><a href="https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf">https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf</a></li> </ol>		



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## B.Tech. III Year II Semester

PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (Common to all branches of Engineering)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0035T	3:0:0:0	3	CIE:30 & SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
<p>The objectives of the course are to make the students learn about:</p> <ul style="list-style-type: none"> <li>To make the students to understand the concept of crystal growth, defects in crystals and thin films.</li> <li>To provide insight into various semiconducting materials and their properties.</li> <li>To develop a strong foundation in semiconductor physics and device engineering.</li> <li>To elucidate excitonic and luminescent processes in solid-state materials.</li> <li>To understand the principles, technologies, and applications of modern display systems.</li> </ul>					
<b>Course Outcomes(CO):</b>					
<p>After the completion of the course students will able to:</p> <ul style="list-style-type: none"> <li>Understand crystal growth and thin film preparation</li> <li>Summarize the basic concepts of semiconductors</li> <li>Illustrate the working of various semiconductor devices</li> <li>Analyze various luminescent phenomena and the devices based on these concepts</li> <li>Explain the working of different display devices</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Fundamentals of Materials Science</b>				<b>10Hrs</b>
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).					
<b>Unit-II</b>	<b>Semiconductors</b>				<b>9Hrs</b>
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, change of electron hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.					

<b>Unit-III</b>	<b>Physics of Semiconductor Devices</b>	<b>10Hrs</b>
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.		
<b>Unit -IV</b>	<b>Excitons and Luminescence</b>	<b>10Hrs</b>
Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials. Photoluminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot. Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.		
<b>Unit -V</b>	<b>Display devices</b>	<b>9Hrs</b>
LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.		
<b>Textbooks:</b>		
1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4 <sup>th</sup> edition, 2021.		
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.		
<b>Reference Books:</b>		
1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition		
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005		
3. Electronic Components and Materials, Grover and Jamwal, Dhanpat Rai and Co., New Delhi., 2012.		
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011		
<b>NPTEL course links:</b>		
1. <a href="https://nptel.ac.in/courses/113/106/113106062/">https://nptel.ac.in/courses/113/106/113106062/</a>		
2. <a href="https://onlinecourses.nptel.ac.in/noc20_ph24/preview">https://onlinecourses.nptel.ac.in/noc20_ph24/preview</a>		



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## B.Tech. III Year II Semester

<b>CHEMISTRY OF POLYMERS AND APPLICATIONS</b>					
<b>(Common to all branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0041T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> <li>• To understand the basic principles of polymers</li> <li>• To understand natural polymers and their applications.</li> <li>• To impart knowledge to the students about synthetic polymers, their preparation and importance.</li> <li>• To enumerate the applications of hydrogel polymers</li> <li>• To enumerate applications of conducting and degradable polymers in engineering</li> </ul>					
<b>Course Outcomes(CO):</b>					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> <li>• Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer</li> <li>• Describe the physical and chemical properties of natural polymers and Modified cellulose.</li> <li>• Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers.</li> <li>• Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery,</li> <li>• Explain classification and mechanism of conducting and degradable polymers.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Polymers-Basics and Characterization</b>				<b>10Hrs</b>
<p>Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization.</p> <p>Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.</p>					
<b>Unit-II</b>	<b>Natural Polymers &amp; Modified cellulose</b>				<b>9Hrs</b>
<p>Natural Polymers: Chemical &amp; Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes,</p>					

vegetable oils and gums, proteins.

Modified cellulose: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

**Unit-III**

**Synthetic Polymers**

**10Hrs**

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

**Unit -IV**

**Hydrogels of Polymer networks**

**10Hrs**

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

**Unit -V**

**Conducting and Degradable Polymers**

**9Hrs**

**Conducting polymers:** Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

**Degradable polymers:** Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

**Textbooks:**

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

**Reference Books:**

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.



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## B.Tech. III Year II Semester

<b>ACADEMIC WRITING AND PUBLIC SPEAKING</b>					
<b>(Common to All Branches of Engineering)</b>					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0045T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE
<b>Course Objectives:</b>					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> <li>• To encourage all round development of the students by focusing on writing skills</li> <li>• To make the students aware of non-verbal skills</li> <li>• To develop analytical skills</li> <li>• To deliver effective public speeches</li> </ul>					
<b>Course Outcomes(CO):</b>					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> <li>• Understand various elements of Academic Writing</li> <li>• Identify sources and avoid plagiarism</li> <li>• Demonstrate the knowledge in writing a Research paper</li> <li>• Analyse different types of essays</li> <li>• Assess the speeches of others and know the positive strengths of speakers</li> </ul>					
Build confidence in giving an impactful presentation to the audience					
<b>Syllabus</b>					<b>Total Hours: 48Hrs</b>
<b>Unit-I</b>	<b>Introduction to Academic Writing</b>				<b>10Hrs</b>
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing					
<b>Unit-II</b>	<b>Academic Journal Article</b>				<b>9Hrs</b>
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing -Editing, Proof Reading – Plagiarism					
<b>Unit-III</b>	<b>Essay &amp; Writing Reviews</b>				<b>10Hrs</b>
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP					

