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Chhatrapati Shivaji Institute of Technology

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2.6.1. Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

Being an affiliated Institute the CSIT follows the curriculum of programmes designed and developed by CSVTU. The CSIT adheres to Outcome-Based Education (OBE) approach, hence follows Program Outcomes (POs), Program Specific Outcomes (PSOs), and Course Outcomes (COs) for all its programs offered by the departments. Program Outcomes (POs): POs are overarching statements that describe what students are expected to know at the end of their graduation. These outcomes are general and reflect the essential skills, knowledge and attitudes expected of graduates. They align with the mission of the CSIT. Program Specific Outcomes (PSOs): PSOs are specific to each department and further define the knowledge and skills expected from the graduates in that particular field of study. Course Outcomes (COs): COs are detailed statements that specify the learning objectives of individual courses.

CSIT's efforts to propagate the Outcomes.

After completion of framing of Outcomes the Institute utilizes following means to make the students and other stakeholders aware of them:

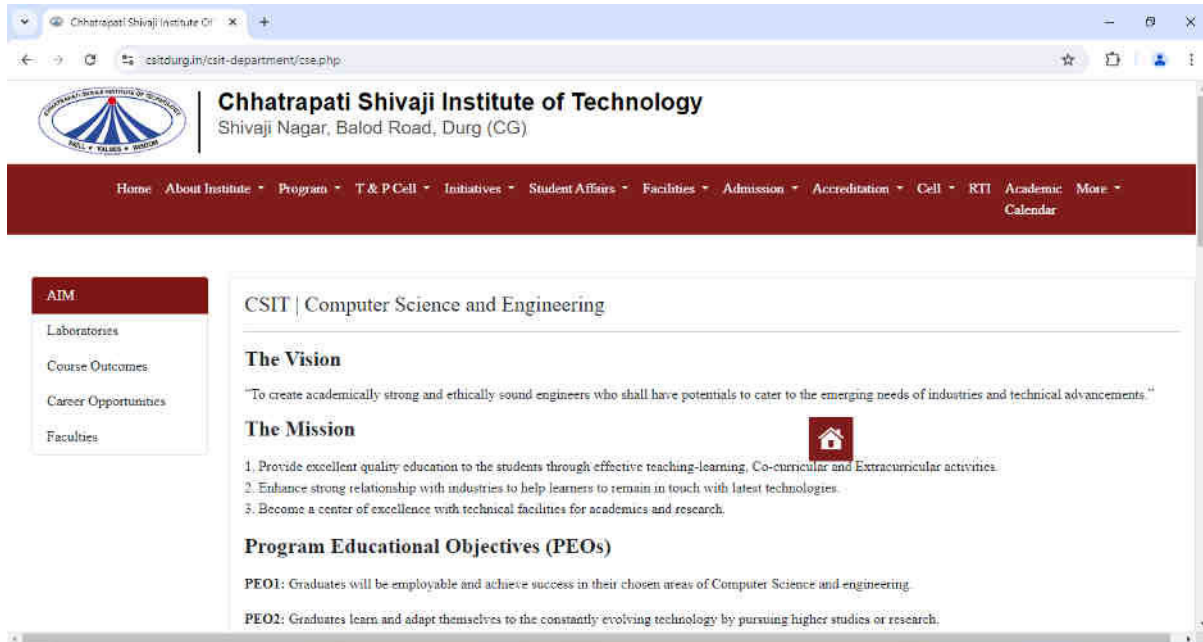
- The institution's website.
- Departmental bulletin boards.
- Curriculum documents.
- In-class presentations.
- Laboratories.
- Orientation programs for students.
- References in the Staff Meetings.
- References in the meetings with employers.
- Parent-Teacher Meeting.
- Meetings with professional bodies.
- Library materials.

2.6.1 Course Outcomes of All Courses

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Samples of PO, PEO, PSO and CO displayed in web site



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CSIT | Computer Science and Engineering

The Vision

"To create academically strong and ethically sound engineers who shall have potentials to cater to the emerging needs of industries and technical advancements."

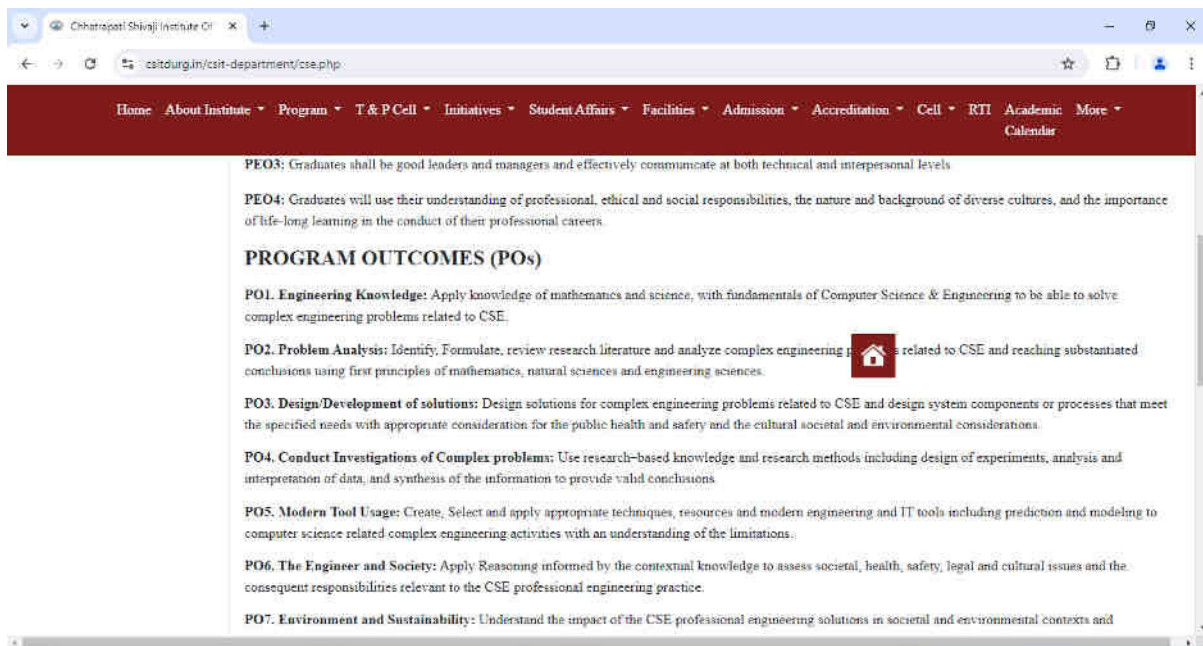
The Mission

1. Provide excellent quality education to the students through effective teaching-learning, Co-curricular and Extracurricular activities.
2. Enhance strong relationship with industries to help learners to remain in touch with latest technologies.
3. Become a center of excellence with technical facilities for academics and research.

Program Educational Objectives (PEOs)

PEO1: Graduates will be employable and achieve success in their chosen areas of Computer Science and engineering.

PEO2: Graduates learn and adapt themselves to the constantly evolving technology by pursuing higher studies or research.



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PEO3: Graduates shall be good leaders and managers and effectively communicate at both technical and interpersonal levels

PEO4: Graduates will use their understanding of professional, ethical and social responsibilities, the nature and background of diverse cultures, and the importance of life-long learning in the conduct of their professional careers.

PROGRAM OUTCOMES (POs)

PO1. Engineering Knowledge: Apply knowledge of mathematics and science, with fundamentals of Computer Science & Engineering to be able to solve complex engineering problems related to CSE.

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

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

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

PO5. Modern Tool Usage: Create, Select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to computer science related 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 CSE professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the CSE professional engineering solutions in societal and environmental contexts and



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PO7. Environment and Sustainability: Understand the impact of the CSE 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 able to comprehend and with 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 management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments

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

Program Specific Outcomes (PSOs)

PSO1: Professional Skills: Have abilities to, analyze, design, develop and evaluate computer software in areas related to web based applications, data security, databases, algorithms, multimedia, networking and data communication

PSO2: Product Development Skills: Have abilities to apply standard practices and strategies in software project development using open-ended programming environments to deliver innovative quality products for business and societal requirement

PSO3: Entrepreneurship and Career: Have ability to apply computational platforms, programming and logic development as computer professionals for higher studies and entrepreneurship

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Laboratories

Course Outcomes

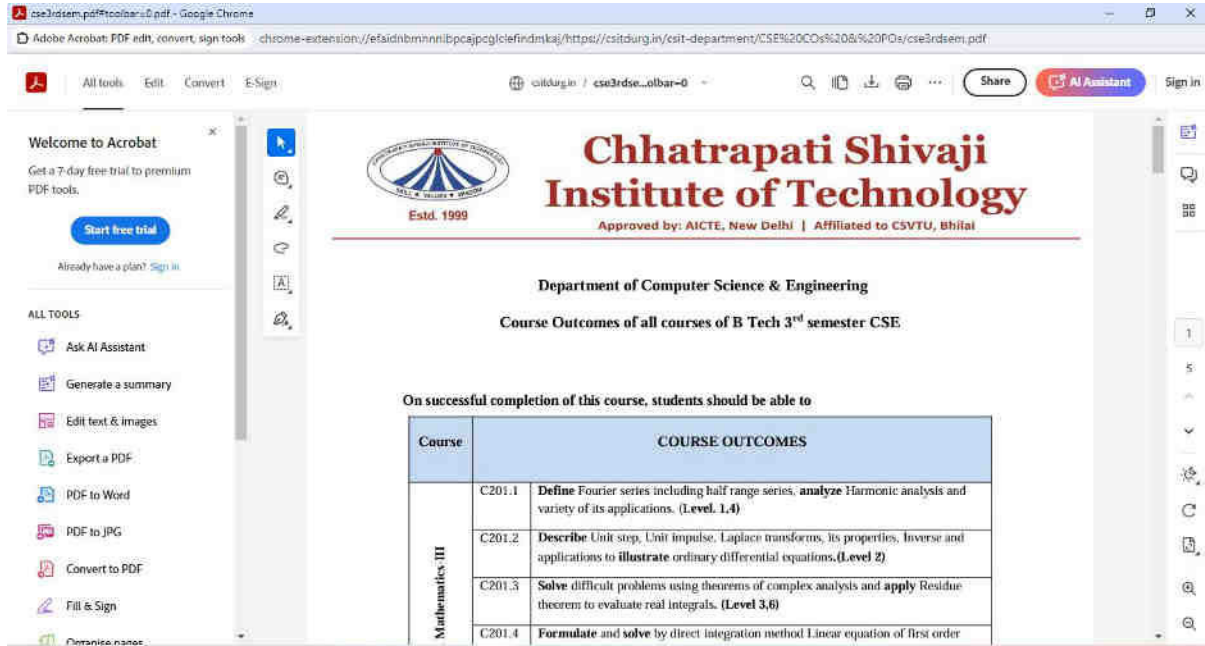
Career Opportunities

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CSIT | Computer Science and Engineering

CSE COURSE OUTCOMES

Semester	Action
3rd Semester	View
4th Semester	View
5th Semester	View
6th Semester	View



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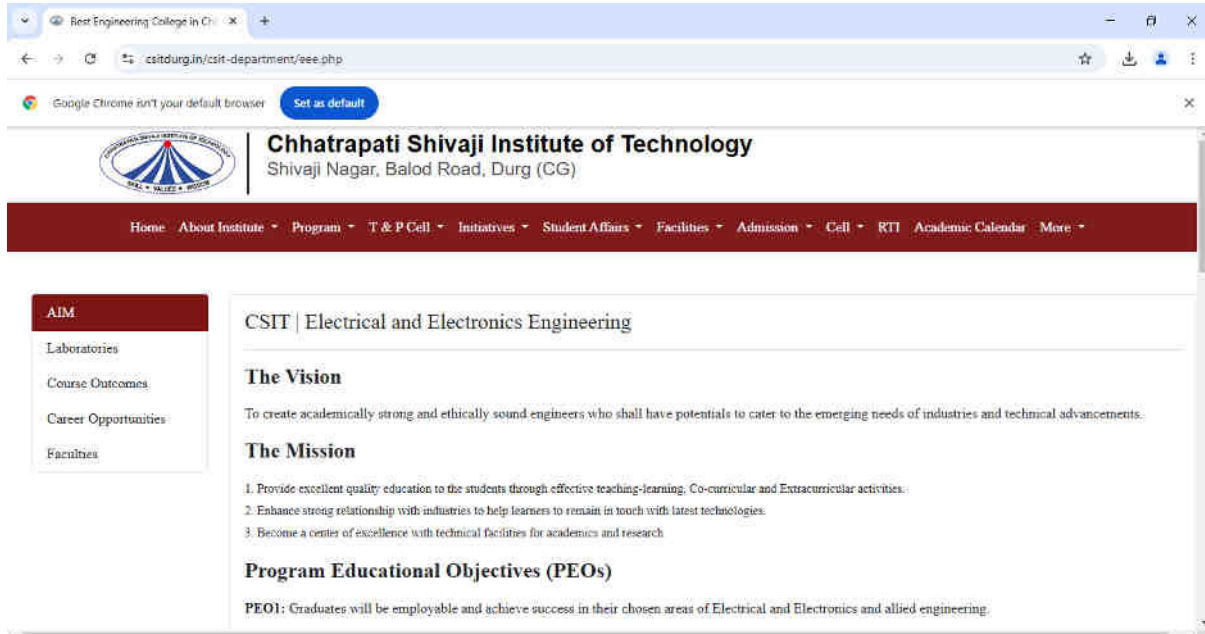
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Department of Computer Science & Engineering
Course Outcomes of all courses of B Tech 3rd semester CSE.

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES
Mathematics III	C201.1 Define Fourier series including half range series; analyze Harmonic analysis and variety of its applications. (Level 1,4)
	C201.2 Describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to illustrate ordinary differential equations.(Level 2)
	C201.3 Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. (Level 3,6)
	C201.4 Formulate and solve by direct integration method Linear equation of first order



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CSIT | Electrical and Electronics Engineering

The Vision

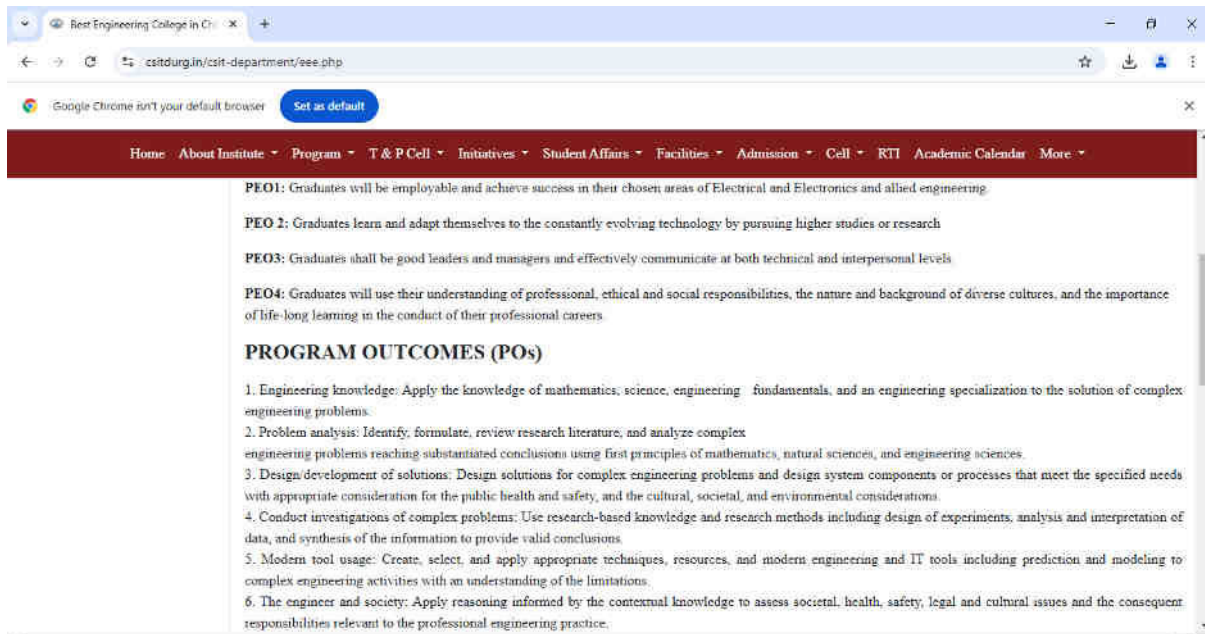
To create academically strong and ethically sound engineers who shall have potentials to cater to the emerging needs of industries and technical advancements.

The Mission

- Provide excellent quality education to the students through effective teaching-learning, Co-curricular and Extracurricular activities.
- Enhance strong relationship with industries to help learners to remain in touch with latest technologies.
- Become a centre of excellence with technical facilities for academics and research.

Program Educational Objectives (PEOs)

PEO1: Graduates will be employable and achieve success in their chosen areas of Electrical and Electronics and allied engineering.



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PEO1: Graduates will be employable and achieve success in their chosen areas of Electrical and Electronics and allied engineering.