Unit -IV	Public Speaking	10Hrs
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events		
Unit -V	Public Speaking and Non-Verbal Delivery	9Hrs
Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics - Paralanguage – Signs		
<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)</li> <li>2. Pease, Allan &amp; Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Alice Savage, Masoud Shafiei Effective Academic Writing,2Ed.,2014 Oxford University Press.</li> <li>2. Shalini Verma, Body Language, S Chand Publications 2011.</li> <li>3. Sanjay Kumar and Pushpalata,Communication Skills 2E 2015, Oxford.</li> <li>4. Sharon Gerson, Steven Gerson,Technical Communication Process and Product, Pearson, New Delhi, 2014</li> <li>5. Elbow, Peter. Writing with Power. OUP USA, 1998</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://youtu.be/NNhTIT81nH8">https://youtu.be/NNhTIT81nH8</a></li> <li>2. <a href="https://www.youtube.com/watch?v=478ccrWKY-A">https://www.youtube.com/watch?v=478ccrWKY-A</a></li> <li>3. <a href="https://www.youtube.com/watch?v=nzGo5ZC1gMw">https://www.youtube.com/watch?v=nzGo5ZC1gMw</a></li> <li>4. <a href="https://www.youtube.com/watch?v=Qve0ZBmJMh4">https://www.youtube.com/watch?v=Qve0ZBmJMh4</a></li> <li>5. <a href="https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-ofdelivery/">https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-ofdelivery/</a></li> <li>6. <a href="https://onlinecourses.nptel.ac.in/noc21_hs76/preview">https://onlinecourses.nptel.ac.in/noc21_hs76/preview</a></li> <li>7. <a href="https://archive.nptel.ac.in/courses/109/107/109107172/#">https://archive.nptel.ac.in/courses/109/107/109107172/#</a></li> <li>8. <a href="https://archive.nptel.ac.in/courses/109/104/109104107/">https://archive.nptel.ac.in/courses/109/104/109104107/</a></li> </ol>		



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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

## B.Tech. III Year II Semester

DEEP LEARNING LAB (Professional Core)					
Exam Marks	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3011P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
<b>This course will enable students to:</b>					
<ul style="list-style-type: none"> <li>To provide hands-on experience in building, training, and evaluating deep learning models using popular frameworks such as Tensor Flow and PyTorch. Students will implement neural networks, understand hyper parameter tuning, and explore deep learning architectures for real-world applications.</li> </ul>					
List of Experiments					
<b>WEEK-1</b>					
1. Implement a basic Perceptron using Python and classify binary data.					
<b>WEEK-2</b>					
2. Build and train a Multilayer Perceptron (MLP) using Tensor Flow/Keras on the MNIST dataset.					
<b>WEEK-3</b>					
3. Experiment with different activation functions (ReLU, sigmoid, tanh) and observe effects on learning.					
<b>WEEK-4</b>					
4. Compare optimizers (SGD, Adam, RMSprop) on convergence and performance.					
<b>WEEK-5</b>					
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets					
<b>WEEK-6</b>					
6. Perform data augmentation techniques and evaluate improvements in model accuracy.					
<b>WEEK-7</b>					
7. Implement Recurrent Neural Networks (RNN) and LSTMs for sentiment analysis on IMDB dataset.					

**WEEK-8**

8. Train a GAN (Generative Adversarial Network) to generate handwritten digits.

**WEEK-9**

9. Use Transfer Learning (e.g., ResNet, VGG) for fine-tuning on a custom dataset.

**WEEK-10**

10. Evaluate model using metrics such as precision, recall, F1-score, ROC curves.

**WEEK-11**

11. Deploy a trained deep learning model using Flask or Streamlit for web-based inference.

**WEEK-12**

12. Case Study: Develop an end-to-end solution (e.g., face mask detector, plant disease detection).

**Textbooks**

1. Ian Good fellow, Yoshua Bagnio, and Aaron Courville, **Deep Learning**, MIT Press, 2016.
2. François Chollet, **Deep Learning with Python**, Manning Publications, 2nd Edition, 2021.
3. Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras & Tensor Flow**, O'Reilly, 3rd Edition, 2022.

**Reference Books:**

1. Nikhil Buduma, **Fundamentals of Deep Learning**, O'Reilly Media, 2017.
2. Josh Patterson and Adam Gibson, **Deep Learning: A Practitioner's Approach**, O'Reilly, 2017.
3. Michael Nielsen, **Neural Networks and Deep Learning** (Online Book).



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## B.Tech. III Year II Semester

BIG DATA ANALYTICS & DATA VISUALIZATION LAB					
(Professional Core)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A3012P	0:0:3:1.5	1.5	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
This course will enable students					
<ul style="list-style-type: none"> <li>To introduce foundational tools and platforms in big data analytics.</li> <li>To apply programming skills in Hadoop and Spark for processing big datasets.</li> <li>To build visualization pipelines using Python libraries and BI tools.</li> <li>To analyze and interpret data insights visually and statistically.</li> <li>To implement predictive modelling and visual communication of outcomes.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<ul style="list-style-type: none"> <li>Understand big data ecosystems and tools.</li> <li>Execute data analysis tasks using Hadoop and Spark.</li> <li>Perform data visualization using Python and BI platforms.</li> <li>Analyze patterns, trends, and correlations in large datasets.</li> <li>Create dashboards and interactive visual insights.</li> </ul>					
<b>List of Experiments</b>					
WEEK-1					
1. Installation of Hadoop ecosystem and execution of basic HDFS commands					
WEEK-2					
2. Word Count and File Processing using Hadoop Map Reduce					
WEEK-3					
3. Working with Hive: Table creation, loading data, and performing analytical queries					
WEEK-4					
4. Data cleaning and transformation using PySpark Data Frames					
WEEK-5					
5. Implementing ML lib algorithms (e.g., Classification/Clustering) on Spark					