PEO2: Graduates learn and adapt themselves to the constantly evolving technology by pursuing higher studies or research

PEO3: Graduates shall be good leaders and managers and effectively communicate at both technical and interpersonal levels

PEO4: Graduates will use their understanding of professional, ethical and social responsibilities, the nature and background of diverse cultures, and the importance of life-long learning in the conduct of their professional careers

PROGRAM OUTCOMES (POs)

- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 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.
- 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.
- 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.
- Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 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.



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6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, human, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. 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.

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

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

10. 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.

11. 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.

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

Program Specific Outcomes (PSOs)

PSO1: Students interpret data and understand testing, commissioning and maintenance of major electrical equipment related to power system and electrical machines.

PSO2: Students analyses the performance of electrical and electronic circuits and system, can evaluate the behavior and apply different control techniques for optimization.

PSO3: Capable of successfully qualifying in national level competitive examinations for higher studies and employment.

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CSIT | Electrical and Electronics Engineering

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EEE COURSE OUTCOMES

Semester	Action
3rd Semester	View
4th Semester	View
5th Semester	View
6th Semester	View
7th Semester	View
8th Semester	View



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CSIT | Mechanical Engineering

The Vision

To nurture excellence in the field of mechanical engineering by fostering a culture dedicated to words quality teaching and learning to create professionals ready to meet the demanding challenges in the field of Mechanical Engineering and allied areas.

The Mission

- To provide quality education with ample scope to include basic engineering knowledge and specialized training to meet the emerging needs of mankind.
- To inculcate ethical, professional and leadership qualities to prepare globally competitive human resources.
- To maintain state-of-the-art facilities for creating opportunities to learn, interpret, apply and disseminate knowledge.
- To collaborate with reputed industries and institutes through knowledge sharing and training.

Program Educational Objectives (PEOs)

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Program Educational Objectives (PEOs)

PEO 1: Graduates shall apply principles of machine design, production and thermal engineering and management concepts to identify, formulate and solve the real-life problems during their successful career in Mechanical and allied Engineering.

PEO 2: Graduates shall have technical ability along with good communication, ethical values and team spirit and shall apply modern tools and techniques to provide solutions for environmental and social issues.

PEO 3: Graduates shall opt for higher education or research through continuous learning.

PEO 4: Graduates shall excel in the operational areas of the industries, as entrepreneurs by applying manufacturing and management practices.

PROGRAM OUTCOMES (POs)

- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 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.
- 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.
- Conduct investigations of complex problems:** The research based knowledge and research methods including design of experiments, analysis and interpretation of



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

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

10. 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.

11. 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.

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

Program Specific Outcomes (PSOs)

PSO 1: An ability to apply their knowledge in the domains of engineering mechanics, design, fluid, thermal, industrial engineering, and advanced technologies to solving engineering problems for the benefit of society.

PSO 2: Capable of successfully qualifying in national level competitive examinations for higher studies and employment.

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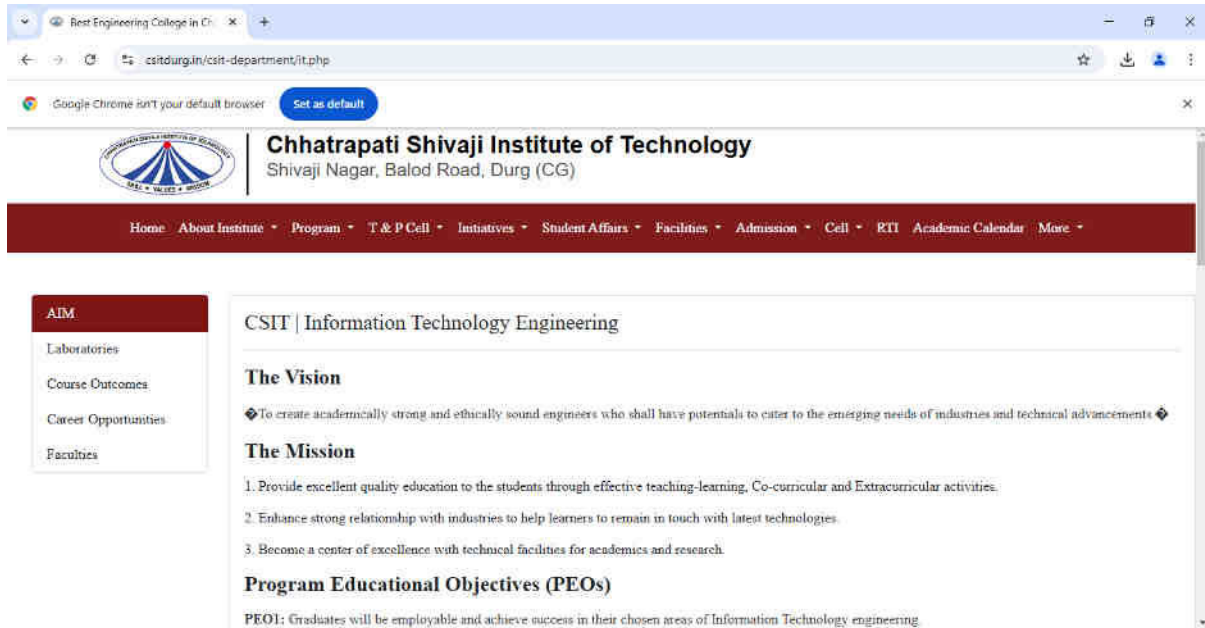
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Department of Mechanical Engineering

Course Outcomes of all courses of B Tech 5th semester MECH

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES	
C301 Internal Combustion Engine C037511037	C 301.1	Describe the construction and working principle of various internal combustion engines. Explain the concepts of fuel air cycle and actual cycle and apply it to analyze related practical problems. (LEVEL 2,3)
	C 301.2	Explain the theory of combustion of S.I. engine and C.I. engine, describe I.C. Engine fuels and solve problem related to flue gas analysis. (LEVEL 2,3)
	C 301.3	Discuss properties of air-petrol mixtures and describe fuel supply system of S.I. and C.I. Engine. (LEVEL 4)
	C 301.4	Describe ignition system, cooling system, lubrication system and Engine emissions and its control. (LEVEL 3)
	C 301.5	Describe various performance parameter of I.C. Engine, its method of testing and analyze related practical problems. (LEVEL 3)



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CSIT | Information Technology Engineering

The Vision

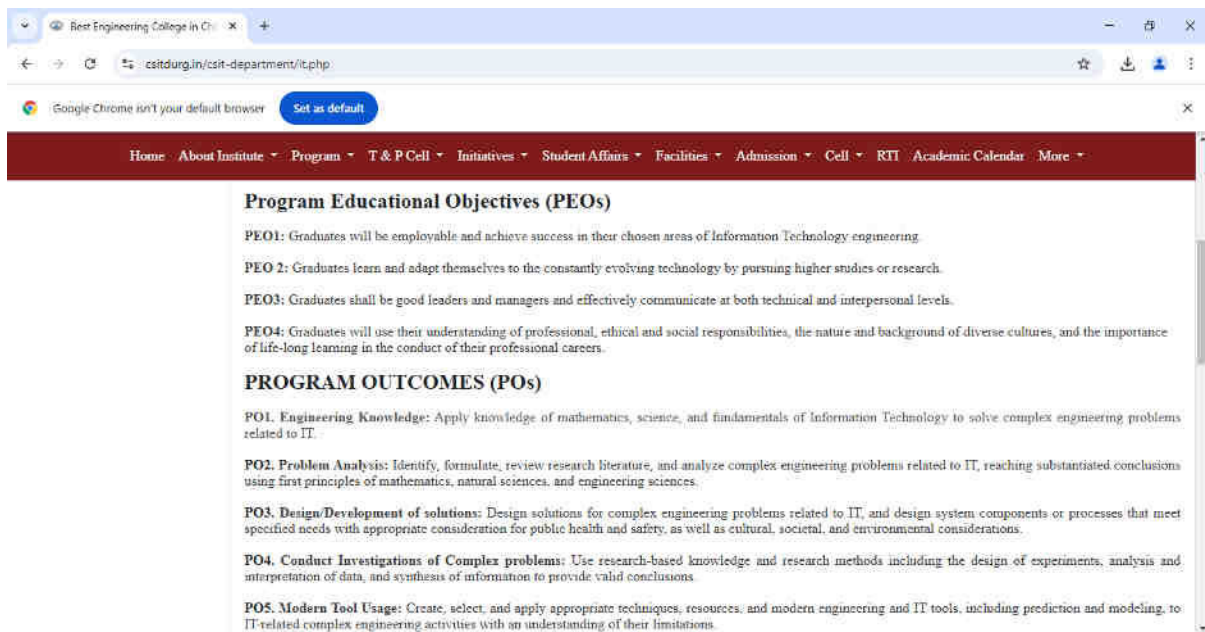
◆ To create academically strong and ethically sound engineers who shall have potentials to cater to the emerging needs of industries and technical advancements ◆

The Mission

1. Provide excellent quality education to the students through effective teaching-learning, Co-curricular and Extracurricular activities.
2. Enhance strong relationship with industries to help learners to remain in touch with latest technologies.
3. Become a center of excellence with technical facilities for academics and research.

Program Educational Objectives (PEOs)

PEO1: Graduates will be employable and achieve success in their chosen areas of Information Technology engineering.



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Program Educational Objectives (PEOs)

PEO1: Graduates will be employable and achieve success in their chosen areas of Information Technology engineering.

PEO 2: Graduates learn and adapt themselves to the constantly evolving technology by pursuing higher studies or research.

PEO3: Graduates shall be good leaders and managers and effectively communicate at both technical and interpersonal levels.

PEO4: Graduates will use their understanding of professional, ethical and social responsibilities, the nature and background of diverse cultures, and the importance of life-long learning in the conduct of their professional careers.

PROGRAM OUTCOMES (POs)

PO1. **Engineering Knowledge:** Apply knowledge of mathematics, science, and fundamentals of Information Technology to solve complex engineering problems related to IT.

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

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

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

PO5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to IT-related complex engineering activities with an understanding of their limitations.



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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 able to comprehend and with 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 management principles and apply these to one's own work as a member and leader in a team, to manage projects and in multi disciplinary environments.

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

Program Specific Outcomes (PSOs)

PSO1: Professional Skills: Possess the ability to analyze, design, develop, and evaluate computer software and systems in areas related to web-based applications, data security, databases, algorithms, multimedia, networking, and data communication.

PSO2: Product Development Skills: Demonstrate the ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver innovative quality products for business and societal requirements.

PSO3: Entrepreneurship and Career: Utilize computational platforms, programming, and logic development skills as IT professionals to pursue higher studies and entrepreneurial ventures.

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Department of Information Technology
Course Outcomes of all courses of B Tech 6th semester IT

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES	
C310 - Computer Graphics and Data Visualization	C310.1	To Demonstrate the functionalities of pixels and coordinate systems pertaining to graphics manipulation. (<i>Level 2</i>)
	C310.2	Design and demonstrate the 2D and 3D objects using graphics algorithms. (<i>Level 6</i>)
	C310.3	Simplify objects by comprehending the complexities of illumination in virtual scenes. (<i>Level 4</i>)
	C310.4	Identify the different data types, visualization types to bring out the insight. (<i>Level 3</i>)
	C310.5	Relate the visualization towards the problem based on the dataset. (<i>Level 2</i>)



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CSIT | Mechatronics Engineering

The Vision

To become a leading educational and research focused Mechatronics Engineering programme, to develop leaders in industry, teaching, research and entrepreneurship and to transform them into responsible global citizens.

The Mission

To impart high quality education in Mechatronics Engineering, by providing futuristic multidisciplinary knowledge along with goal-oriented, quality-based and value-added education.

Program Educational Objectives (PEOs)

Graduates of Mechatronics Engineering Programme shall

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value-added education.

Program Educational Objectives (PEOs)

Graduates of Mechatronics Engineering Programme shall

PEO 1 Synergistically integrate mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes.

PEO 2 Have strong team skills, good analytical and problem solving skills to innovate, research, develop and solve multi-disciplinary problems.

PEO 3 Have professional ethics and good communication Skills.

PEO 4 Have Awareness of Societal and the Environmental implications and make themselves, suitable for Engineering Career in Industries or for pursuing higher studies.

PROGRAM OUTCOMES (POs)

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



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- 4. **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.
- 5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. **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.
- 7. **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.
- 8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. **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.
- 11. **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.
- 12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO 1 Automate and maintain the mechanical systems by using the interdisciplinary electrical and electronic devices as well as computational tools.
 PSO 2 Recognize and apply the recent technological advancements for developing Mechatronics products to cater to the global needs.
 PSO 3 Capable of successfully qualifying in national level competitive examinations for higher studies and employment.

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Department of Mechanical Engineering
 Course Outcomes of all courses of B Tech 7th semester MECHATRONICS

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES	
C401- Autonomics	C 401.1	The students will get the knowledge of different parts of the automobile Level: Remember (1)
	C 401.2	The students will know about chassis & frame, clutches, gear box, tyres, brakes, and the steering system Level: Understand (2)
	C 401.3	Identify & differentiate components of SI & CI engines Level: Analyze (4)
	C 401.4	The students will be able to understand the functioning together of mechanical and electronic systems Level: Understand (2)
	C 401.5	Differentiate various subsystems of two, three & four wheeler vehicles Level: Analyze (4)



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Shivaji Nagar, Balod Road, Durg (CG)

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AIM

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CSIT | Civil Engineering

The Vision

◆ To impart knowledge and excellence in Civil Engineering technology with global perspectives to our students and to make them ethically strong engineers to build nation ◆

The Mission

- To bring forth Civil Engineers of high Caliber, Technical Skills and Ethical values to serve society and the nation.
- To make the department a center of excellence in the field of civil engineering and allied research.
- To provide knowledge and consultancy services to the community in all areas of civil engineering.
- To promote innovative and original thinking in the minds of budding engineers to face the challenges of future.

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To promote innovative and original thinking in the minds of budding engineers to face the challenges of future.

Program Educational Objectives (PEOs)

PEO1: To develop abilities and talents, leading to creativity and productivity in professional and industrial field beyond the curriculum and thus enhance the employability skills.

PEO2: To promote lifelong self-learning abilities for gaining multi disciplinary knowledge through projects and industrial training to meet the social needs.

PEO3: Graduates shall be good leaders and managers and effectively communicate at both technical and interpersonal levels.

PEO4: Graduates will use their understanding of professional, ethical and social responsibilities, the nature and background of diverse cultures, and the importance of life-long learning in the conduct of their professional careers.

PROGRAM OUTCOMES (POs)

- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 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.
- 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.
- 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.
- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to



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of data, and synthesis of the information to provide valid conclusions.

- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 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.
- 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.
- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 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.
- 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.
- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Plan, design, execute, operate and maintain civil engineering projects within specified time, cost and quality.

PSO2: The graduates will analyze and design regular and complex structures having acquired the knowledge of building analysis software packages.

PSO3: Capable of successfully qualifying in national level competitive examinations for higher studies and employment.

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DEPARTMENT OF CIVIL ENGINEERING

COURSE OUTCOMES SUMMARY SHEET

8TH SEM

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES
C411-Structure Engineering Design-IV	C411.1 Analyze and design continuous beam, building frames, strap beam and raft footing.(Level-4,5)
	C411.2 Analyze and design cantilever and counter fort retaining wall .(Level-4,5)
	C411.3 Analyze and design water tank and its staging .(Level-4,5)
	C411.4 Analyze and design bridges as per the BIS code of practice.(Level-4,5)
	C411.5 Analyze pre stressed concretes beam for flexure and losses. .(Level-4)

On successful completion of this course, students should be able to



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CSIT | Artificial Intelligence & Data Science Engineering

Vision

- To cultivate innovative and ethically responsible engineers proficient in artificial intelligence and data science, equipped to drive technological advancements and address the evolving demands of industry and society

Mission

- Deliver Outstanding Education through Diverse Learning Experiences
- Strengthen Industry Ties to Keep Students Updated with Emerging Technologies.
- Establish a Hub of Excellence with Advanced Academic and Research.

PROGRAM EDUCATIONAL OBJECTIVE (PEOs)

- PEO1: Graduates will be employable and achieve success in their chosen areas of artificial intelligence, data science, and allied engineering

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PROGRAM EDUCATIONAL OBJECTIVE (PEOs)

- PEO1: Graduates will be employable and achieve success in their chosen areas of artificial intelligence, data science, and allied engineering
- PEO2: Graduates learn and adapt themselves to the constantly evolving technology by pursuing higher studies or research.
- PEO3: Graduates shall be good leaders and managers and effectively communicate at both technical and interpersonal levels.
- PEO4: Graduates will use their understanding of professional, ethical, and social responsibilities, the nature and background of diverse cultures, and the importance of lifelong learning in the conduct of their professional careers.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Students will be proficient in data analysis, interpretation, and application of machine learning and artificial intelligence techniques to solve complex real-world problems.

PSO2: Students will evaluate and optimize the performance of AI and data science models, applying different computational techniques for enhanced outcomes.

PSO3: Students will be well-prepared to excel in national and international competitive examinations, pursue higher studies, and secure employment in leading AI and data science roles.

PROGRAMME OUTCOMES

Engineering Graduates will be able to:



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PROGRAMME OUTCOMES

Engineering Graduates will be able to:

- Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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- 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.
- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
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- 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.

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Department of Artificial Intelligence & Data Science
Course Outcomes of all courses of B Tech 3rd semester AIDS

On successful completion of this course, students should be able to

Course	COURSE OUTCOMES
C201 Mathematics-III	C201.1 Students learn about the how to solve partial differential equation which arises in mathematical description of situations in engineering.(Level 4)
	C201.2 To make student understand that Fourier series method is powerful method where formulas are integrals and to have knowledge of expanding periodic functions that explore verity of applications of Fourier series (Level 2)
	C201.3 Students learn about the how to solve mathematical model with Laplace Transform and error functions and their applications (Level 4)
	C201.4 Solving the concept of probability distribution of random variables (Level 4)
	C201.5 Explaining the technique of estimating the values of function for any intermediate value of independent variable. (Level 4)



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COURSE OUTCOMES OF ALL COURSES

Department of Computer Science & Engineering			
S.N.	Sem	Course Name	Course Outcome
1	3	Mathematics-III	CO1 Define Fourier series including half range series, analyze Harmonic analysis and variety of its applications. (Level. 1,4)
			CO2 Describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to illustrate ordinary differential equations.(Level 2)
			CO3 Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. (Level 3,6)
			CO4 Formulate and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. (Level 3,6)
			CO5 Hands on these Mathematical topics will make them equipped to simplify for higher studies through competitive examinations. (Level 4)
2	3	Data Structure & Algorithms	CO1 Construct knowledge of the data structures and algorithms on which file structures and data bases are based. (Level 3)
			CO2 Understand the importance of data and able to identify the data requirements for an application. (Level 2)
			CO3 Understand the practical experience of algorithmic design and their implementations. (Level 2)
			CO4 Develop the applications that utilize for the databases. (Level 6)
			CO5 Understand the complexity of algorithm and performance (Level 2)
3	3	Principles of Programming Languages	CO1 Understand the role of computer science, fundamental software design concepts and notations. (Level 2)
			CO2 Analyze various programming language paradigm, processors and software simulation types. (Level 4)
			CO3 Understand key concepts in the implementation of common features of programming languages. (Level 2)



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			CO4	Analyze and Evaluate to use concept of inheritance, polymorphism, template, exception handling, file handling in C++ environment. (Level 4)
			CO5	Describe different features of C++ such as composition of objects, Operator overloading, inheritance, Polymorphism etc. (Level 2)
4	3	Digital Electronics & Logic Design	CO1	Apply digital coding concepts to simplify circuit design. (Level 3)
			CO2	Analyze the operation of various logic families and different semiconductor memories. (Level 4)
			CO3	Design and implement various combinational circuits. (Level 3,6)
			CO4	Classify and relate digital circuits like RTL, TTL, DTL, MOS and CMOS. (Level 2, 4)
			CO5	Design and demonstrate finite state machine and semiconductor memories. (Level 3, 6)
5	3	Operating System	CO1	Identify the role of operating system in making computers execute data-processing jobs. (Level 2)
			CO2	Recognize managing computers resource complexity during concurrent process execution through OS layers. (Level 2)
			CO3	Analyze the reason of resource bottlenecks-concurrency, deadlock and various synchronization mechanism available. (Level 4)
			CO4	Understand the function of operating system components in memory management techniques, virtual memory management. (Level 2)
			CO5	Understand disk organization, file system structure, secondary storage management functions of OS. (Level 2)
6	3	Data Structure & Algorithms Lab	CO1	Understand the importance of abstract data types, structure types and their usability in different applications through different programming platforms. (Level 2)
			CO2	Implement various data structure operations on stacks, linked lists, queues, trees and graphs. (Level 3)
			CO3	Design and analyse the time efficiency of implemented data structures. (Level 5,6)
			CO4	Identify the selection of appropriate data structure for given problem solution. (Level 2)
			CO5	Implement various kinds of sorting and searching techniques. (Level 3)



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7	3	Digital Electronics & Logic Design Lab	CO1	Classify about the fundamentals of digital circuit design. (Level 2)
			CO2	Understand the concepts of logic families. (Level 2)
			CO3	Design and develop ICs in VLSI industries. (Level 6)
			CO4	Understand the operations of latch circuits, flip flops, counters & semiconductors memories. (Level 2)
			CO5	Understand and design and combinational circuit. (Level 2)
8	3	Operating System (UNIX) Lab	CO1	Understand the concept of Unix and shell programming. (Level 2)
			CO2	Evaluate the working of Linux OS Kernel. (Level 5)
			CO3	Analyze the differences between features provided in windows and Linux operating system. (Level 4)
			CO4	Evaluate the concept of loops and decision making statement. (Level 5)
			CO5	Analyze the logic & procedure of problem solving through Scripts. (Level 4)
9	3	Software Lab (Sci lab/MATLAB)	CO1	Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning. (Level 2)
			CO2	Evaluate the power of interactive calculation, programming, graphs, animation in SciLab/MatLab and complete protability across platform. (Level 5)
			CO3	Create SciLab/MatLab as a scientific computing and visualization tool. (Level 6)
			CO4	Examine interactive computation with matrices arrays of n-dimension. (Level 4)
			CO5	Evaluate and interpret simple mathematical functions and operations there on using plots/display. (Level 5)
10	4	Discrete Mathematics	CO1	Develop a concept mathematical logic, logical equivalence & quantifiers, Boolean functions and can Apply Boolean algebra in switching circuits & logic circuits. (Level 3,6)
			CO2	Apply set theory, Explain relation and functions and can develop Lattices & Hasse diagram (Level 2,3,6)
			CO3	Define algebraic structures and can state Lagrange's theorem, Isomorphism, Automorphism, Homomorphism .(level 1)



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			CO4	Analyze graph theory , types of graphs, concept of tree and can solve Matrix representation of graphs.(Level 4,6)
			CO5	Solve problems related to combinatorics in various fields in computer science, specially networking. (Level 6)
11	4	Computer System Architecture	CO1	Create the basic hardware components of a computer system. (Level 6)
			CO2	Evaluate the binary and hexadecimal number systems including computer arithmetic. (Level 5)
			CO3	Analyze the functional units of the processor such as the register file and arithmetic logical unit. (Level 4)
			CO4	Apply the basics of systems topics: parallel, pipelined, superscalar, and RISC/CISC architectures. (Level 3)
			CO5	Understand the representation of data, addressing modes, an instruction sets. (Level 2)
12	4	Database Management Systems	CO1	Develop the basic concepts of DBMS and relational data model. (Level 6)
			CO2	Understand the relational database theory & be able to write relational algebra expressions for queries (Level 2)
			CO3	Understand DML, DDL and to construct queries using SQL by knowing the importance of data. (Level 2)
			CO4	Analyze and Evaluate basic database storage structures and access new techniques. (Level 4,5)
			CO5	Analyze and Extract knowledge using database techniques. (Level 4)
13	4	Object Oriented Programming (with Java)	CO1	Understand the concepts of declaring data variable along with its type and flow of control of the programs. (Level 2)
			CO2	Analyze functional and procedural abstraction and its importance in good program design . (Level 4,6)
			CO3	Understand the basics concepts of exception handling, and Strings (Level 2)
			CO4	Design a programming level independent solution to the problem using programming language construct. (Level 6)
			CO5	Design , write, develop , execute and debug a JAVA programs onto Java programming construct. (Level 6)
14	4	Design & Analysis Algorithm	CO1	Distinguish the correctness of algorithms using inductive proofs and invariants. (Level 4)



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			CO2	Analyze and match worst-case running times of algorithms using asymptotic analysis. (Level 4)
			CO3	Analyze the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. (Level 4)
			CO4	Distinguish and describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. (Level 4)
			CO5	Evaluate the greedy paradigm and explain when an algorithmic design situation calls for it. (Level 5)
15	4	Computer Organization & Architecture Lab	CO1	Construct the hardware part of the computer system and will be able to partition the memory and format the system. (Level 6)
			CO2	Apply different types of OS and BIOS setup and Configuration. (Level 3)
			CO3	Test the Circuit using Multimeter and perform continuity test mode, able to draw the schematic. (Level 6)
			CO4	Design and simulate digital circuit like multiplexer, demultiplexer and ALU in VHDL. (Level 6)
			CO5	Apply terminal Windows for Linux (multiuser and a free and open-source) and DOS (Single User) user OS. (Level 3)
16	4	Object Oriented Programming (with JAVA) Lab	CO1	Apply an integrated development environment to write, compile, run, and test simple object-oriented Java programs. (Level 3)
			CO2	Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity. (Level 6)
			CO3	Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem. (Level 2)
			CO4	Illustrate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved. (Level 2)
			CO5	Understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development. (Level 6)



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17	4	Database Management System Laboratory	CO1	To understand efficient DB handling codes in DML, DDL. (Level 2)
			CO2	Will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications. (Level 6)
			CO3	Develop codes using efficient database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing, transaction processing and concurrency control. (Level 3)
			CO4	To design a programs in PL/SQL using cursor, functions, triggers. (Level 6)
			CO5	Design programs in PL/SQL, to generate the Report. (Level 6)
18	4	Virtual laboratory (PHP/My SQL)	CO1	Develop dynamic web designing applications and database handling applications using php. (Level 6)
			CO2	Design and develop dynamic web page components, interfaces & portals – (Project-based Learning technique). (Level 6)
			CO3	Create an associative array using the countries as keys, the cities as values and display the data as a table. (Level 6)
			CO4	Create pages for signup and sign-in process using PHP MySQL database operations. (Level 6)
			CO5	Create pages for profile updation and deletion of an employee using PHP MySQL. (Level 6)
19	5	Microprocessors & Interfaces	CO1	Apply basic concepts of digital fundamentals to microprocessor based personal computer system. (Level 3)
			CO2	Identify detailed software and hardware structure of the microprocessors. (Level 2)
			CO3	Design , write and test assembly language programs of moderate complexity. (Level 6)
			CO4	Illustrate how the different peripherals are interfaced with microprocessor. (Level 2)
			CO5	To choose and use a microprocessor for an application. (Level 3)
20	5	Computer Networks	CO1	Understand basic computer network technology. (Level 2)
			CO2	Analyze Data Communications System and its components. (Level 4)



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			CO3	Memorize the different types of network topologies and protocols. (Level 1)
			CO4	Analyze the layers of the OSI model and TCP/IP. Explain the function(s) of each layer. (Level 4)
			CO5	Apply and building the skills of sub-netting and routing mechanism. (Level 3)
21	5	Formal Languages and Automata Theory	CO1	Design finite automata to accept a set of strings of a language. (Level 6)
			CO2	Determine whether the given language is regular or not. (Level 5)
			CO3	Design context free grammars to generate strings of context free language. (Level 6)
			CO4	Design push down automata and the equivalent context free grammars and design turing machine. (Level 6)
			CO5	Distinguish between computability and non-computability, decidability and un-decidability. (Level 4)
22	5	Data Analytics with Python	CO1	Use various data structure available in python. (Level 3)
			CO2	Apply the concepts of data analytics. (Level 3)
			CO3	Apply the use of numpy library for performing various data processing activities. (Level 3)
			CO4	Apply the use of pandas library for data handling activities. (Level 3)
			CO5	Apply the use of matplotlib for data visualization activities. (Level 3)
23	5	Computer Graphics	CO1	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. (Level 6)
			CO2	Match and explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects. (Level 4)
			CO3	Analyze and demonstrate 2D & 3D geometrical transformations using modern tools. (Level 4)
			CO4	Distinguish various 3D projections and current models for surfaces. (Level 4)
			CO5	Evaluate the color and transformation techniques for various. (Level 5)
24	5	Microprocessors & Interfaces (Laboratory)	CO1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system. (Level 3)



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			CO2	Identify a detailed s/w & h/w structure of the Microprocessor. (Level 3)
			CO3	Design , write and test assembly language programs of moderate complexity. (Level 6)
			CO4	Illustrate how the different peripherals are interfaced with Microprocessor. (Level 2)
			CO5	Apply concepts of microprocessor for developing system to solve real world problems. (Level 3)
25	5	Computer Networks Laboratory	CO1	Design LAN (Level 6)
			CO2	Formulate Windows 2003 /2000/DHCP, Proxy Server. (Level 6)
			CO3	Formulate L2/L3 Switches. (Level 6)
			CO4	Operate netsim and simulate various LAN Protocols. (Level 6)
			CO5	Operate wireshark and Analyze network data using it. (Level 6)
26	5	Data Analytics with PYTHON Laboratory	CO1	Apply various data structures available in Python. (Level 3)
			CO2	Apply the concepts of Data Analysis. (Level 3)
			CO3	Apply the use of Numpy Library for performing various data processing activities. (Level 3)
			CO4	Apply the use of Pandas library for data handling activities. (Level 3)
			CO5	Apply the use of Matplotlib for data visualization activities. (Level 3)
27	5	Project-I Laboratory	CO1	Apply theoretical knowledge to practical scenarios effectively, showcasing an understanding of core principles in the vocational field. (Level 3)
			CO2	Develop and manage a project plan, including setting objectives, timelines, resource allocation, and documentation. (Level 6)
			CO3	Understand and adhere to industry safety standards and regulations, ensuring a safe working environment. (Level 2)
			CO4	Implement quality control measures to ensure the output meets industry standards. (Level 2)
			CO5	Understand the basics of entrepreneurship, including business planning, financial management, and marketing within the vocational domain. (Level 2)



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28	6	Compiler Design	CO1	Create and understand the basic concept of compiler and lexical analyzer. (Level 2,6)
			CO2	Evaluate and distinguish various parsing techniques. (Level 2,4)
			CO3	Identify and analyze the syntax directed translation and intermediate code generation. (Level 2)
			CO4	Recognize and apply runtime environment using activation tree and activation record. (Level 2,3)
			CO5	Understand code optimization and code generation techniques. (Level 2)
29	6	Software Engineering & Project Management	CO1	To introduce software project and to understand about the different software processes & their uses. (Level 2)
			CO2	To understand and conceptualize the process of software development life cycle (SDLC) models. (Level 2)
			CO3	To introduce ethical and professional issues and to explain why they are concern to software engineers. (level 1,2,4)
			CO4	Apply use of software life cycle to implement the projects successfully in the corporate world. (Level 3)
			CO5	To understand how Software engineering & Project Management is concerned with theories, methods and tools for professional software development. (level 1,2)
30	6	Artificial Intelligence & Expert Systems	CO1	Distinguish the fundamental understanding of artificial intelligence (AI) and expert systems. (Level 4)
			CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. (Level 3)
			CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. (Level 2)
			CO4	Analyze the proficiency in applying scientific method to models of machine learning. (Level 4)
			CO5	Distinguish the basic understanding of AI- languages (Level 4)
31	6	Internet Of Things	CO1	Illustrate the concepts of internet of things. (Level 2)
			CO2	Demonstrate with internet of things architecture. (Level 2)



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			CO3	Analyze basic protocols in wireless sensor network. (Level 4)
			CO4	Understand the security threats privacy issues with internet of things system. (Level 2)
			CO5	To design internet of things application in different domain and be able to analyze their performance. (Level 4,6)
32	6	Cryptography & Network Security	CO1	Identify conventional encryption algorithms for confidentiality and their design principles. (Level 2)
			CO2	Define knowledge about Public key encryption algorithms and their design principles (Level 5)
			CO3	Understands the use of message authentication codes, hash functions , digital signature and public key certificates (Level 2)
			CO4	Apply Network security tools and applications for implementation Of network.(Level 3)
			CO5	Evaluate System-level security issues like threat of and countermeasures for intruders and viruses, and the use of firewalls and trusted systems (Level 5)
33	6	Software Engineering & Project Management (Laboratory)	CO1	Define various software application domains and remember different process model used in software development. (Level 1)
			CO2	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques. (Level 2)
			CO3	Convert the requirements model into the design model and demonstrate use of software and user-interface design principles. (Level 2)
			CO4	Justify the role of SDLC in Software Project Development and evaluate importance of Software Engineering in PLC. (Level 5)
			CO5	Generate project schedules, deliverables and construct, design and develop network diagram for different type of projects; also practicing the activities of each phase. (Level 3, 6)
34	6	Artificial Intelligence & Expert Systems Laboratory	CO1	Acquire an overview of logic constructs for performing inference techniques. (First Order Predicate Calculus) in toy problems /classical problems using PROLOG / LISP syntax. (Level 3)



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			CO2	Develop confidence in drafting production rules (iterative / recursive) for an AI simulating code, given a story domain. (Level 3)
			CO3	Understand , on how to use different data structures (lists, trees, stacks and queues) for solving routing problems and implementing heuristic searches. (Level 2)
			CO4	Develop exposure to deal with situations that crop up syntax / compile-time / run-time errors. (Level 3)
			CO5	Simplify game playing / puzzle problems using general solution in PROLOG / LISP syntax. (Level 4)
35	6	Internet of Things Laboratory	CO1	Describe what IoT is and how it works today. (Level 2)
			CO2	Recognize the factors that contributed to the emergence of IoT, Design and program IoT devices. (Level 2)
			CO3	Use real IoT protocols for communication, secure the elements of an IoT device. (Level 3)
			CO4	Design an IoT device to work with a Cloud Computing infrastructure. (Level 6)
			CO5	Examine IoT data to the cloud and in between cloud providers. (Level 4)
36	6	Android Application Laboratory	CO1	Acquire an overview of logic constructs for performing inference techniques. (First Order Predicate Calculus) in toy problems /classical problems using PROLOG / LISP syntax. (Level 3)
			CO2	Develop confidence in drafting production rules (iterative / recursive) for an AI simulating code, given a story domain. (Level 3)
			CO3	Understand , on how to use different data structures (lists, trees, stacks and queues) for solving routing problems and implementing heuristic searches. (Level 2)
			CO4	Develop exposure to deal with situations that crop up syntax / compile-time / run-time errors. (Level 3)
			CO5	Simplify game playing / puzzle problems using general solution in PROLOG / LISP syntax. (Level 4)
37	7	Machine Learning	CO1	Remember the basic concept of machine learning. (Level 1)
			CO2	Able to implement data analysis in machine learning. (Level 3)
			CO3	Remember and Execute the machine learning algorithms. (Level 1,3)