WEEK-6

6. Connecting Spark with Mongo DB/Cassandra for No SQL-based Big Data processing

WEEK-7

7. Visualizing data using Matplot lib and Sea born for univariate and bivariate analysis

WEEK-8

8. Creating interactive plots using Plotly and Dash

WEEK-9

9. Exploratory Data Analysis (EDA) and feature analysis with Pandas and Seaborn

WEEK-10

10. Real-time data ingestion (Twitter API or sensor data) and live visualization with Kafka + Spark Streaming

WEEK-11

11. Developing a dashboard using Tableau/Power BI for insights from processed Big Data

WEEK-12

12. Mini Project: End-to-end pipeline integrating Big Data processing and visualization using any real dataset

**Tools/Software Required:**

1. Hadoop, Hive, Spark (PySpark)
2. Python (Pandas, NumPy, Seaborn, Matplotlib, Plotly, Dash)
3. NoSQL: MongoDB / Cassandra
4. Tableau, Power BI, or Google Data Studio
5. Jupyter Notebooks, Anaconda
6. Kafka / Twitter API (for streaming)



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## B.Tech. III Year II Semester

SOFT SKILLS (Common to All Branches of Engineering)					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0026T	0:1:2:2	2	CIE:30 SEE:70	3 Hours	SE
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>To encourage all round development of the students by focusing on soft skills</li> <li>To make the students aware of critical thinking and problem-solving skills</li> <li>To enhance healthy relationship and understanding within and outside an organization</li> <li>To function effectively with heterogeneous teams</li> </ul>					
<b>Course Outcomes (CO):</b>					
COs	Statements				Blooms level
CO1	List out various elements of soft skills				L1, L2
CO2	Describe methods for building professional image				L1,L2
CO3	Apply critical thinking skills in problem solving				L3
CO4	Analyse the needs of an individual and team for well-being				L4
CO5	Assess the situation and take necessary decisions				L5
CO6	Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being				L6
Syllabus				Total Hours:48	
Unit-I	Soft Skills & Communication Skills			10Hrs	
Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques					
Unit-II	Critical Thinking				
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking – Reflection					
<b>Activities:</b> Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis					
Unit-III	Problem Solving & Decision Making				
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles					

<b>Activities:</b> Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion		
<b>Unit-IV</b>	<b>Emotional Intelligence &amp; Stress Management</b>	
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips		
<b>Activities:</b> Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates		
<b>Unit-V</b>	<b>Corporate Etiquette</b>	
Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips - Overcoming challenges		
<b>Activities</b> Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games		
<b>NOTE-:</b>  1. 1.The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.  2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.		

**Text Books:**

1. Mitra Barun K, *Personality Development and Soft Skills*, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, *Personality Development and Soft Skills: Preparing for Tomorrow*, K I ,esuoHgnihsilbu PlanoitanretnI

**REFERENCES:**

1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications 2018.
2. Alex K, *Soft Skills* S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, *Soft Skills: An Integrated Approach to Maximise Personality* Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, *Soft Skills and Employability Skills*, Cambridge University Press, 2018
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain, *Life Skills* (Paperback English) Publisher : Vayu Education of India, 2014

**Web References:**

1. [https://youtu.be/DUlsNJtg2L8?list=PLLy\\_2iUCG87CQhELCytvXh0E\\_y-bOO1\\_q](https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q)
2. [https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel\\_j2PUy0pwjVUgj7KlJ](https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ)
3. <https://youtu.be/-Y-R9hDI7IU>
4. <https://youtu.be/gkLsn4ddmTs>
5. <https://youtu.be/2bf9K2rRWwo>
6. <https://youtu.be/FchfE3c2jzc>
7. <https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/>
8. [https://onlinecourses.nptel.ac.in/noc24\\_hs15/preview](https://onlinecourses.nptel.ac.in/noc24_hs15/preview)
9. [https://onlinecourses.nptel.ac.in/noc21\\_hs76/preview](https://onlinecourses.nptel.ac.in/noc21_hs76/preview)



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## B.Tech. III Year II Semester

TECHNICAL REPORT WRITING & IPR					
Course Code	L:T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A0053T	2:0:0:-	-			MC
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>To enable the students to practice the basic skills of research paper writing</li> <li>To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.</li> <li>To practice the basic skills of performing quality literature review</li> <li>To help them in knowing the significance of real life practice and procedure of Patents.</li> <li>To enable them learn the procedure of obtaining Patents, Copyrights, &amp; Trade Marks</li> </ul>					
<ul style="list-style-type: none"> <li><b>Course Outcomes:</b></li> </ul>					
<b>On completion of this course, student will be able to</b>					
<ul style="list-style-type: none"> <li>Identify key secondary literature related to their proposed technical paper writing</li> <li>Explain various principles and styles in technical writing</li> <li>Use the acquired knowledge in writing a research/technical paper</li> <li>Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.</li> <li>Evaluate different forms of IPR available at national &amp; international</li> <li>Develop skill of making search of various forms of IPR by using modern tools and techniques..</li> </ul>					
<b>Syllabus</b>				<b>Total Hours: 48</b>	
<b>UNIT – I:</b>	<b>Principles of Technical Writing</b>				
<b>Principles of Technical Writing:</b> styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .					
<b>UNIT – II:</b>	<b>Technical Research Paper Writing</b>				
<b>Technical Research Paper Writing:</b> Abstract- Objectives-Limitations-Review of Literature-Problems and Framing Research Questions- Synopsis					
<b>UNIT – III:</b>	<b>Process of research</b>				
<b>Process of research:</b> publication mechanism: types of journals- indexing-seminars- conferences-proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules.					