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			CO4	To explain machine learning model diagnosis and tuning. (Level 2)
			CO5	Apply the concept of artificial neural network. (Level 1)
38	7	Data Mining & Warehousing	CO1	Construct basic design of data warehouse for an organization. (Level 6)
			CO2	Evaluate queries using DMQL and to Develop skills. (Level 5)
			CO3	Analyze the data mining techniques. (Level 4)
			CO4	Implement the data mining tools. (Level 3)
			CO5	Understand the advance trends in data mining such as web mining, spatial-temporal mining. (Level 2)
39	7	Internet & Web Technology	CO1	Describe the architecture, design and behaviors of the internet. (Level 2)
			CO2	Understand the protocols and able to implement different model. (Level 2,3)
			CO3	Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, JavaScript, and Web applications. (Level 2)
			CO4	Analyze a web page and identify its elements and attributes. (Level 4)
			CO5	Create XML documents and XML Schema. (Level 6)
40	7	Cyber Security	CO1	Describe the principles of cybercrime, cyber-criminal, and intellectual property rights. (Level 2)
			CO2	Match and apply proper passive components to attain better security in Cryptographic components present in the Cyber World. (Level 3,4)
			CO3	Analyze protection and resilience of Critical Information Infrastructure and Encouraging Open Standards. (Level 4)
			CO4	Distinguish between the types of Cyber-Crimes along with the type of investigation needs to be done. (Level 4)
			CO5	Understand and remember the role of IT Act 2000 according to which the criminal must be treated. (Level 1,2)
41	7	Software Testing	CO1	Design test cases suitable for software development for different domains.(Level 6)
			CO2	Identify suitable test to be carried out. (Level 2)
			CO3	Select test planning based on the document. (Level 5)
			CO4	Implement test plan and test cases designed. (Level 3)
			CO5	Use automatic testing tools. (Level 3)
42	7	Machine Learning Laboratory	CO1	Apply Numpy along with Matplotlib for visual analysis of data. (Level 3)



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			CO2	Apply Supervised Learning models for problem solving. (Level 3)
			CO3	Apply Un-Supervised Learning models for problem solving. (Level 3)
			CO4	Apply Artificial Neural Network for problem solving. (Level 3)
			CO5	To understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy. (Level 2)
43	7	Internet and Web Technology Laboratory	CO1	Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's. (Level 6)
			CO2	Construct Good grounding of Web Application Terminologies, Internet Tools, E-commerce and other web services. (Level 3)
			CO3	Develop and demonstrate , using Java script, a XHTML document that collects the USN. (Level 2, 6)
			CO4	Develop and demonstrate , using JavaScript script, a XHTML document that contains three short paragraphs of text. (Level 2, 6)
			CO5	Design an XML document to store information about a student in an engineering college affiliated to CSVTU. (Level 3)
44	7	Project (Phase I)	CO1	Identify and define a relevant engineering problem or research question within the domain of study. (Level 1, 2)
			CO2	Demonstrate effective project management skills to track progress and make necessary adjustments. (Level 2)
			CO3	Apply appropriate engineering principles, techniques, and tools to develop a solution or prototype. (Level 3)
			CO4	Implement and test the design, analyzing the results to validate the solution. (Level 3)
			CO5	Demonstrate critical thinking and innovative problem-solving abilities in developing and refining the project. (Level 2)
45	8	Cyber Law and Intellectual Property	CO1	Describe the principles of cybercrime, cyber-criminal, and intellectual property rights. (Level 2)
			CO2	Understand cyber crime and cyber laws. (Level 2)
			CO3	Classify various privacy and security concerns on online social media its legal aspects and best practices. (Level 2)
			CO4	Understand the importance and applications of IPR its regulations. (Level 2)



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			CO5	Describe the application process of patent file and other related aspects such as search, registration and grant. (Level 2)
46	8	Supply Chain Management	CO1	Create a cyclic view of product will be created. (Level 6)
			CO2	Evaluate that why one need a drivers for running a product. (Level 5)
			CO3	Analyze how one can analyze the product by using different models. (Level 4)
			CO4	By Applying how one implement the location for better product aspect. (Level 3)
			CO5	Understand & Translate the idea of product into implementation plans. (Level 2)
47	8	R Programming	CO1	Understand the basics of Fundamental of R. (Level 2)
			CO2	Describe the loading, retrieval techniques of data. (Level 2)
			CO3	Understand how data is analyzed and visualized using statistic function. (Level 2,4)
			CO4	Implement algorithm in R programming to automate decision making. (Level 3)
			CO5	Create visualizations using R to present data in an understandable and insightful manner. (Level 6)
48	8	Computer Vision Laboratory	CO1	Apply Python for Image handling and processing. (Level 3)
			CO2	Apply Python for geometric transformation and computer homography matrix. (Level 3)
			CO3	Apply for Python perspective transformation, edge detection, line detection and corner detection. (Level 3)
			CO4	Apply Python for SIFT , SURF and HOG. (Level 3)
			CO5	Apply Projcet based on Computer Vision Applications. (Level 3)
49	8	R Programming Laboratory	CO1	Demonstrate use of basic functions. (Level 2)
			CO2	Design a program to check whether a year entered by the user is a leap year or not. (Level 6)
			CO3	Create a list of data frame that stores the marks of any any three subjects for 10 students. (Level 6)
			CO4	To create a program of two 3 X 3 matrices A and B and perform the following operations a) Transpose of the matrix b) addition and subtraction. (Level 6)



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			CO5	Design a program to make a simple calculator that can add, subtract, multiply and divide using switch cases and functions. (Level 6)
50	8	Major Project (Phase-II)	CO1	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level 1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (Level 3, 5)
			CO3	Function in a team and adapt as per requirement to achieve desired goal with ethical practices (Level 4, 6)
			CO4	Apply principles to solve problems and interpret the result. (Level 3, 5)
			CO5	Relate the impact of engineering solutions in society and classify modern tools. (Level 2,3)



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Department of Artificial Intelligence & Data Science				
S. N.	Sem	Course Name	Course Outcome	
1	3	Mathematics-III	CO1	Students learn about the howto solve partial differential equation which arises in mathematical description of situations in engineering.(Level 4)
			CO2	To make student understand that Fourier series method is powerful method where formulas are integrals and to have knowledge of expending periodic functions that explore verity of applications of Fourier series.(Level 2)
			CO3	Students learn about the how to solve mathematical model with Laplace Transform and error functions and their applications.(Level 4)
			CO4	Solving the concept of probability distribution of random variables.(Level 4)
			CO5	Explaining the technique of estimating the values of function for any intermediate value of independent variable. (Level 4)
2	3	Data Structure & Algorithms	CO1	Construct knowledge of the data structures and algorithms on which file structures and data bases are based.(Level 3)
			CO2	Understand the importance of data and able to identify the data requirements for an application.(Level 2)
			CO3	Understand the practical experience of algorithmic design and their implementations. (Level 2)
			CO4	Develop the applications that utilize for the databases.(Level 6)
			CO5	Understand the complexity of algorithm and performance(Level 2)
3	3	Operating system	CO1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.(Level 1)
			CO2	Analyze the memory management and its allocation policies.(Level 4)
			CO3	Illustrate different conditions for deadlock and their possible solutions.(Level 4)
			CO4	Explains the storage management policies with respect to different storage management technologies.(Level 4)
			CO5	Evaluate the concept of the operating system with respect to UNIX, Linux, Time, and mobile OS.(Level 5)
4	3	Introduction to Python	CO1	Understanding of a programming language syntax and its definition by example(Level 2)
			CO2	Build basic programs using NumPy library programming constructs like shape manipulation, array manipulation.(Level 6)



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			CO3	Implementing use of panda libraries for data handling activity.(Level 3)
			CO4	Explaining the use of Matplotlib for data visualization activity like working with multiple figures and axes.(Level 5)
			CO5	Analyzing the different concepts of data analysis(Level 2)
5	3	Digital Electronics & Logic Design	CO1	Apply digital coding concepts to simplify circuit design. (Level 3)
			CO2	Analyze the operation of various logic families and different semiconductors memories. (Level 4)
			CO3	Design and implement various combinational circuits. (Level 3,6)
			CO4	Classify and related digital circuits like RTL, TTL, DTL, MOS and CMOS. (Level 2, 4)
			CO5	Design and demonstrate finite state machine and semiconductor memories.(Level 3, 6)
6	3	Data Structure & Algorithms Lab	CO1	Understand the importance of abstract data types, structure types and their usability in different applications through different programming platforms. (Level 2)
			CO2	Implement various data structure operations on stacks, linked lists, queues, trees and graphs. (Level 3)
			CO3	Design and analyse the time efficiency of implemented data structures. (Level 5,6)
			CO4	Identify the selection of appropriate data structure for given problem solution. (Level 2)
			CO5	Implement various kinds of sorting and searching techniques. (Level 3)
7	3	Operating System Lab	CO1	Understand the concept of CPU Scheduling. (Level 2)
			CO2	Evaluate the working of CPU Scheduling priority algorithm. (Level 5)
			CO3	Analyze the producer-consumer problems using semaphores. (Level 4)
			CO4	Evaluate the concept of Dining Philosophers problem. (Level 5)
			CO5	Analyze the Dead Lock prevention technique. (Level 4)
8	3	Digital Electronics & Logic Design Lab	CO1	Classify about the fundamentals of digital circuit design. (Level 2)
			CO2	Understand the concepts of logic families. (Level 2)
			CO3	Design and develop ICs in VLSI industries. (Level 6)
			CO4	Understand the operations of latch circuits, flip flops, counters & semiconductors memories. (Level 2)
			CO5	Understand and design and combinational circuit. (Level 2)
9	3	Python Lab	CO1	Understand python for various data structures for data representation and manipulation. (Level 2)



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			CO2	Evaluate Numpy for data handling.(Level 5)
			CO3	Create Pandas for data processing. (Level 6)
			CO4	Examinematplotlib for visual representation of data. (Level 4)
			CO5	Evaluate the use of matplotlib for working with line chart, histogram, bar charts, pie charts. (Level 5)
10	4	Design and analysis of algorithm	CO1	Calculate the time complexity of Insertion short, heap short , linier and binary search algorithm . (Level 4)
			CO2	Apply the algorithm and design technique to solve problems related to solve problems related to divide and conquer and Greedy algorithm. (Level 3)
			CO3	Analyze Dynamic programming problems including matrix chain multiplication, longest Common subsequence and Knapsack problem. (Level 4)
			CO4	Understand the implementation of Backtracking and Recursive backtracking Method. (Level 2)
			CO5	Understand the basic concepts of NP-Hard, NP-Complete and branch and bound methods. (Level 2)
11	4	Database management system	CO1	Master the basics of SQL and construct queries using MYSQL.(Level 2)
			CO2	Understand DML, DDL and will be able to construct queries using SQL by knowing the importance of data & its requirement in any applications. (Level 2)
			CO3	Identify the data models for relevant problems. (Level 1)
			CO4	Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data. (Level 6)
			CO5	Analyze normalization for the development of application software 's. (Level 4)
12	4	Object Oriented Concepts & Programming using Java	CO1	Study the difference between object oriented programming and procedural oriented language and data types in Java.(Level 1)
			CO2	Describe different features of Java such as composition of objects, Operator overloading, inheritance, Polymorphism etc.(Level 2)
			CO3	Implement the concept of memory management, static keywords, pointer concepts constructor.(Level 3)
			CO4	Analyze and Evaluate to use concept of inheritance, polymorphism, template, exception handling, and file handling in Java environment.(Level 4)
			CO5	Design at the end of the course students will able to write a program in object-oriented programming and also Build good quality software using object-oriented programming technique using java.(Level 6)



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13	4	Computer system architecture	C01	Identify the basic hardware concepts of a computer system design in appropriate formats, addressing modes; an instruction sets as per the system configuration requirements. (Level 1)
			C02	Analyzing binary and hexadecimal number system including computer arithmetic. (Level 4)
			C03	Outline organization of various parts of system memory hierarchy. (Level 1)
			C04	Demonstrate computer architecture concept related to design of modern processor, memories and I/O. (Level 3)
			C05	Analyze the basic functionality of system: parallel, pipelined, superscalar and RICS/CISC architecture. (Level 4)
14	4	Discrete structure	C01	Able to apply mathematical logical and Boolean algebra in switching circuit & logic circuits. (Level 3)
			C02	Define set theory, relation and functions. (Level 1)
			C03	Able to calculate algebraic structure, graph theory and combinatory. (Level 4)
			C04	Able to solve problems in various fields in computer science, specially networking. (Level 6)
			C05	Analyze logical propositions via truth table. (Level 4)
15	4	Data Analytics with PYTHON Laboratory	C01	Apply operation count for a given pseudo code. (Level 3)
			C02	Apply the concepts of Bubble sort for any given list of numbers. (Level 3)
			C03	Understand the time complexity of algorithm. (Level 2)
			C04	Apply the problem using backtracking. (Level 3)
			C05	Apply the Dynamic programming to write programs for the problem. (Level 3)
16	4	Data base Management System Laboratory	C01	To understand efficient DB handling codes in DML, DDL. (Level 2)
			C02	Will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications. (Level 6)
			C03	Develop codes using efficient database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing, transaction processing and concurrency control. (Level 3)
			C04	To design programs in PL/SQL using cursor, functions, triggers. (Level 6)
			C05	Design programs in PL/SQL, to generate the Report. (Level 6)



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17	4	Object Oriented Programming(with JAVA)	C01	Apply an integrated development environment to write, compile, run, and test simple object-oriented Java programs.(Level 3)
			C02	Implement Object Oriented programming concept using basic syntaxes of control Structures, stringsandfunctionfordevelopingskillsoflogicbuildingactivity.(Level 6)
			C03	Identify classes ,objects ,members of a class and the relationship samong them needed for a finding the solution to specific problem. (Level 2)
			C04	Illustrate how to achieve e usability using in heritage, interfaces and packages and describes faster application development can be achieved. (Level 2)
			C05	Understanding anduseofdifferentexceptionhandlingmechanismsandconceptofmultithreadingforrobustfaster and efficient application development.(Level 6)
18	4	Virtual laboratory (PHP/MySQL)	C01	Develop dynamic web designing applications and database handling applications using php. (Level 6)
			C02	Designanddevelop dynamicwebpagecomponents,interfaces&portals–(Project-basedLearningtechnique).(Level 6)
			C03	he countries as keys, the cities as values and display the data as a
			C04	Create pages for signup and sign-in process using PHP My SQL database operations. (Level 6)
			C05	Describe the logic of each a problem introduced. (level1)
19	5	Artificial Intelligence	C01	Apply AI algorithms for solving practical problems. (Level 3)
			C02	Describe human intelligence and AI. (Level 2)
			C03	Explain how intelligent system works. (Level 2)
			C04	Apply basics of Fuzzy logic and neural networks. (Level 3)
			C05	Learn about application and analysis of planning approaches. (Level 4)
20	5	Introduction to Machine learning	C01	Understanding wide verity of learning algorithm. (Level 2)
			C02	Understand how to evaluate models generated from data. (Level 2)
			C03	Apply algorithm to real problem. (Level 3)
			C04	Evaluating the model learned and report on the expected accuracy. (Level 5)
			C05	Apply the optimized model. (Level 3)
21	5	Object Oriented Concepts &	C01	Study the difference between object oriented programming and procedural oriented language and data types in Java.(Level 1)



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		Programming using Java		
			C02	Describe different features of Java such as composition of objects, Operator overloading, inheritance, Polymorphism etc. (Level 2)
			C03	Implement the concept of memory management, static keywords, pointer concepts constructor. (Level 3)
			C04	Analyze and Evaluate to use concept of inheritance, polymorphism, template, exception handling, and file handling in Java environment. (Level 4)
			C05	Design at the end of the course students will able to write a program in object-oriented programming and also Build good quality software using object-oriented programming technique using java. (Level 6)
22	5	Computer system architecture	C01	Identify the basic hardware concepts of a computer system design in appropriate formats, addressing modes; an instruction sets as per the system configuration requirements. (Level 1)
			C02	Analyzing binary and hexadecimal number system including computer arithmetic. (Level 4)
			C03	Outline organization of various parts of system memory hierarchy. (Level 1)
			C04	Demonstrate computer architecture concept related to design of modern processor, memories and I/O. (Level 3)
			C05	Analyze the basic functionality of system: parallel, pipelined, superscalar and RICS/CISC architecture. (Level 4)
23	5	Discrete structure	C01	Able to apply mathematical logical and Boolean algebra in switching circuit & logic circuits. (Level 3)
			C02	Define set theory, relation and functions. (Level 1)
			C03	Able to calculate algebraic structure, graph theory and combinatory. (Level 4)
			C04	Able to solve problems in various fields in computer science, specially networking. (Level 6)
			C05	Analyze logical propositions via truth table. (Level 4)
24	5	Data Analytics with PYTHON Laboratory	C01	Apply operation count for a given pseudo code. (Level 3)
			C02	Apply the concepts of Bubble sort for any given list of numbers. (Level 3)
			C03	Understand the time complexity of algorithm. (Level 2)
			C04	Apply the problem using backtracking. (Level 3)
			C05	Apply the Dynamic programming to write programs for the problem. (Level 3)
25	5	Data base Management System Laboratory	C01	To understand efficient DB handling codes in DML, DDL. (Level 2)