<b>UNIT – IV:</b>	<b>Introduction to Intellectual property</b>	
<p><b>Introduction to Intellectual property:</b> Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights</p> <p>Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.</p>		
<b>UNIT – V:</b>	<b>Law of copy rights</b>	
<p><b>Law of copy rights:</b> Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law</p> <p>Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Deborah. E. Bouchoux, Intellectual Property Rights, Engage Learning India, 2013</li> <li>2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.</li> <li>2. Prabuddha Ganguli, Intellectual Property Rights Tata McGraw Hill, 2001</li> <li>3. P. Naryan, Intellectual Property Law, 3rd Ed, Eastern Law House, 2007.</li> <li>4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York ,2016</li> <li>5. Dan Jones, Sam Dragga, Technical Writing Style</li> </ol>		
<p><b>Online Learning Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://theconceptwriters.com.pk/principles-of-technical-writing/">https://theconceptwriters.com.pk/principles-of-technical-writing/</a></li> <li>• <a href="https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html">https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html</a></li> <li>• <a href="https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html">https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html</a></li> <li>• <a href="https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/">https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/</a></li> <li>• <a href="https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&amp;Practice.pdf">https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&amp;Practice.pdf</a></li> <li>• <a href="https://lawbhoomi.com/intellectual-property-rights-notes/">https://lawbhoomi.com/intellectual-property-rights-notes/</a></li> <li>• <a href="https://www.extension.purdue.edu/extmedia/ec/ec-723.pd">https://www.extension.purdue.edu/extmedia/ec/ec-723.pd</a></li> </ul>		



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## Honor Courses

S. No	Code	Course Name	Hours Per Week			Credits
			L	T	P	
1	23A30H01	Advanced Machine Learning & Statistical Modeling	3	0	0	3
2	23A30H02	Scalable AI & Big Data	3	0	0	3
3	23A30H03	Advanced Deep Learning for Data Science Applications	3	0	0	3
4	23A30H04	Data Engineering & Cloud-based AI Pipelines	3	0	0	3
5	23A30H05	Ethics, Bias & Explainability in AI	3	0	0	3
6	23A30H06	Big Data & AI Analytics Lab	0	0	3	1.5
7	23A30H07	Data Science & Visualization Lab	0	0	3	1.5
<b>Total</b>			15	0	6	<b>18</b>



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<b>Advanced Machine Learning &amp; Statistical Modelling</b>					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H01</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• To provide in-depth knowledge of advanced machine learning techniques and algorithms.</li> <li>• To impart statistical modelling concepts that support predictive and inferential learning.</li> <li>• To enable the learners to design, implement, and evaluate robust ML models.</li> <li>• To expose students to real-world data and model deployment techniques.</li> <li>• To encourage critical thinking in selecting and optimizing ML/statistical models for varied applications.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>• CO1: Understand and apply advanced supervised and unsupervised machine learning algorithms.</li> <li>• CO2: Analyze and evaluate models using statistical techniques and performance metrics.</li> <li>• CO3: Implement probabilistic graphical models and ensemble learning approaches.</li> <li>• CO4: Use statistical modelling to make data-driven decisions.</li> <li>• CO5: Develop, fine-tune, and deploy ML models using modern tools and frameworks.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>Advanced Supervised Learning</b>				<b>9 Hrs</b>
Review of foundational ML concepts, regularization: L1, L2, Elastic Net, Support Vector Machines (SVM) with Kernels, Gradient Boosting Machines (XGBoost, LightGBM), Hyperparameter tuning: Grid Search, Random Search, Bayesian Optimization					
<b>Unit-II</b>	<b>Deep Learning &amp; Neural Networks</b>				<b>10 Hrs</b>
Deep Feed forward Neural Networks, Back propagation and Optimization (SGD, Adam, RMSProp), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), LSTM, GRU, Transfer Learning and Fine-Tuning Pretrained Models					
<b>Unit-III</b>	<b>Unsupervised Learning &amp; Dimensionality Reduction</b>				<b>9 Hrs</b>

Clustering Algorithms: K-Means, DBSCAN, Agglomerative Clustering, Gaussian Mixture Models (GMM), Principal Component Analysis (PCA), t-SNE, UMAP, Auto encoders and Variational Auto encoders (VAE)

<b>Unit-IV</b>	<b>Statistical Modelling &amp; Probabilistic Learning</b>	<b>10 Hrs.</b>
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Linear & Logistic Regression (Advanced), Generalized Linear Models (GLM), Bayesian Inference and Bayesian Networks, Markov Chain Monte Carlo (MCMC), Gibbs Sampling, Hidden Markov Models (HMMs)

<b>Unit-V</b>	<b>Ensemble Methods &amp; Model Deployment</b>	<b>10 Hrs</b>
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Bagging, Boosting, and Stacking techniques, Random Forests and Voting Classifiers, Model Evaluation: Cross-validation, ROC, AUC, Precision-Recall, Model Explainability: SHAP, LIME, Model Deployment using Flask/Streamlit and MLflow

**Textbooks:**

1. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Ian Goodfellow, YoshuaBengio, and Aaron Courville, Deep Learning, MIT Press, 2016.
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

**Reference Books:**

1. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning, Springer, 2017.
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 3rd Edition, 2023.
3. David Barber, Bayesian Reasoning and Machine Learning, Cambridge University Press.

**Online Learning Resources:**

1. Stanford CS229: Machine Learning by Andrew Ng (YouTube & Coursera)
2. Fast.ai - Practical Deep Learning for Coders
3. Deep Learning Specialization - Coursera



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<b>SCALABLE AI &amp; BIG DATA ANALYTICS</b>					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H02</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To introduce the fundamentals and technologies used in big data ecosystems.</li> <li>• To explore scalable AI techniques and platforms for processing massive datasets.</li> <li>• To enable students to perform real-time analytics using distributed frameworks.</li> <li>• To understand storage, processing, and analysis challenges with big data.</li> <li>• To develop scalable machine learning and AI models on cloud-based environments.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After successful completion of the course, students will be able to:					
<p><b>CO1:</b> Understand the architecture and components of big data frameworks like Hadoop and Spark.</p> <p><b>CO2:</b> Analyze and manage large-scale data using distributed file systems and processing tools.</p> <p><b>CO3:</b> Apply AI and ML models on big data platforms for scalable analysis.</p> <p><b>CO4:</b> Work with cloud-based big data analytics platforms (e.g., AWS, GCP, Azure).</p> <p><b>CO5:</b> Design real-world applications involving real-time streaming and large-scale predictions.</p>					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>Introduction to Big Data Ecosystem</b>				<b>9Hrs</b>
Characteristics and types of Big Data (Volume, Velocity, Variety, Veracity, Value), Big Data Architecture, Hadoop Ecosystem: HDFS, MapReduce, YARN, NoSQL Databases: HBase, Cassandra, MongoDB, Introduction to Data Lakes.					
<b>Unit-II</b>	<b>Distributed Computing with Apache Spark</b>				<b>10Hrs</b>
Spark Architecture and RDDs, Spark SQL and Data Frames, Spark Streaming: Structured Streaming, Kafka integration, Performance optimization in Spark, Introduction to Delta Lake					
<b>Unit-III</b>	<b>Scalable Machine Learning</b>				<b>10Hrs</b>
MLlib in Spark: Feature extraction, classification, regression, clustering, Model tuning and evaluation at scale, Distributed training with TensorFlow and PyTorch, Transfer Learning with large datasets, AutoML in big data environments					
<b>Unit-IV</b>	<b>Real-time and Cloud-based Analytics</b>				<b>10Hrs</b>

Stream Processing: Apache Kafka, Flink, and Spark Structured Streaming, Cloud platforms: AWS (EMR, S3, SageMaker), Azure, Google BigQuery, BigQuery ML and Vertex AI, Server less Big Data Pipelines, Data Warehousing with Snowflake/Redshift

**Unit-V**

**Scalable AI Applications & Ethics**

**9Hrs**

Case Studies: Recommender Systems, Fraud Detection, Smart Cities, Federated Learning and Edge AI with Big Data, Explainable AI at Scale (XAI), Ethical and Privacy concerns in Big Data AI, Responsible AI frameworks and regulations (GDPR, Bias Mitigation)

Text Books:

1. **Viktor Mayer-Schönberger & Kenneth Cukier**, Big Data: A Revolution That Will Transform How We Live, Work, and Think, Houghton Mifflin Harcourt.
2. **Bill Chambers and Matei Zaharia**, Spark: The Definitive Guide, O'Reilly Media, 2018.
3. **Jules S. Damji et al.**, Learning Spark: Lightning-Fast Data Analytics, 2nd Edition, O'Reilly, 2020.

Reference Books:

1. **Tom White**, Hadoop: The Definitive Guide, O'Reilly, 4th Edition.
2. **Rajkumar Buyya, Rodrigo N. Calheiros, and Amir Vahid Dastjerdi**, Big Data: Principles and Paradigms, Morgan Kaufmann.
3. **Davy Cielen, Arno D. B. Meysman, and Mohamed Ali**, Introducing Data Science: Big Data, Machine Learning, and more, Manning Publications.