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			C02	Will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications. (Level 6)
			C03	Develop codes using efficient database storage structures and access techniques: file and page organizations, indexing methods including B-tree and hashing, transaction processing and concurrency control. (Level 3)
			C04	To design programs in PL/SQL using cursor, functions, triggers. (Level 6)
			C05	Design programs in PL/SQL, to generate the Report. (Level 6)
26	5	Object Oriented Programming (with JAVA)	C01	Apply an integrated development environment to write, compile, run, and test simple object-oriented Java programs. (Level 3)
			C02	Implement Object Oriented programming concept using basic syntaxes of control structures, strings and function for developing skills of logic building activity. (Level 6)
			C03	Identify classes, objects, members of a class and the relationships among them needed for finding the solution to specific problem. (Level 2)
			C04	Illustrate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved. (Level 2)
			C05	Understanding and use of different exception handling mechanisms and concept of multithreading for robust, faster and efficient application development. (Level 6)
27	5	Virtual laboratory (PHP/MySQL)	C01	Develop dynamic web designing applications and database handling applications using php. (Level 6)
			C02	Design and develop dynamic webpage components, interfaces & portals – (Project-based Learning technique). (Level 6)
			C03	Create an associative array using the countries as keys, the cities as values and display the data as a table. (Level 6)
			C04	Create pages for signup and sign-in process using PHP MySQL database operations. (Level 6)
			C05	Describe the logic of each a problem introduced. (level 1)
28	6	Compiler Design	C01	Create and understand the basic concept of compiler and lexical analyzer. (Level 2,6)
			C02	Evaluate and distinguish various parsing techniques. (Level 2,4)
			C03	Identify and analyze the syntax directed translation and intermediate code generation. (Level 2)
			C04	Recognize and apply runtime environment using activation tree and activation record. (Level 2,3)



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			C05	Understand code optimization and code generation techniques. .(Level 2)
29	6	Computer Networks	C01	Understand basic computer network technology.(Level 2)
			C02	Analyze Data Communications System and its components.(Level 4)
			C03	Memorize the different types of network topologies and protocols.(Level 1)
			C04	Analyze the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.(Level 4)
			C05	Apply and building the skills of sub-netting and routing mechanism.(Level 3)
30	6	Software Engineering & Project Management	C01	To introduce software project and to understand about the different software processes & their uses. (Level 2)
			C02	To understand and conceptualize the process of software CO3development life cycle (SDLC) models. (Level 2)
			C03	To introduce ethical and professional issues and to explain why they are concern to software engineers.(level 1,2,4)
			C04	Apply use of software life cycle to implement the projects successfully in the corporate world. (Level 3)
			C05	To understand how Software engineering & Project Management is concerned with theories, methods and tools for professional software development. (level 1,2)
31	6	Big Data Analytics using Hadoop	C01	To introduce and to understand the Big data platform and its use cases. (Level 2)
			C02	To understand HDFS concepts and interfacing with HDFS.(Level 2)
			C03	To introduce and provide an overview of Apache Hadoop.(level 1,2,4)
			C04	Apply analytics on structured and unstructured data.(Level 3)
			C05	To understand Map, Reduce Jobs. (level 1,2)
32	6	Data Warehousing and Mining	C01	To introduce and to understand the functionality of the various data mining and data warehousing component(Level 2)
			C02	To understand the strengths and limitations of various data mining and data warehousing models.(Level 2)
			C03	To introduce and explain the analysing techniques of various data.(level 1,2,4)
			C04	Describe and apply different methodologies used in data mining and data ware housing.(Level 3)
			C05	To understand the different approaches of data warehousing and data mining with various technologies. (level 1,2)



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33	6	Android Laboratory	C01	Understand the limitations and features of developing for mobile devices. (Level 2)
			C02	Design a complete mobile app with a significant programming component, involving the sensors and hardware features of the phone. (Level 6)
			C03	Evaluate existing state of mobile app development via researching existing apps, meeting with industry professionals, and formulating new ideas. (Level 5)
			C04	Formulate proficiency in coding on a mobile programming platform. (Level 6)
			C05	Use good knowledge of economics and features of the app marketplace by offering the app for download. (Level 3)
34	6	Computer Network Laboratory	C01	Identify and use various networking components understand different transmission media and design cables for establishing a network. (Level 2, 3)
			C02	Usesimulation tools. (Level 3)
			C03	Implement the various networking protocols. (Level 3)
			C04	Analyse the performance of the protocols in different layers. (Level 4)
			C05	Design , install and configure servers. (Level 6)
35	6	Big Data Analytics using Hadoop Lab	C01	UseHadoop and perform File management tasks. (Level 3)
			C02	ApplyMapReduce programs to real time issues like word count, weather datasets, and sales of a company. (Level 2)
			C03	Critically analyze huge data set using Hadoop and Mapreduce. (Level 4)
			C04	Apply data processing tools. (Level 3)
			C05	Develop a java application to find the maximum temperature using spark. (Level 6)
36	6	Minor Project Phase - II	C01	Apply theoretical knowledge to practical scenarios effectively, showcasing an understanding of core principles in the vocational field. (Level 3)
			C02	Develop and manage a project plan, including setting objectives, timelines, resource allocation, and documentation. (Level 6)
			C03	Understand and adhere to industry safety standards and regulations, ensuring a safe working environment. (Level 2)
			C04	Implement quality control measures to ensure the output meets industry standards. (Level 2)
			C05	Understand the basics of entrepreneurship, including business planning, financial management, and marketing within the vocational domain. (Level 2)
37	7	Deep Learning and Application	C01	Understand machine learning basics and back propagation model. (Level 2)



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			C02	Define Regularize the deep models. (Level 1)
			C03	Apply optimization techniques for training deep models. (Level 3)
			C04	Apply convolution networks for computer vision problems. (Level 3)
			C05	Use Deep Recurrent Architecture. (Level 3)
38	7	Data and Visual Analytics in AI	C01	Understand the fundamental concepts of data analysis. (Level 2)
			C02	Apply various visualization techniques to explore and analyze datasets. (Level 3)
			C03	Design and create effective visualization using appropriate tools and software. (Level 6)
			C04	Critically evaluate and improve existing visualizations based on principles of perception and design. (Level 5)
			C05	Apply data visualization techniques to real-world problems in AI and machine learning. (Level 3)
39	7	Natural Language Processing	C01	Describe the fundamental concepts and techniques of natural language processing. (Level 2)
			C02	Evaluate the syntax of any sentences using parsing. (Level 5)
			C03	Apply proper method to perform semantic analysis of a sentence. (Level 3)
			C04	Analyze a sentence for discourse integration. (Level 4)
			C05	To explore and apply fundamental techniques of speech processing for effective audio data handling. (Level 3)
40	7	Enterprise Resource Planning	C01	Describe the basic concepts and technologies used in ERP. (Level 2)
			C02	Describe ERP package selection process. (Level 2)
			C03	Describe the process of developing and implementing ERP systems. (Level 2)
			C04	Identify and describe typical functional modules in ERP systems. (Level 2)
			C05	Explain the different applications of ERP systems. (Level 2)
41	7	Managerial Skills	C01	Understand basic management principles to execute daily activities (Level 2)
			C02	Use principles of planning and organizing for accomplishment of tasks. (Level 3)
			C03	Define principles of directing and controlling for implementing the plans (Level 1)
			C04	Apply principles of safety management in all activities. (Level 3)
			C05	Understand various provisions of industrial acts. (Level 2)
42	7	Deep Learning Laboratory	C01	Understand the principles of feed forward and back propagation in neural networks through practical implementation. (Level 2)



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			C02	Apply deep learning algorithms such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) to solve classification problems. (Level 3)
			C03	Analyze the performance of models trained using techniques like data augmentation and fine-tuning. (Level 3)
			C04	Evaluate the effectiveness of Generative Adversarial Networks (GANs) in generating realistic data. (Level 5)
			C05	Create deep learning models for specific tasks such as sentiment analysis, speech recognition, and object detection. (Level 6)
43	7	Dev Ops Laboratory	C01	Understand DevOps principles, roles, and practices to bridge the gap between development and operations teams. (Level 2)
			C02	Apply version control systems like Git and GitHub for efficient source code management. (Level 3)
			C03	Analyze the functioning of continuous integration and deployment using Jenkins and Gradle/Maven tools. (Level 4)
			C04	Evaluate containerization and orchestration tools like Docker to deploy scalable applications. (Level 5)
			C05	Create automated pipelines for building, testing, and deploying applications using Jenkins and configuration management tools like Puppet. (Level 6)
44	7	Project (Phase I)	C01	Identify and define a relevant engineering problem or research question within the domain of study. (Level 1, 2)
			C02	Demonstrate effective project management skills to track progress and make necessary adjustments. (Level 2)
			C03	Apply appropriate engineering principles, techniques, and tools to develop a solution or prototype. (Level 3)
			C04	Implement and test the design, analyzing the results to validate the solution. (Level 3)
			C05	Demonstrate critical thinking and innovative problem-solving abilities in developing and refining the project. (Level 2)
45	8	Advance data science	C01	Apply advanced machine learning techniques, including ensemble methods and reinforcement learning, to complex datasets for real-world problem-solving. (Level 3)
			C02	Design, implement, and optimize deep learning models using neural network architectures like CNNs, RNNs, and GANs for various applications. (Level 3, 6)
			C03	Design Automate and scale data science workflows using AI-driven techniques, AutoML frameworks, and ethical AI practices to deliver robust solutions. (Level 6)



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			C04	Analyze and forecast time series data using classical models like ARIMA, advanced models like GARCH, and deep learning-based approaches. (Level 4)
			C05	Explore and apply cutting-edge topics like Explainable AI, Federated Learning, and Quantum Machine Learning to innovate and advance data science applications. (Level 3, 4)
46	8	Supply Chain Management	C01	Create a cyclic view of product will be created. (Level 6)
			C02	Evaluate that why one need a drivers for running a product. (Level 5)
			C03	Analyze how one can analyze the product by using different models. (Level 4)
			C04	By Applying how one implement the location for better product aspect. (Level 3)
			C05	Understand & Translate the idea of product into implementation plans. (Level 2)
47	8	Multimedia and Computer Vision	C01	To list the fundamental video, audio, image, text processing techniques. (Level 2)
			C02	Acquire the basic skill of designing video compression, audio compression, image compression, text compression. (Level 6)
			C03	To know the basic techniques in designing video transmission systems: error control and rate control. (Level 6)
			C04	To identify basic concepts, terminology, theories, models and methods in the field of computer vision. (Level 3)
			C05	Apply computer vision techniques such as image analysis, feature detection, and image classification to solve real-world problems in multimedia systems. (Level 3)
48	8	Web Development using Full Stack Laboratory	C01	Use of various front and back end Tools. (Level 3)
			C02	They can understand and create applications on their own. (Level 2)
			C03	Demonstrate and Designing of Websites can be carried out. (Level 3,6)
			C04	Develop web based application using suitable client side and server side code. (Level 6)
			C05	Implement web based application using effective database access. (Level 3)
49	8	Advance AI/LINUX Laboratory	C01	Understand the fundamental concepts of constraint satisfaction problems and implement solutions using Python. (Level 2)
			C02	Apply algorithms like Breadth-First Search (BFS), Depth-First Search (DFS), and A* for problem-solving in AI scenarios. (Level 3)



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			C03	Analyze various search strategies such as Hill Climbing and implement them for solving optimization problems. (Level 4)
			C04	Evaluate probabilistic models like Naïve Bayes for classification tasks and assess their performance. (Level 5)
			C05	Create AI-based applications, including game-playing algorithms like MiniMax, and implement intelligent systems such as chatbot prototypes. (Level 6)
50	8	Major Project (Phase-II)	C01	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level 1)
			C02	Develop and select a solution to identified problem in a cost effective manner. (Level 3, 5)
			C03	Function in a team and adapt as per requirement to achieve desired goal with ethical practices (Level 4, 6)
			C04	Apply principles to solve problems and interpret the result. (Level 3, 5)
			C05	Relate the impact of engineering solutions in society and classify modern tools . (Level 2,3)



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Department of Information Technology			
S.N.	Sem	Course Name	Course Outcome
1	3	Mathematics-III	CO1 Define Transform of elementary functions , Inverse Laplace Transform, ordinary differential equations. (<i>Level 1</i>)
			CO2 Apply Homogeneous linear equation with constant coefficients, Method of separation of variables (<i>Level 3</i>)
			CO3 Implement Mathematical expectation, Mean and Variance, Moments, Moment generating function,(<i>Level 3</i>)
			CO4 Apply Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula (<i>Level 3</i>)
			CO5 Simplify Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula. (<i>Level 4</i>)
2	3	Computer Architecture, Organization and Microprocessor	CO1 Classify basic structure of digital computers. Define Addressing Modes , <i>Pipelining, Control Unit.</i> (<i>Level 1</i>)
			CO2 Solve Arithmetic operations, Hardware algorithm ,floating point arithmetic operations.(<i>Level 2</i>)
			CO3 Apply the concept of memory management, static keywords, pointer concepts constructor. (<i>Level 3</i>)
			CO4 Illustrate Basic processor architecture and data movement instructions. (<i>Level 2</i>)
			CO5 Develop Assembly Language Programs , Interrupt Programming and Procedures.(Level 3)
3	3	Object Oriented Concepts & Programming using Java	CO1 study the difference between object oriented programming and procedural oriented language and data types in Java. (<i>Level 1</i>)
			CO2 describe different features of Java such as composition of objects, Operator overloading, inheritance, Polymorphism etc... (<i>Level 2</i>)
			CO3 implement the concept of memory management, static keywords, pointer concepts constructor. (<i>Level 3</i>)
			CO4 analyze and Evaluate to use concept of inheritance, polymorphism, template, exception handling, file handling in Java environment. (<i>Level 4</i>)



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			CO5	design At the end of the course students will able to write a program in object-oriented programming and also Build good quality software using object-oriented programming technique using java. (Level 6)
4	3	Computer Networks	CO1	Define Computer Networks uses, Data Transmission modes. (Level 1)
			CO2	describe concept of Data link layer and medium access control sublayer (Level 2)
			CO3	Classify Network Layer, Routing algorithms and internet protocols.(Level 2)
			CO4	Develop transport layer, protocols, and establish TCP connections.. (Level 3)
			CO5	Analyze File transfer in Application Layer and working with Electronic mail (SMTP,POP3,IMAP etc)(Level 4)
5	3	Digital Electronics	CO1	Define Logical gates, Weighted & Non-weighted codes and minimization techniques (Level 1)
			CO2	Illustrate Adder & Subtractor, code conversation and multiplexer , demultiplexer (Level 2)
			CO3	Develop Sequential & Combinational Circuits, working with flipflops, registers and counters.(Level 3)
			CO4	Analyze Sequential Circuits ,State Diagram, State Equation, State Reduction (Level 4)
			CO5	Determine Memory devices and digital integrated circuit, Implementation of combinational logic circuits(Level 5)
6	3	Digital Electronics Lab	CO1	Demonstrate the truth table of various expressions and combinational circuits usinglogic gates. (Level 2)
			CO2	Design , test and evaluate various combinational circuits such as adders (Level 5,6)
			CO3	Construct subtractors, comparators, multiplexers and demultiplexers.. (Level 6)
			CO4	Construct flips-flops, counters and shift registers. (Level 6)
			CO5	Design and evaluate full adder and up/down counters. (Level 6)
7	3	COA & Microprocessor Lab	CO1	Implements Addition, Subtraction, Multiplication&Division (Level 4)
			CO2	Create various assembly language program on given series. (Level 6)
			CO3	Construct Programs for String Operation (Level 6)



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			CO4	Develop STACK Programming using assembly language (Level 6)
			CO5	To demonstrate delay programming (Level 2)
8	3	Computer Networks Lab	CO1	Explain simulation tools (Level 2)
			CO2	Develop the various protocols. (Level 3)
			CO3	Analyze the performance of the protocols in different layers. (Level 4)
			CO4	Analyze various routing algorithms (Level 4)
			CO5	Create Stop, Wait Protocol and Sliding Window Protocol (Level 6)
9	3	Software Lab(Programming in Java)	CO1	To develop java programs using constructors and destructors.(level 6)
			CO2	To utilize the concept of inheritance to develop java programs.(level 3)
			CO3	To demonstrate the use of exception handling and Strings in java programs.(level 2)
			CO4	To Create multithreaded applications using java programming.(level 6)
			CO5	To design and develop interactive application programs using user Interfacing components, file handling, and JDBC.(level 6)
10	4	Data Structures	CO1	Define Abstract Data Types, Arrays implementation and Operations on a Linked List (Level 1)
			CO2	Evaluate Prefix and Postfix Expressions,stack operations(push & pop) (Level 4)
			CO3	Construct Binary Trees, Binary Tree Representation, Tree Traversal algorithms: Inorder, Preorder and Postorder (Level 3)
			CO4	Create Graphs, Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, (Level 6)
			CO5	Apply Prim's and Kruskal algorithm. Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm. (Level 3)
11	4	Database Management System	CO1	Will be able to Define the basic concepts of RDMBS and relational data model (Level 1)
			CO2	Be familiar with the relational database theory, and construct relational algebra expressions for queries. (Level 3)
			CO3	Understand DML, DDL and will be able to construct queries using SQL by knowing the importance of data & its requirements in any applications. (Level 2)
			CO4	Analyze the basic issues of transaction, its processing and concurrency control.



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				(<i>Level 4</i>)
			CO5	To develop translate DB designs from relational notation to ER notation & con Perform normalization once redundancies have been eliminated. (<i>Level 6</i>)
12	4	Analog Electronic Circuits	CO1	To clearly understand and demonstrate the knowledge of semiconductor diode and transistors and its applications (<i>Level 2</i>)
			CO2	To clearly understand and demonstrate the knowledge of amplifiers at low frequencies. (<i>Level 2</i>)
			CO3	To Analyze the concepts of multistage amplifiers and their applications. (<i>Level 4</i>)
			CO4	To Classify the basics of feedback in amplifiers. (<i>Level 4</i>)
			CO5	To gain a thorough understanding of oscillators, their applications. (<i>Level 2</i>)
13	4	Operating System	CO1	Define the general architecture of computers and operating system (<i>Level 1</i>)
			CO2	Illustrate concept of Process, Operations on Processes and CPU Scheduling. (<i>Level 2</i>)
			CO3	Examine Prevention, avoidance and detection, Recovery from dead lock combined approach (<i>Level 4</i>)
			CO4	Analyze memory management and Multiprogramming with fixed partitions. (<i>Level 4</i>)
			CO5	Understand Virtual Memory concept, Demand Paging, Performance, Page Replacement algorithms, Allocation of frames (<i>Level 2</i>)
14	4	Internet of Things	CO1	To understand Concepts, design and characteristics of IoT. (<i>Level 2</i>)
			CO2	To understand Architecture and basic protocols of IoT. (<i>Level 2</i>)
			CO3	To understand challenges and applications of IoTs. (<i>Level 2</i>)
			CO4	To develop IoT applications using Tools. (<i>Level 6</i>)
			CO5	Analyze basic protocols in wireless sensor network (<i>Level 4</i>)
15	4	Data Structures Lab	CO1	Identify the appropriate data structure for a given problem.(level-3)



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			CO2	Design various data structure algorithms and estimate their time and space complexity. (level-6)
			CO3	Apply appropriate algorithm for better utilization of memory. (level-3)
			CO4	Apply practical knowledge on the applications of data structures. (level-3)
			CO5	Solve real world problems using sorting and searching techniques. (level-3)
16	4	Database Management Lab	CO1	Utilize typical data definitions and manipulation commands.(level 3)
			CO2	Design applications to test Nested and Join Queries.(level 6)
			CO3	Develop simple applications that use Views.(level 6)
			CO4	Develop applications that require a Front-end Tool. (level 6)
			CO5	Critically analyze the use of Tables, Views, Functions and Procedures.(level 4)
17	4	Operating System (UNIX) Lab	CO1	Demonstration of Basic UNIX Commands.(level 2)
			CO2	Develop Shell Script for Files and Directory.(level 3)
			CO3	Create Program for File I/O. (level 6)
			CO4	Develop Shell Script using loops. (level 3)
			CO5	Create Program with Shell script for math operations. (level 6)
18	4	Virtual Lab (IoT Laboratory)	CO1	Define what IoT is and how it works today.(level 1)
			CO2	Recognize the factors that contributed to the emergence of IoT, Design and program IoT devices.(level 6)
			CO3	Use of real IoT protocols for communication, secure the elements of an IoT device.(level 3)
			CO4	Design an IoT device to work with a Cloud Computing infrastructure.(level 6)
			CO5	Analyze data to the cloud and in between cloud providers.(level 4)
19	5	Artificial Intelligence and Machine Learning	CO1	To understand basic concepts of AI, heuristic search techniques, knowledge representation methods and planning for AI solutions. (<i>Level 2</i>)
			CO2	Apply the knowledge and skills of heuristic search and game playing for solving real time problems(<i>Level 3</i>)



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			CO3	Analyze decisions based on which knowledge representation to use (<i>Level 4</i>)
			CO4	Develop with Natural Languages and implement linear and nonlinear planning (<i>Level 6</i>)
			CO5	Apply suitable Bayesian decision theory for various types of learning problems (<i>Level 3</i>)
20	5	Theory of Computation	CO1	Understanding of algorithms and procedures finite representations for languages and machines. (<i>Level 2</i>)
			CO2	To construct finite state machines and minimize them (<i>Level 6</i>)
			CO3	To design regular expressions and to prove the equivalence of languages described by finite state machines and regular expressions (<i>Level 6</i>)
			CO4	To design grammars and simplify context free grammars. (<i>Level 6</i>)
			CO5	To construct pushdown automata and to prove the equivalence of languages described by pushdown automata and context free grammars (<i>Level 6</i>)
21	5	Principles of Communication System	CO1	Understanding of Various analog and digital modulation and demodulation techniques.. (<i>Level 2</i>)
			CO2	Classification of the communication system with analog modulation techniques and their comparative analysis and application suitability. (<i>Level 4</i>), (<i>Level 6</i>), (<i>Level 2</i>)
			CO3	Explain characterization and performance parameters of modulation and demodulation. (<i>Level 2</i>)
			CO4	Apply Analog to digital conversion and digital data transmission. (<i>Level 3</i>)
			CO5	Digital modulation techniques and their comparative analysis along with advanced multiplexing technique. (<i>Level 4</i>)
22	5	Software Engineering & Project Management	CO1	Decide on a process model for a developing a software project. (<i>Level 5</i>)
			CO2	Classify software applications and Identify



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				unique features of various domains. (Level 2)
			CO3	Design test cases of a software system. (Level 6)
			CO4	Understand basics of IT Project management. (Level 2)
			CO5	Plan , schedule and execute a project considering the risk management. (Level 3)
23	5	Design and Analysis of Algorithm	CO1	Apply design principles and concepts to algorithm design.(Level 3)
			CO2	Have the mathematical foundation in analysis of algorithms. (Level 4), (Level 2)
			CO3	Understand different algorithmic design strategies. (Level 2)
			CO4	Analyze the efficiency of algorithms using time and space complexity theory (Level 4)
			CO5	Knowledge of algorithm design strategies (Level 6)
24	5	Artificial Intelligence and Machine Learning Lab	CO1	Develop programs for computation of recursive functions like factorial Fibonacci numbers, etc. (level 3)
			CO2	Understand Python, and learning interactively at command prompt and writing simple programs. (level 2)
			CO3	Explain the conditions and iterations in Python by writing and running simple programs.(level 2)
			CO4	Analyze tuples and exercises based on tuples. (level 4)
			CO5	Identify unique and duplicate items of a list.(level 3)
25	5	Software Engineering & Project Management Lab	CO1	Understand software development life cycle (level 2)
			CO2	Explain the need of the software engineering. (level 2)
			CO3	Identify the different requirement engineering tasks.(level 3)
			CO4	Identify various modules, input, output etc. of the system.(level 3)
			CO5	Analyze various elements such as classes, member variables, member functions etc. of the class diagram. (level 4)



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26	5	Principles of Communication System Lab	CO1	To Design the O/P waveform of Amplitude and Frequency Modulation & Demodulation & Calculate Modulation Index.(level 6)
			CO2	To Explain DSB and SSB Transmitter & Receiver. (level 2)
			CO3	Design the Graph of PAM and PPM Modulation & Demodulation.(level 6)
			CO4	Analyze Sampling & Reconstruction of original signal & to calculate the Sampling Frequency.(level 4)
			CO5	Analyze Delta Modulation & Compare it with Adaptive Delta Modulation (ADM). (level 4)
27	5	Project-I Laboratory	CO1	Apply theoretical knowledge to practical scenarios effectively, showcasing an understanding of core principles in the vocational field. (Level 3)
			CO2	Develop and manage a project plan, including setting objectives, timelines, resource allocation, and documentation. (Level 6)
			CO3	Understand and adhere to industry safety standards and regulations, ensuring a safe working environment. (Level 2)
			CO4	Implement quality control measures to ensure the output meets industry standards. (Level 2)
			CO5	Understand the basics of entrepreneurship, including business planning, financial management, and marketing within the vocational domain. (Level 2)
28	6	Computer Graphics and Data Visualization	CO1	To Demonstrate the functionalities of pixels and coordinate systems pertaining to graphics manipulation. (Level 2)
			CO2	Design and demonstrate the 2D and 3D objects using graphics algorithms. (Level 6)
			CO3	Simplify objects by comprehending the complexities of illumination invirtual scenes. (Level 4)
			CO4	Identify the different data types, visualization types to bring out the insight. (Level 3)
			CO5	Relate the visualizationtowards the problem based on the dataset. (Level 2)



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29	6	Compiler Design	CO1	Explain the concepts of Compilers and roles of the lexical analyzer. (<i>Level 2</i>)
			CO2	Apply the concepts of different Parsing techniques (<i>Level 3</i>)
			CO3	Determine the knowledge to Yacc tool (<i>Level 5</i>)
			CO4	Develop syntax directed translation schemes. (<i>Level 6</i>)
			CO5	Explain the principles of scoping, parameter passing and runtime memory management (<i>Level 2</i>)
30	6	Information Theory and Coding	CO1	Explain different probability of erroneous condition incommunication and how to control it. (<i>Level 2</i>)
			CO2	Analyze the channel bandwidth and different conditions to improve efficiency of the communication system (<i>Level 4</i>)
			CO3	Understand the basic concept of Source Coding Techniques (<i>Level 2</i>)
			CO4	Develop the performance of Communication System. (<i>Level 6</i>)
			CO5	Understand basic concepts of complexity of cryptographic security methods and their practical applications (<i>Level 2</i>)
31	6	Data Mining	CO1	To discover patterns from raw data and make predictions of the outcomes. (<i>Level 4</i>)
			CO2	To apply data mining techniques for solving practical problems (<i>Level 3</i>)
			CO3	Explain various critical operations (<i>Level 2</i>)
			CO4	Involved in designing a data warehouse for application domains. (<i>Level 6</i>)
			CO5	Experiment with well-known data mining techniques for obtaining interesting knowledge from data. (<i>Level 3</i>)
32	6	Management Information System	CO1	Understand the basic concepts and technologies used in the field of management information systems. (<i>Level 2</i>)
			CO2	Will able to make decision using DSS tool. (<i>Level 6</i>)



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			CO3	Analyze the knowledge of the different types of system and the concept of planning. (Level 4)
			CO4	Develop an understanding of how DSS and Expert system work. (Level 6)
			CO5	Understand the processes of developing and implementing information systems. (Level 2)
33	6	Computer Graphics and Data Visualization Lab	CO1	To Demonstrate the Bresenham's line drawing Algorithm (level 2)
			CO2	Experiment with the following 2D transformation operations upon various 2D-polygons. (level 3)
			CO3	Experiment with Graphics Display Algorithms (level 3)
			CO4	Statistical Analysis such as Multivariate Analysis, PCA, LDA, Correlation, regression and analysis of variance. (level 4)
			CO5	Dashboard Creation and explain Text visualization. (level 2)
34	6	Mobile Application Development (Android) Lab	CO1	Understand the Basic concepts of Android OS (level 2)
			CO2	Use of SDK and Other Development tools. (level 3)
			CO3	Create GUI Application using Android (level 6)
			CO4	Develop Layout (Linear, Relative, Frames) using Android. (level 6)
			CO5	Understanding Development of Applications with APIs and Databases (level 2)
35	6	Web Application Development Lab	CO1	Understand the Basic concepts of Bootstrap. (level 2)
			CO2	Programming to demonstrate Bootstrap Grids (level 2)
			CO3	Develop Programs using Ajax (level 6)
			CO4	Develop UI Form (Login Page) using Bootstrap. (level 6)
			CO5	Develop Server Side Programming (level 6)
36	6	Project-1 (Android)	CO1	To understand how to work with various mobile application development frameworks. (level 2)
			CO2	To understand the capabilities and limitations of mobile devices. (level 2)



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			CO3	Develop mobile applications relating to real world apps. (level 6)
			CO4	Develop Mobile applications for enhancement of existing ideas (level 6)
			CO5	Develop Server Side Programming (level 6)
37	7	Cryptography and Network Security	CO1	Define encryption algorithms for confidentiality and their design principles. (Level 1)
			CO2	Public key encryption algorithms and their design principles (Level 6)(Level 2)
			CO3	Utilize message authentication codes, hash functions , digital signature and public key certificates (Level 3)
			CO4	Analyze Network security tools and applications. (Level 4)
			CO5	Solve System-level security issues like threat of and countermeasures for intruders and viruses. (Level 3)
38	7	Cloud Computing	CO1	Understand the main concepts, key technologies, strengths, and limitations of cloud computing. (Level 2)
			CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. (Level 3)
			CO3	Simplify the core issues of cloud computing such as security, privacy, and interoperability. (Level 4)
			CO4	Provide the appropriate cloud computing solutions and recommendations according to the applications used (Level 6)
			CO5	Develop Hardware/Software verification concept & smart phone activities. (Level 6)
39	7	Enterprise Resource Planning (ERP)	CO1	Define the Basic concepts and technologies used in ERP. (Level 1)
			CO2	Classify ERP package selection process. (Level 2)
			CO3	Apply the process of developing and implementing ERP systems. (Level 3)
			CO4	Identify and describe typical functional modules in ERP system. (Level 3)
			CO5	Explain the different applications of ERP systems. (Level 2)



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40	7	Decision Support System	CO1	Recognize the relationship between business information needs and decision making (Level 4)
			CO2	Select the general nature and range of decision support systems (Level 3)
			CO3	Appraise issues related to the Analyse , design, development and implement a DSS (Level 4)
			CO4	Select appropriate modeling techniques (Level 3)
			CO5	design , implementation: benefits and pitfalls. Risk assessment. Decision analysis and strategic decision support (Level 6)
41	7	Managerial Skills	CO1	Understand basic management principles to execute daily activities (Level 2)
			CO2	Use principles of planning and organizing for accomplishment of tasks. (Level 3)
			CO3	Define principles of directing and controlling for implementing the plans (Level 1)
			CO4	Apply principles of safety management in all activities. (Level 3)
			CO5	Understand various provisions of industrial acts. (Level 2)
42	7	Cryptography and Network Security Lab	CO1	Build security of the data over the network.(level 3)
			CO2	Identify basic security attacks and services. (level 3)
			CO3	Explain use of symmetric and asymmetric key algorithms for cryptography (level 2)
			CO4	Build crypto systems by applying symmetric and public key encryption algorithms. (level 3)
			CO5	Construct code for authentication algorithms. (level 6)
43	7	Cloud Computing Lab	CO1	Create AWS Account.(level 6)
			CO2	Create Windows and Linux instances.(level 6)
			CO3	Make use of operating system instances.(level 3)
			CO4	Analyze elastic file system.(level 4)
			CO5	Develop load balancer.(level 6)
44	7	Project(Phase-I)	CO1	Apply engineering knowledge and utilize technical resources in real life projects by integrating classroom theory with real-time situations.(level 3)
			CO2	Analyze practical skills, organizational skills, professional awareness and experience working on projects. (level 4)



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			CO3	Explain knowledge of how to make optimal decisions to resolve technical challenges. (level 2)
			CO4	Be able to Create technical documents related to the project work completed. (level 6)
			CO5	Simplify effective communication skill to present the completed project in a promise manner. (level 4)
45	8	Cyber Security	CO1	To create cyber security awareness and understand principles of web security. (Level 6)
			CO2	To understand the fundamentals of computer forensics, Evidence Collection Etc. (Level 2)
			CO3	To Understand key terms and concept in cyber law and cyber crimes. (Level 2)
			CO4	Illustrate intellectual property trademarks and domain theft (Level 2)
			CO5	To make attentive to students about possible hacking and threats in this communication era. (Level 3)
46	8	Introduction to Data Science	CO1	Identify and describe the methods and techniques commonly used in data science. (Level 3)
			CO2	Demonstrate proficiency with the methods and techniques for obtaining, organizing, exploring, and analyzing data. (Level 2)
			CO3	Justify how data analysis, inferential statistics, modeling, machine learning, and statistical computing can be utilized in an integrated capacity. (Level 5)
			CO4	Create and modify customizable tools for data analysis and visualization (Level 6)
			CO5	Demonstrate the ability to clean and prepare data for analysis and assemble data from a variety of sources. (Level 2)
47	8	Big Data Analytics	CO1	Define fundamental concepts and competitive advantages of big data analytics (Level 1)
			CO2	Analyze the big data by utilizing various statistical and data mining approaches. (Level 4)
			CO3	Understand various data analysis methods and intelligent techniques. (Level 5) (Level 2)