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

<b>Advanced Deep Learning for Data Science Applications</b>					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H03</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>➤ To understand the theoretical foundations and architectures of deep learning.</li> <li>➤ To apply deep learning models to solve real-world data science problems.</li> <li>➤ To develop skills in training, tuning, and deploying deep neural networks.</li> <li>➤ To explore use-cases in image, text, time-series, and tabular data analytics.</li> <li>➤ To gain hands-on experience with popular frameworks such as TensorFlow and PyTorch.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<b>On completion of this course, student will be able to:</b>					
CO1: Understand the fundamental concepts and mathematical foundations of deep learning.					
CO2: Design and implement various deep neural network architectures for data-driven tasks.					
CO3: Analyze data science problems and apply suitable deep learning techniques.					
CO4: Evaluate and fine-tune deep learning models using appropriate metrics.					
CO5: Build and deploy end-to-end deep learning applications in domains such as vision, NLP, and forecasting.					
<b>Syllabus</b>					<b>Total Hours:48</b>
<b>Unit-I</b>	<b>Fundamentals of Deep Learning</b>				<b>10Hrs</b>
Introduction to Deep Learning and Neural Networks, Perceptron, Activation Functions, and Back propagation, Loss Functions and Optimizers (SGD, Adam, etc.), Regularization (Dropout, Batch Normalization, Weight Decay), Evaluation Metrics for Regression and Classification.					
<b>Unit-II</b>	<b>Convolutional Neural Networks (CNNs)</b>				<b>9Hrs</b>
Basics of CNNs: Convolution, Pooling, Padding, Deep Architectures: LeNet, AlexNet, VGG, ResNet, Data Augmentation and Transfer Learning, Applications: Image Classification, Object Detection, Semantic Segmentation, Tools: OpenCV, Keras/TensorFlow for Vision Tasks					
<b>Unit-III</b>	<b>Recurrent Neural Networks (RNNs) and Sequence Modelling</b>				<b>10Hrs</b>
RNNs, vanishing gradient problem, LSTM and GRU networks, Sequence to Sequence Models, Attention Mechanisms, NLP Applications: Sentiment Analysis, Text Classification, Translation, Libraries: NLTK, SpaCy, Hugging Face Transformers					

<b>Unit-IV</b>	<b>Deep Learning for Structured and Time-Series Data</b>	<b>9Hrs</b>
Deep Learning for Tabular Data (TabNet, Deep & Cross Networks), Time Series Forecasting with RNNs, TCNs, and LSTMs, Anomaly Detection in Time-Series, Multivariate Time Series Prediction, Visualization and Interpretation Tools: SHAP, LIME		
<b>Unit-V</b>	<b>Auto encoders</b>	<b>10Hrs</b>
Auto encoders, Variational Auto encoders (VAE), Generative Adversarial Networks (GANs) and their Applications, Model Optimization and Quantization, Deployment using Flask, FastAPI, TensorFlow Serving, Case Studies: Health Analytics, Finance, Retail, and Industrial AI		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Ian Good fellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016.</li> <li>2. Francois Chollet, Deep Learning with Python, 2nd Edition, Manning Publications, 2021.</li> <li>3. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer, 2018.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 3rd Edition, 2023.</li> <li>2. Josh Patterson and Adam Gibson, Deep Learning: A Practitioner's Approach, O 'Reilly Media.</li> <li>3. Tariq Rashid, Make Your Own Neural Network, Create Space Independent Publishing.</li> </ol>		



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<b>DATA ENGINEERING &amp; CLOUD-BASED AI PIPELINES</b>					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H04</b>	<b>3:0:0:3</b>	<b>3</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<ol style="list-style-type: none"> <li>1. To understand the foundational concepts of data engineering and the lifecycle of data.</li> <li>2. To design and implement data pipelines for scalable and efficient data processing.</li> <li>3. To leverage cloud platforms (AWS, GCP, Azure) for AI pipeline development.</li> <li>4. To integrate data engineering with machine learning workflows in production.</li> <li>5. To explore modern tools and frameworks for orchestration, streaming, and automation.</li> </ol>					
<b>Course Outcomes (CO):</b>					
Upon completion of this course, the student will be able to:					
<ul style="list-style-type: none"> <li>• Understand and implement the components of a modern data engineering pipeline.</li> <li>• Use cloud services for data ingestion, transformation, storage, and processing.</li> <li>• Build scalable and fault-tolerant data pipelines using cloud-native and open-source tools.</li> <li>• Automate and orchestrate ML workflows using tools like Airflow and Kubeflow.</li> <li>• Apply learned concepts in real-world domains like IoT, finance, healthcare, and recommendation systems.</li> </ul>					
<b>Syllabus</b>					<b>Total Hours:48 Hrs</b>
<b>Unit-I</b>	<b>Foundations of Data Engineering</b>				<b>9 Hrs</b>
Data Lifecycle and Pipeline Architectures, Types of Data: Structured, Semi-structured, Unstructured, Data Modeling and Schema Design, Batch vs Stream Processing, ETL vs ELT pipelines					
<b>Unit-II</b>	<b>Data Ingestion and Storage</b>				<b>10 Hrs</b>
Data Ingestion Tools: Apache Kafka, AWS Kinesis, GCP Pub/Sub, Relational and NoSQL Databases: PostgreSQL, MongoDB, Bigtable, Data Lakes and Data Warehouses: S3, BigQuery, Snowflake, Redshift, Data Formats: JSON, Avro, Parquet, ORC, Partitioning, Bucketing, and Sharding					
<b>Unit-III</b>	<b>Data Transformation and Processing</b>				<b>10 Hrs</b>
Distributed Processing Frameworks: Apache Spark, Apache Beam, Dataproc, Data Cleaning, Feature Engineering at Scale, Handling Missing Data, Outliers, and Anomalies, Stream Processing with Apache Flink and Structured Streaming, Server less Data Processing: AWS Lambda, GCP Cloud					