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			CO4	Apply analytics on real-time streaming data. (<i>Level 3</i>)
			CO5	Understand various No SQL database models and visualization techniques. (<i>Level 2</i>)
48	8	Hadoop Lab	CO1	Define the tools required to manage and analyze big data.(level 1)
			CO2	Understand Map Reduce Paradigm. (level 2)
			CO3	Identify various sources of Big data. (level 3)
			CO4	Be able to solve complex real-world problems. (level 3)
			CO5	Develop programming tools PIG and HIVE in Hadoop eco system. (level 6)
49	8	Simulation (Lab)	CO1	Make Use the MATLAB based IT tools for the analysis of data and systems. (level 3)
			CO2	Design different automated systems as a project of their choice using these IT tools. (level 2)
			CO3	Identify and explore different IT tools in MATLAB. (level 3)
			CO4	Extend machine learning and deep learning tools. (level 2)
			CO5	Extend ANN and AI tools. (level 2)
50	8	Project (Phase-II)	CO1	Be able to apply engineering knowledge. (level 2)
			CO2	Analyze technical resources in real life projects. (level 2)
			CO3	Explain practical skills, organizational skills, Communication skills, professional awareness and experience working on projects. (level 3)
			CO4	Understand knowledge of how to make optimal decisions to resolve technical challenges. (level 2)
			CO5	Create Technical documents and give presentations. (level 6)



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Department of Mechatronics Engineering				
S.N .	Se m	Course Name	Course Outcome	
1	3	Applied Mathematics-III	CO1	Define Fourier series including half range series; analyze Harmonic analysis and variety of its applications. (Level. 1,4)
			CO2	Describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to illustrate ordinary differential equations.(Level 1,2)
			CO3	Formulate and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. (Level 5)
			CO4	Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. (Level 3,6)
			CO5	Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations. (Level 3)
2	3	Mechanics of Materials	CO1	Understand and evaluate the various elastic constants. Level (5)
			CO2	Understand and apply the concept of stress and strain. Level (3)
			CO3	Understand pure bending phenomenon on various cross-sections of a beam. Level (2)
			CO4	Learn about statically indeterminate beams and be able to draw shear force, bending moment, and calculate slope and deflection. Level (3)
			CO5	Understand the failure of a shaft due to torsion. Level (2)
3	3	Electronic Devices and Digital Circuits	CO1	Describe structure & operation of semiconductor material. (Level 3,5)
			CO2	Express operation of pn junction diode, zener diode and various rectifier circuits with their merits & demerits. (Level 2, 5)
			CO3	Distinguish the working of a transistor and its operation under various configurations. (Level 3,5)
			CO4	Compare the working operations of FET and MOSFET and their performance characteristics. (Level 4,5)
			CO5	Analyze about different biasing and stabilization circuits for transistor & their respective significances. (Level 2,3,5)
4	3	Metrology and Instrumentation	CO1	Describe the functional elements of measurement system and its performance characteristics. (Level 1,2,4)
			CO2	Describe & Distinguish measurement of pressure, strain and temperature. (Level 2,5)
			CO3	Analyze the type of fluid flow interpret its nature . Describe the data acquisition system.(Level 3,4)
			CO4	Describe linear and angular measurement devices, measurement of geometrical forms, optical projectors, tool maker microscope and autocollimators. (Level 2)
			CO5	Distinguish And Describe the interferometers ,comparators , screw threads and gear measurement.(Level 6)
5	3	Engineering Materials	CO1	Describe mechanism of solidification and various mechanical properties measurement systems. (Level 1,2)
			CO2	Describe and distinguish various metal deformation process and its theories. (Level 1,2,)



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			CO3	Describe phase formation rules and various types of phase equilibrium diagram. (Level 1,2)
			CO4	Understand TTT curve and various heat treatment process of metal. (Level 1,2)
			CO5	Distinguish and describe the properties of ferrous, Non ferrous, and smart metal. (Level 1,2)
6	3	Material Testing Lab	CO1	Analyze mechanical properties of various engineering materials under specific types of load in universal testing machine. (Level 3)
			CO2	Analyze mechanical properties of engineering materials under impact loading. (Level 3)
			CO3	Analyze mechanical properties of specimen under torsion (Torsion Testing Machine, Spring Testing Machine) (Level 3)
			CO4	Determine hardness of given material. (Level 3)
			CO5	Analyze mechanical properties of specimen under fatigue, deep drawing and buckling load. (Level 3)
7	3	Electronic Devices and Digital Circuits Lab.	CO1	Study basic electronic components, observe characteristics of electronic devices: Analyze the characteristics of different electronic devices such as diodes, transistors, etc.: Level (2, 4)
			CO2	Measure voltage, frequency, and phase of any waveform using CRO: Level (3)
			CO3	Generate sine, square, and triangular waveforms with required frequency and amplitude using function generator: Level (3)
			CO4	Understand the frequency response of feedback amplifiers using BJT and FET: Level (2)
			CO5	Understand the operation of oscillators and waveform generators: Level (2)
8	3	Metrology and Instrumentation Lab	CO1	Knowledge of basic measurement tools and methods(Level 1, 2)
			CO2	Comparison of different tools and methods (Level 2,4)
			CO3	Knowledge about the calibration of tools (Level 1,2)
			CO4	Applying the methods of measurement (Level 2,3)
			CO5	Able to know process and quality control (Level 1,2, 3)
9	3	Software Lab (Programming in C++)	CO1	Write a Program to check whether the number is prime or not. LEVEL (2)
			CO2	Write a Program to read number and to display the largest value between: (a) Two numbers, (b) Three Numbers, (c) Four numbers by using switch-case statements. LEVEL (3)
			CO3	Write a Program to find the sum of first natural numbers: sum= 1+2+3+4+...100 by using (a) for loop, (b) while loop, (c) do-while loop. LEVEL (3)
			CO4	Write a Program to find the sum of the following series using function declaration: Sum= $x - (x^3)/3! + (x^5)/5! - \dots (x^n)/n!$ LEVEL (4)
			CO5	Write a Program to read the element of the given two matrices & to perform matrix multiplication. LEVEL (4)
10	4	Kinematics of Machines	CO1	Define kinematic elements, pairs, and mechanism, describe mechanisms such as four bar mechanism and its inversions, identify, interpret, and examine for velocity for different mechanisms by relative velocity and instantaneous centre methods. (Level-1,3,4)
			CO2	Synthesis of mechanism, Pantograph, Lower pair mechanism, identify, interpret, and examine relative acceleration diagram,



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				<p>klens construction, corollis component of acceleration. (Level-1,3,4,5)</p> <p>CO3 Define, classify cams and followers, and construct displacement diagram and cam profiles for SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motions. (Level-1,3,5)</p> <p>CO4 Classify gear, define gear terminology and law of gearing , compare involutes and cycloid teeth ,describe interference and undercutting of Involutess teeth, minimum number of teeth on pinion to avoid interference.identify, construct and examine velocity ratio for different gear trains using algebraic and tabular methods. (Level-1,3,4,5)</p> <p>CO5 Describe various applications of friction, analyse pivot and collar friction, and thrust bearing, compare ratio of tensions for flat belt & V-belt, describe centrifugal tension, condition for maximum power transmission, describe absorption dynamometer, transmission dynamometer. (Level-1,3,4)</p>
11	4	Microprocessor and Microcontroller	<p>CO1 The students will gain knowledge about the architecture of general-purpose microprocessors. Level: 2 (Understanding)</p> <p>CO2 The students will get basic knowledge of all types of microcontrollers. Level: 2 (Understanding)</p> <p>CO3 They will get the basic knowledge of programming techniques with 8051 microcontroller. Level: 3 (Applying)</p> <p>CO4 The basic concepts of embedded systems are known. Level: 2 (Understanding)</p> <p>CO5 The concept of interfacing devices with 8051 is known. Level: 3 (Applying)</p>	
12	4	Modern Control Systems	<p>CO1 Describe the Students will get basic knowledge of all types of control system. (Level 3,5)</p> <p>CO2 Express to know why time domain is used. (level 2, 5)</p> <p>CO3 Distinguish to students will understand the significance of S-domain. (Level 3,5)</p> <p>CO4 Compare the students will understand the concept of state variable techniques.. (level 4,5)</p> <p>CO5 Analyze applications and Analytical Skills How stable and better control of devices can be achieved... (Level 2,3,5)</p>	
13	4	Fluid Mechanics	<p>CO1 Understand and Describe the laws of fluid motion and its engineering application (Level 1,2,3)</p> <p>CO2 Classify & Analyze various fluid flow situations of engineering interest (Level 1,2,4,5)</p> <p>CO3 Evaluate the merits and demerits of application of principles to variety of fluid flow problems (Level 1,2,5,6)</p> <p>CO4 Design or select equipments based on flow through pipelines or other conduits (Level 1,2,3,5)</p> <p>CO5 Interpret the results and its physical significance (Level 1,2,4,5,6)</p>	
14	4	Thermal Engineering	<p>CO1 The student will be able to analyze the second law. Level (4)</p> <p>CO2 The student will be able to evaluate the performance of an internal combustion engine. Level (5)</p> <p>CO3 The student will be able to understand the vapor and vapor power cycle and steam condenser. Level (2)</p> <p>CO4 The student will be able to understand the refrigeration cycle and reciprocating air compressors. Level (2)</p> <p>CO5 The student will be able to execute knowledge of solar energy to various devices. Level (3)</p>	



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15	4	Kinematics of Machines Lab	CO1	Analyze the jump phenomena of cam follower apparatus. Level (4)
			CO2	Demonstrate the ability to draw displacement, velocity, and acceleration curves of cam motion. Level (3)
			CO3	Evaluate the load carrying capacity of bearings using experimental methods. Level (5)
			CO4	Calculate the coefficient of friction of bearings through experimental measurements. Level (3)
			CO5	Analyze and calculate the frictional horsepower of bearings based on experimental data. Level (4)
16	4	Microprocessor and Microcontroller Lab	CO1	Develop and implement basic arithmetic operations using 8-bit microcontroller registers and memory. Level (3)
			CO2	Program and execute 16-bit addition using registers of an Atmel 89C51 microcontroller. Level (3)
			CO3	Program and execute 32-bit addition using registers of an Atmel 89C51 microcontroller. Level (3)
			CO4	Convert binary numbers into decimal using Atmel 89C51 microcontroller registers. Level (4)
			CO5	Transfer data between ROM and RAM using different methods on Atmel 89C51 microcontroller. Level (3)
17	4	Fluid Mechanics Lab	CO1	Demonstrate practical understanding of principles of buoyancy and flotation and determine meta-centric height. (Level 3,5)
			CO2	Verify impulse momentum principle (Level 5)
			CO3	Demonstrate practical understanding of the various terms in Bernoulli's equation and verify Bernoulli's theorem. (Level 3,5)
			CO4	Calibrate flow measurement devices (Level 3)
			CO5	Demonstrate practical understanding of Major and Minor Losses in pipe flow. (Level 3)
18	4	Virtual Lab(Computer aided design and manufacturing Lab)	CO1	Develop and validate computer programs for line or circle drawing algorithms. Level (3)
			CO2	Implement and validate computer programs for geometric transformations such as translation, rotation, and scaling. Level (3)
			CO3	Design and validate computer programs for simulating machine components or systems. Level (6)
			CO4	Utilize and apply commands of 3-D modeling software for modeling and visualization. Level (3)
			CO5	Create and validate solid models of machine components using advanced modeling software. Level (6)
19	5	Dynamics of Machines	CO1	Apply knowledge of Dynamics of machine for understanding, formulating and solving engineering problems. (Level 1,2)
			CO2	Acquire knowledge and hands-on competence in applying the concepts Dynamics of machine in the design and development of mechanical systems. (Level 1,3)
			CO3	Demonstrate creativeness in designing new systems components and processes in the field of engineering. (Level 1,3)
			CO4	Identify, analyze and solve mechanical engineering problems useful to the society. (Level 1,2,4,6)
			CO5	Analyse effectively with engineering and science teams as well as with multidisciplinary designs. (Level 1,2)
20	5	Fluid Machines and Fluidics	CO1	Demonstrate the ability to test and analyze the performance of turbines such as Pelton wheel, Francis turbine, and Kaplan turbine. Level (4)



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			CO2	Perform testing and analysis of the performance of a two-stage reciprocating air compressor and air blower. Level (4)
			CO3	Acquire knowledge about the operational principles and characteristics of turbines and pumps. Level (2)
			CO4	Gain familiarity with the operational principles and applications of hydraulic machines. Level (2)
			CO5	Understand the principles and functions of fluid systems in various applications. Level (2)
21	5	Advance Microcontroller and System Design	CO1	Program to Solve basic problems using 8051 microcontroller.[1,2,6]
			CO2	State 8051 Counter/Timer and Interrupts features and applications machine automation. [1]
			CO3	Develop understanding for using concepts of Serial Communication in machine to machine interface [5]
			CO4	Apply fundamental knowledge about Embedded systems for better understanding of Machine automation [3]
			CO5	Analyze interface between Microcontroller and various devices .[4]
22	5	Manufacturing Technology	CO1	Understand the basic concepts of heat treatment process and it's influences on properties of metal, types of ferrous and non-ferrous metal and its classification.(Level-2)
			CO2	Define and classify principles & application, advantages & limitations of various casting and welding processes. .(Level-1,2)
			CO3	Understand, classify the primary forming processes like forging , rolling, drawing, Extrusion. .(Level-2)
			CO4	Classify and understand the principle and constructional features, operations performed on -lathe, drilling machine, shaper machine, planner machine, and slotter machine etc. .(Level-2)
			CO5	Understand the principle and operations and types of non-conventional machines and applications of press working operations. (Level-2)
23	5	Signals and Systems	CO1	Describe the properties of various types of signals and systems. (Level 1,2,4)
			CO2	Match different types of continuous and discrete time signals to design the communication systems as per the requirement. (Level 2,5)
			CO3	Analyze the behavior of the signal in different time domain and interpret the response of the systems. (Level 3,4)
			CO4	Distinguish between IIR and FIR Systems. (Level 2)
			CO5	Evaluate the role of correlation and convolution in the area of signal processing, and communication. (Level 6)
24	5	Dynamic Of Machine lab	CO1	Analyze the vibration parameters of various systems. .(LEVEL 3)
			CO2	Analyze gyroscopic parameters. .(LEVEL 3)
			CO3	Analyze various types of governors. .(LEVEL 3)
			CO4	Find the critical speed of different diameters of shafts. .(LEVEL 1,2)
			CO5	Analyze the effects of unbalance in machine and methods to reduce/eliminate these effects. .(LEVEL 3)
25	5		CO1	Analyze the performance parameters of Pelton Turbine. .(LEVEL 3)



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		Fluid Machines and Fluidics lab	CO2	Analyze the performance parameters of Francis and Kaplan Turbine.(LEVEL 3)
			CO3	Analyze the performance parameters of Centrifugal Pump and Reciprocating Pump. (LEVEL 3)
			CO4	Determine Lift and drag force over an air foil. (LEVEL 4)
			CO5	Explain the construction and working of various fluidic devices. (LEVEL 2)
26	5	System Design Lab	CO1	Implement fundamental arithmetic operations in Assembly Language for Atmega16, including addition, subtraction, multiplication, and division of 8-bit numbers. Level: 3 (Application)
			CO2	Develop proficiency in handling 16-bit unsigned numbers using Assembly Language on Atmega16 to perform addition operations and manage register pairs effectively. Level: 4 (Analysis)
			CO3	Convert hexadecimal numbers to decimal representation using C language on a microcontroller, demonstrating knowledge of bitwise operations and register management. Level: 4 (Analysis)
			CO4	Translate packed Binary-Coded Decimal (BCD) numbers into ASCII format using C language, applying logical operations and character encoding techniques. Level: 5 (Synthesis)
			CO5	Develop applications in C language for microcontroller peripherals such as LCDs, keypads, stepper motors, temperature sensors, and servo motors, integrating hardware interfaces and control algorithms effectively. Level: 6 (Evaluation)
27	5	Project-I based on Summer Internship/ Industrial Training	CO1	Technical Skills Development Students will be tasked with applying the technical skills they've acquired during their internship or training to solve real-world problems. This could involve implementing software solutions, conducting experiments, or troubleshooting technical issues encountered in the industry.(Level: 3)
			CO2	Problem-Solving Abilities Students will analyze complex problems relevant to their field of study or industry. They will identify key issues, examine different approaches to problem-solving, and propose innovative solutions. This could involve case studies, simulations, or research-based projects. (Level: 4)
			CO3	Communication Skills Enhancement Students will evaluate and improve their communication skills through project presentations, reports, or documentation. They will articulate their ideas, present findings, and defend their solutions effectively. Peer reviews and feedback sessions can be incorporated to enhance communication abilities. (Level: 5)
			CO4	Professional Development Students will create a professional portfolio showcasing their achievements, experiences, and skills gained during the internship or training. They will reflect on their learning journey, set career goals, and develop a plan for continuous professional development. This could involve creating resumes, LinkedIn profiles, or personal branding materials.(Level: 6)
			CO5	Teamwork and Collaboration Students will apply their teamwork and collaboration skills by working on group projects or collaborative assignments. They will demonstrate effective teamwork, leadership, and interpersonal skills while completing tasks and achieving project objectives. Group presentations or