Functions		
<b>Unit-IV</b>	<b>AI &amp; ML Pipelines in the Cloud</b>	<b>10 Hrs</b>
MLOps Fundamentals: Versioning, Model Registry, CI/CD for ML, AutoML and ML Pipelines: Vertex AI Pipelines, Azure ML Pipelines, SageMaker Pipelines, Model Monitoring, Drift Detection, and Logging, Case Study: Real-time Recommendation Engine on GCP/AWS, Edge Deployment and Federated Learning Integration		
<b>Unit-V</b>	<b>Orchestration, Governance &amp; Security</b>	<b>9 Hrs</b>
Workflow Orchestration with Apache Airflow and Prefect, Data Lineage, Quality, and Governance, Role-based Access Control (RBAC), IAM policies in Cloud, Data Encryption, Compliance (GDPR, HIPAA), Auditing and Cost Optimization Strategies		
<p><b>Textbooks</b></p> <ol style="list-style-type: none"> <li>1. Joe Reis &amp; Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, 2022.</li> <li>2. Ankur Taly, D. Sculley, Machine Learning Design Patterns, O'Reilly Media, 2021.</li> <li>3. Gwen Shapira, Todd Palino, Kafka: The Definitive Guide, O'Reilly Media, 2017.</li> </ol>		
<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Ashish Thusoo, Joydeep Sen Sarma, Data Warehousing at Face book: Apache Hive and the Journey to Petabyte Scale, O'Reilly.</li> <li>2. Mansoor Ahmed, Data Engineering with Python, Packt Publishing.</li> <li>3. Jean-Georges Perrin, Spark in Action, 2nd Edition, Manning Publications.</li> <li>4. Mark Treveil and The Logical Clocks Team, Operational AI with DataOps and MLOps, O'Reilly.</li> </ol>		
<p><b>Online Courses &amp; Resources:</b></p> <ol style="list-style-type: none"> <li>1. Google Cloud: Data Engineering on GCP (Coursera)</li> <li>2. AWS Data Engineering Path (AWS Skill Builder)</li> </ol>		



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**ETHICS, BIAS & EXPLAINABILITY IN AI**

Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
23A30H05	3:0:0:3	3	CIE:30 SEE:70	3 Hours	PC
<b>Course Objectives:</b>					
1. To understand the ethical challenges and responsibilities involved in building and deploying AI systems. 2. To identify and mitigate bias in AI data, algorithms, and models. 3. To explore techniques for interpretability and explainability in machine learning. 4. To critically evaluate AI systems from a legal, social, and philosophical perspective. 5. To analyze real-world case studies involving ethical dilemmas in AI deployment.					
<b>Course Outcomes (CO):</b>					
<b>After successful completion of the course, students will be able to:</b> <b>CO1:</b> Demonstrate awareness of ethical and societal concerns associated with AI technologies. <b>CO2:</b> Detect and reduce bias in datasets and machine learning models. <b>CO3:</b> Apply explainable AI (XAI) techniques for model transparency. <b>CO4:</b> Evaluate AI systems based on fairness, accountability, and transparency. <b>CO5:</b> Reflect on policy, legal, and human-centric implications of AI deployment.					
<b>Syllabus</b>				<b>Total Hours:48 Hrs</b>	
<b>Unit-I</b>	<b>Foundations of AI Ethics</b>			<b>9 Hrs</b>	
Introduction to AI Ethics and Responsible AI, Ethical Theories: Utilitarianism, Deontology Virtue Ethics, Key Ethical Principles: Fairness, Accountability, Transparency, Privacy (FATP), Human-in-the-loop and Ethical Decision Making, AI and the SDGs (Sustainable Development Goals)					
<b>Unit-II</b>	<b>Bias in Data and Algorithms</b>			<b>10 Hrs</b>	
Types of Bias: Historical, Representation, Measurement, Aggregation, Sources of Bias in AI: Data Collection, Annotation, Model Training, Metrics for Fairness: Demographic Parity, Equal Opportunity, Predictive Parity, Bias Mitigation Techniques: Pre-processing, In-processing, Post-processing, Case Studies: COMPAS, Hiring Algorithms, Face Recognition Bias					

<b>Unit-III</b>	<b>Explainable AI (XAI) Techniques</b>	<b>10 Hrs</b>
Need for Explainability and Transparency, Global vs Local Explanations, Methods: LIME, SHAP, Anchors, Integrated Gradients, Model-specific vs Model-agnostic Explanations, Visual Explanations and Human-Centric Interpretability		
<b>Unit-IV</b>	<b>Legal, Regulatory &amp; Societal Aspects</b>	<b>10 Hrs</b>
Data Protection Laws: GDPR, CCPA, Indian Digital Personal Data Protection Act, Ethical Guidelines: IEEE, UNESCO, OECD AI Principles, Algorithmic Accountability and Auditing, Intellectual Property and Liability in A AI, Ethical Considerations in Surveillance, Military, and Social Scoring		
<b>Unit-V</b>	<b>Building Responsible AI Systems</b>	<b>9 Hrs</b>
Designing Ethical AI Systems: Frameworks and Toolkits, Human-Centered AI and Value Alignment, Responsible AI Lifecycle and Documentation (Model Cards, Data Sheets), AI for Good and Ethical Innovation, Industry Case Studies: Google, Microsoft, IBM's AI Governance		
Text Books:		
<ol style="list-style-type: none"> <li>1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill.</li> <li>2. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley.</li> <li>3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Shalini Sharma, B. Ravindran, Responsible AI: An Indian Perspective, Springer, 2023.</li> <li>2. Christopher Kuner et al., The GDPR: General Data Protection Regulation (EU) Regulation 2016/679, Oxford University Press.</li> </ol>		



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<b>Big Data &amp; AI Analytics Lab</b>					
Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H06</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
<ul style="list-style-type: none"> <li>• To gain practical exposure to distributed data processing using Hadoop and Spark.</li> <li>• To develop skills in AI and ML model development using large datasets.</li> <li>• To implement predictive analytics and recommendation systems on scalable platforms.</li> <li>• To explore big data storage, ingestion, and analytics tools.</li> </ul>					
<b>Course Outcomes (CO):</b>					
<p>After completing this lab, students will be able to:</p> <ul style="list-style-type: none"> <li>• CO1: Perform distributed data processing using Hadoop and Spark.</li> <li>• CO2: Build and deploy machine learning models on big data platforms.</li> <li>• CO3: Analyze large-scale datasets for AI-driven decision-making.</li> <li>• CO4: Use real-time data streams for analytics and predictions.</li> <li>• CO5: Integrate big data tools in cloud environments.</li> </ul>					
<b>Tools Required</b>					
<ul style="list-style-type: none"> <li>• Apache Hadoop</li> <li>• Apache Spark</li> <li>• Apache Kafka</li> </ul>					
<b>List of 12 Experiments</b>					
<b>WEEK-1</b>					
1. HDFS Operations – Store, retrieve, and replicate data using HDFS commands.					
<b>WEEK-2</b>					
2. Map Reduce Program – Word count or log file analysis using MapReduce.					
<b>WEEK-3</b>					
3. Spark RDD & Data Frame Operations – Load and manipulate datasets using RDDs and Data Frames					
<b>WEEK-4</b>					
4. Big Data Cleaning with PySpark – Clean messy data using Spark SQL and Python.					

**WEEK-5**

5. Linear Regression with MLlib – Train a regression model on a large dataset using Spark MLlib.

**WEEK-6**

6. Classification with Decision Trees – Implement decision tree classifier using MLlib.

**WEEK-7**

7. Recommendation System – Build a movie/book recommender using collaborative filtering.

**WEEK-8**

8. Streaming with Spark Streaming – Analyze Twitter or sensor data in real-time.

**WEEK-9**

9. Sentiment Analysis – Perform sentiment classification using Spark and logistic regression.

**WEEK-10**

10. Big Data Clustering – K-Means clustering on a large customer dataset.

**WEEK-11**

11. Real-time Stock Data Analytics – Use Kafka + Spark to stream and analyze stock data.

**WEEK-12**

12. Deploy AI Model on GCP/AWS – Train and deploy a model using Google AI Platform or AWS SageMaker.



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## DATA SCIENCE & VISUALIZATION LAB

Course Code	L: T:P:C	Credits	Exam Marks	Exam Duration	Course Type
<b>23A30H07</b>	<b>0:0:3:1.5</b>	<b>1.5</b>	<b>CIE:30 SEE:70</b>	<b>3 Hours</b>	<b>PC</b>
<b>Course Objectives:</b>					
This course will enable students to:					
<ul style="list-style-type: none"> <li>• To apply statistical and machine learning methods to extract insights from data.</li> <li>• To build dashboards and visualizations for storytelling with data.</li> <li>• To use Python/R for advanced data manipulation and plotting.</li> <li>• To enable students to interpret model results and data distributions visually.</li> </ul>					
<b>Course Outcomes (CO):</b>					
After completion of the course, students will be able to:					
<ul style="list-style-type: none"> <li>• <b>CO1:</b> Analyze, preprocess, and visualize structured and unstructured data.</li> <li>• <b>CO2:</b> Use various plotting libraries for meaningful data storytelling.</li> <li>• <b>CO3:</b> Apply ML models and visualize performance metrics.</li> <li>• <b>CO4:</b> Develop interactive dashboards for real-time insights.</li> <li>• <b>CO5:</b> Communicate results through data-driven narratives.</li> </ul>					
<b>List of 12 Experiments</b>					
<b>WEEK-1</b>					
1. Data Cleaning and Pre-processing – Handle missing values, outliers, and encoding techniques.					
<b>WEEK-2</b>					
2. Exploratory Data Analysis (EDA) – Univariate, bivariate, and multivariate analysis.					
<b>WEEK-3</b>					
3. Statistical Visualization – Use Matplotlib and Seaborn for histograms, box plots, heatmaps.					
<b>WEEK-4</b>					
4. Time Series Visualization – Line plots and decomposition for stock/weather datasets.					
<b>WEEK-5</b>					
5. Interactive Plots with Plotly – Build interactive bar, scatter, and 3D plots.					
<b>WEEK-6</b>					
6. Correlation Analysis – Visualize and interpret correlation matrices.					
<b>WEEK-7</b>					
7. Classification Visualization – ROC curve, confusion matrix, and decision boundaries.					

**WEEK-8**

8. Clustering with Visualization – Visualize K-means clusters with PCA or t-SNE.

**WEEK-9**

9. Feature Importance Visualization – Use tree-based models and SHAP values.

**WEEK-10**

10. Geospatial Data Visualization – Plot maps and location-based insights using Plotly or Folium.

**WEEK-11**

11. Dashboard Development in Tableau / Power BI – Create visual dashboards from a real-world dataset.

**WEEK-12**

12. Build a Data App using Streamlit – Build an interactive application to display model output and insights.

**Tools/Technologies Required:**

- Python (Pandas, Matplotlib, Seaborn, Plotly, Scikit-learn)
- R (ggplot2, dplyr, Shiny – optional)
- Jupyter Notebook / Google Colab
- Tableau / Power BI
- Streamlit (for building data apps)