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				joint reports can be used to assess teamwork outcomes. (Level: 3)
28	6	Machine Design	CO1	Develop knowledge of basic considerations in machine design, Static & Fluctuating loads on components, Material codes(Level 1,4)
			CO2	Understand design of Cotter & Knuckle Joints, Keys, Couplings (mechanical components) (Level 1,5)
			CO3	Understand design of Shafts, Design considerations in ASME codes, Clutches(Level 1,5)
			CO4	Analyze and comprehend design of Threaded Fasteners, Screw threads, Screw Jack & Power screws(Level 1,2,4)
			CO5	Design of different structural joints : Riveted joints(Level 1)
29	6	Industrial and Power Electronics	CO1	Describe the students will get knowledge of basic power electronic devices and how they differ from other electronic devices.. (Level 3,5)
			CO2	Express to get the basic knowledge of inverter, cylo-converter, dual converter and choppers.. (Level 2, 5)
			CO3	Distinguish the basic knowledge of heating and welding control is obtained. (Level 3,5)
			CO4	Compare the knowledge of voltage stabilizer and UPS is obtained. (Level 4,5)
			CO5	Analyze knowledge about voltage requirement for welding process.. (Level 2,3,5)
30	6	Digital Signal Processing and its Applications	CO1	Understand the fundamentals of discrete time signals and application of Fourier and Z transform with respect to Digital signal processing. (Level 1,2,4)
			CO2	Explain the basics of digital filter design and the discrete Fourier transform. (Level 1,2)
			CO3	Analyze and synthesize algorithms and systems that process discrete time signals with emphasis on realization and implementation. (level 4,5)
			CO4	Distinguish and design FIR and IIR filters, and realize the structures. (Level 2,5)
			CO5	Apply signal processing to various areas such as speech and audio processing, image processing, biomedical signal processing, array signal processing etc. (level 1,2,5)
31	6	Hydraulics and Pneumatics control	CO1	Comprehend Different Fluid Power Systems and Applications Level (2)
			CO2	Describe the Construction and Working of Pumps and Actuators, and Know About Their Performance Characteristics Level (4)
			CO3	Comprehend and Analyze Hydraulic Circuits and Accumulators Level (4)
			CO4	Describe the Construction and Working Principles of Different Types of Control Valves Level (2)
			CO5	Understand Pneumatic Systems and Pneumatic Logic Gates (OR & AND) Level (2)
32	6	Entrepreneurs hip Developments	CO1	Describe the history of Entrepreneurship development and the role of entrepreneurship in the economic development (Level 1,2,4)
			CO2	Describe the Forms of Ownerships ,types of entrepreneurship and the Entrepreneurship Development Cycle (Level 2,5)
			CO3	Describe the generation and evaluation of business ideas and the role of industrial bodies.(Level 3,4)



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			CO4	Describe the steps and processes involved in setting up a manufacturing unit and service unit and about the government policies. (Level 2)
			CO5	Distinguish and describe the success cases and opportunities in different economic sectors. (Level 6)
33	6	Computer Aided Modeling & Analysis Lab	CO1	Demonstrate working knowledge in Computer Aided Design methods and procedures. (Level 3)
			CO2	Construct solid modeling using 3D modeling standard software. (Level 6)
			CO3	Describe boundary conditions for structural, heat and fluid flow problems. (Level 2)
			CO4	Solve simple structural and heat problems using standard FEA software. (Level 3,4)
			CO5	Solve fluid flow problems using standard FEA software. (Level 3,4)
34	6	Digital Signal Processing and its Applications Lab	CO1	To study the fundamentals of discrete time system analysis, digital filter design and the DFT. Level (2)
			CO2	The students will understand the fundamentals of discrete time signals, systems and their properties. Level (2)
			CO3	The students will understand the basics of digital filter design and the Discrete Fourier Transform. Level (2)
			CO4	The mathematical problem solving ability of students get improved. Level (3)
			CO5	The students will be motivated to apply signal processing to various areas such as speech and audio processing, image processing, biomedical signal processing, array signal processing etc. Level (3)
35	6	Hydraulics and Pneumatics control Lab	CO1	To understand the working and construction of hydraulic and pneumatic components and basic circuits Level: Understand (2)
			CO2	To control the speed and pressure of hydraulic and pneumatic cylinders using various valves Level: Apply (3)
			CO3	To design and implement electro-hydraulic circuits for speed and pressure control and sequential operations using limit/proximity switches Level: Create (6)
			CO4	To implement control mechanisms for pneumatic cylinders, including memory, time-dependent, and pressure-dependent controls Level: Apply (3)
			CO5	To understand and apply pneumatic logic elements and specialized valves such as Quick Exhaust, Flow Control, and Time Delay valves Level: Apply (3)
36	6	Simulation Lab	CO1	To provide insight into the working, analysis and design of basic circuits using Multisim. Level: Understand (2)
			CO2	Student should be able to design and implement circuits like Half & Full Wave rectifier, multivibrator, op-amp, mixer circuit, integrator, etc. Level: Apply (3)
			CO3	To understand the concept of Multisim simulation and all RC circuits. Level: Understand (2)
			CO4	Student has knowledge about Multisim 11.0 with high frequency analysis. Level: Understand (2)
			CO5	Students should be able to function effectively as an individual and in a team to accomplish the given task. Level: Apply (3)
37	7	Autotronics	CO1	The students will get the knowledge of different parts of the automobile Level: Remember (1)
			CO2	The students will know about chassis & frame, clutches, gear box, tyres, brakes, and the steering system Level: Understand (2)



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			CO3	Identify & differentiate components of SI & CI engines Level: Analyze (4)
			CO4	The students will be able to understand the functioning together of mechanical and electronic systems Level: Understand (2)
			CO5	Differentiate various subsystems of two, three & four wheeler vehicles Level: Analyze (4)
38	7	Automated Manufacturing I	CO1	Student will understand working of NC and CNC machines, DNC system. Level: Understand (2)
			CO2	Able to identify various parts of CNC machine: Ball Screws, Servo Motors, Bearings, Encoders. Level: Understand (2)
			CO3	Understand construction & working of Automatic Tool changer & Pallet changer in CNC systems. Level: Understand (2)
			CO4	Ability to identify the type of CNC machine for the part given (cylindrical or prismatic), Write the part program using G-codes. Level: Understand (2)
			CO5	Students will be conversant with the Rapid Prototype techniques. Level: Understand (2)
39	7	Robotics and Machine Vision	CO1	Discuss about evolution and configuration of robot and concept of robotics.(level-5)
			CO2	Discuss and hands-on competence in applying the concepts in the design and development of robots. .(level-1,5)
			CO3	Demonstrate creativeness in designing and development of robotics technology. (level-4)
			CO4	Discuss about common sensor, their use, and vision system used in robotics.(level-5)
			CO5	Describe the use of Robot in various Applications .(Level-5)
40	7	Electronic Instrumentation and Automation	CO1	Analyze types of errors and apply statistical methods for error reduction in measurements. Analyze (Level 4)
			CO2	Understand and evaluate various types of recording systems and advanced instrument displays such as oscilloscopes and digital displays. Evaluate (Level 5)
			CO3	Demonstrate proficiency in voltage and current measurements using analog and digital instruments, and compare their functionalities. Apply (Level 3) and Analyze (Level 4)
			CO4	Perform frequency and power measurements using advanced techniques such as spectrum and modulation analyzers. Apply (Level 3)
			CO5	Understand advanced instrumentation systems, including telemetry, data acquisition, and programmable control systems. Understand (Level 2) and Apply (Level 3)
41	7	Non Conventional Energy Sources	CO1	Create awareness about depicting conventional energy sources and need for non-Conventional sources of energy technologies.(Level 5)
			CO2	Understand the working criteria of various direct energy conversion systems and study its applications.(level 1)
			CO3	Evaluate methods for generation of hydrogen power and production of hydrogen .(level 6)
			CO4	Understand the basis of energy from biomass.(level 1)
			CO5	Describe basic principles of wind energy conversion, tidal energy, and wave energy. (level 1)
42	7	Autotronics Lab	CO1	Identify the different parts of the automobile Level: Remember (1)
			CO2	Explain the working of various parts like engine, transmission, clutch, brakes Level: Understand (2)



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			CO3	Describe how the steering and the suspension systems operate Level: Understand (2)
			CO4	Understand the environmental implications of automobile emissions Level: Understand (2)
			CO5	Develop a strong base for understanding future developments in the automobile industry Level: Evaluate (5)
43	7	Robotics and Machine Vision Lab	CO1	Discuss about evolution and configuration of robot and concept of robotics.(level-5)
			CO2	Discuss and hands-on competence in applying the concepts in the design and development of robots. .(level-1,5)
			CO3	Demonstrate creativeness in designing and development of robotics technology. (level-4)
			CO4	Discuss about common sensor, their use, and vision system used in robotics.(level-5)
			CO5	Describe the use of Robot in various Applications .(Level-5)
44	7	Project (Phase D)	CO1	Technical Skills Development Students will apply programming languages (e.g., Java, Kotlin) and development frameworks (e.g., Android Studio) to build a functional mobile application. Level: 2
			CO2	Problem-Solving Abilities Students will analyze user requirements and identify challenges in task management. They will devise solutions to address usability issues and enhance user experience through features such as task categorization and prioritization. Level: 3
			CO3	Communication Skills Enhancement Students will evaluate user feedback obtained through surveys and usability testing. They will communicate their findings effectively through project reports and presentations, articulating improvements made based on user input. Level: 4
			CO4	Professional Development Students will create a professional portfolio showcasing their mobile application development skills. They will document the project's design process, coding practices, and testing methodologies to demonstrate their proficiency to potential employers. Level: 5
			CO5	Collaboration and Teamwork Students will apply effective collaboration and teamwork skills throughout the project lifecycle. They will assign roles and responsibilities, communicate project milestones, and resolve conflicts to ensure the timely delivery of the mobile application. Level: 2
45	7	Industrial Training	CO1	Technical Skill Development Participants will apply programming languages (e.g., Java, Python) and development frameworks (e.g., Spring Boot, Django) to create functional software applications. Level: 3
			CO2	Problem-Solving Abilities Participants will analyze complex software problems and debug code effectively using problem-solving techniques such as root cause analysis and systematic debugging strategies. Level: 4
			CO3	Communication and Documentation Participants will evaluate their ability to communicate technical concepts clearly through written documentation, such as technical specifications, user manuals, and project reports, ensuring effective knowledge transfer and collaboration. Level: 5
			CO4	Project Management Skills Participants will create project plans, including task scheduling, resource allocation, and risk management strategies, demonstrating their ability to manage software development projects effectively. Level: 6



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			CO5	Collaboration and Teamwork Participants will apply effective teamwork and collaboration skills while working on group projects or collaborating with colleagues, fostering a positive team environment and achieving project goals collectively. Level: 2
46	8	Automated Manufacturing –II	CO1	Define the basic elements of automation, advance automation function, and levels of automation. (Level-1)
			CO2	Classify NC/CNC systems and part programming. (Level-2)
			CO3	Describe the concept of Group Technology and part classification and coding. (Level-2)
			CO4	Recognize Flexible Manufacturing Systems and its elements. (Level-2)
			CO5	understand computer aided production management, describe the role and function of various department and importance of computer integrated manufacturing. (Level-2)
47	8	Production and Product Management	CO1	Describe the functions of production management and costing and cost analysis. (Level 1,2,4)
			CO2	Describe the Analyze the different methods of sales forecasting. (Level 2,5)
			CO3	Describe and Analyze the methods of Production Planning and Control and also distinguish the material handling methods. (Level 3,4)
			CO4	Describe and Analyze the process of store keeping and inventory control. (Level 2)
			CO5	Describe and Analyze the methods of quality control. (Level 6)
48	8	Industrial Automation	CO1	Understand the fundamentals of Process Control and Control System Evaluation Level: Understand (2)
			CO2	Describe Data Acquisition Systems (DAS) and their components Level: Understand (2)
			CO3	Explain Controller Principles and Modes Level: Analyze (4)
			CO4	Discuss Analog Controllers and Programmable Logic Controllers (PLC) Level: Evaluate (5)
			CO5	Understand Distributed Control Systems (DCS) Level: Understand (2)
49	8	Flexible Manufacturing System (Lab)	CO1	Demonstrate knowledge of interfacing and automation techniques. Level: Understand (2)
			CO2	Explain the concepts of automation combined with advanced manufacturing. Level: Understand (2)
			CO3	Analyze sequence planning, process planning, and shop floor layout generation. Level: Analyze (4)
			CO4	Evaluate offline/online sequence execution techniques. Level: Evaluate (5)
			CO5	Apply data acquisition and process techniques effectively. Level: Apply (3)
50	8	Mechatronics Systems Design (Lab)	CO1	Demonstrate understanding of mechanical linear translation systems. Level: Understand (2)
			CO2	Explain the function and application of special purpose actuators in pneumatics. Level: Understand (2)
			CO3	Analyze various types of sensors and their application areas. Level: Analyze (4)
			CO4	Evaluate the construction and usage of various types of conveyors in automation. Level: Evaluate (5)
			CO5	Design and simulate palletizing systems in conveyor systems for high-speed production. Level: Create (6)



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51	8	Project (Phase-II)	CO1	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (level 3, 5)
			CO3	function in a team and adapt as per requirement to achieve desired goal with ethical practices (level 4, 6)
			CO4	Apply principles to solve problems and interpret the result. (level 3, 5,)
			CO5	Relate the impact of engineering solutions in society and classify modern tools .(level 2,3)



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Department of Mechanical Engineering			
S.N	Se m	Course Name	Course Outcome
1	3	Mathematics-III	CO 1 Define Fourier series including half range series, Analyze Harmonic analysis and variety of its applications. (level 1,4)
			CO 2 Describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to Illustrate ordinary differential equations. (level 1,2)
			CO 3 Formulate and Solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. (level 5)
			CO 4 Solve difficult problems using theorems of complex analysis and Apply Residue theorem to evaluate real integrals. (level 3,6)
			CO 5 Define Z-transform, Inverse Z-transform and solve by Convolution theorem, Partial fraction, Residue method Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations. (level 1, 3,)
2	3	Mechanical Measurement and Metrology	CO 1 Describe the functional elements of measurement system and its performance characteristics. (Level 1,2,4)
			CO 2 Describe & Distinguish measurement of pressure, strain and temperature. (Level 2,5)
			CO 3 Analyze the type of fluid flow interpretits nature .Describe the data acquisition system. (Level 3,4)
			CO 4 Describe linear and angular measurement devices, measurement of geometrical forms, optical projectors, tool maker microscope and autocollimators. (Level 2)
			CO 5 Distinguish And Describe the interferometers ,comparators , screw threads and gear measurement. (Level 6)
3	3	Engineering Mechanics	CO 1 Apply basic concepts and laws of mechanics to determine resultant and analyze the systems of forces. (Level 3, 4)
			CO 2 Analyze static system by applying law of friction/ principle of virtual work. (Level 4,3)



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			CO 3	Determine the centroid, second moment of area and product of inertia of simple and composite plane figures and centre of gravity and mass moment of inertia of simple and composite bodies. (Level 4)
			CO 4	Analyze problem related to kinematics of a particle and rigid bodies. (Level 4)
			CO 5	Analyze problem related to kinetics of rigid bodies. (Level 4)
4	3	Engineering Thermodynamics	CO 1	Apply basic concepts and first laws of thermodynamics to analyze thermodynamics system. (Level 3,4)
			CO 2	Apply the concepts of second law of thermodynamics and entropy to analyze thermodynamics system. (Level 3,4)
			CO 3	Apply the concepts of exergy to solve related problems. (Level 3)
			CO 4	Explain the equations of state and thermodynamic properties of real gases and calculate properties of mixture of ideal non- reactive gases. (Level 1,4)
			CO 5	Analyze processes involving pure substances.
5	3	Material Science	CO 1	Explain crystal structure and Imperfection in crystal structure. (Level 2)
			CO 2	Define basic mechanical properties of materials & explain the theories of deformation. (Level 1,2)
			CO 3	Explain solidification phenomenon of pure metal, alloys and interpret phase diagrams. (Level 2)
			CO 4	Explain how microstructure and mechanical properties of carbon and alloy steels are controlled by various heat treatment/surface treatment processes. (Level 2)
			CO 5	Compare characteristics of various ferrous, nonferrous and composite materials. (Level 2)
6	3	Computer Aided Machine Drawing Lab	CO 1	Demonstrate and understanding of Indian standards on drawing practices, conventional symbol of surface roughness, lay of machining, welded joints and standard components. (Level 2,3)
			CO 2	Demonstrate an understanding of Limit, Fits, Tolerances and representation of dimensional and geometrical tolerance in mechanical engineering drawing. (Level 2,3)
			CO 3	Convert pictorial view of machine components into orthographic views and orthographic sectional view with sectioning conventions (Level 3)
			CO 4	Draw assembled orthographic views of screwed fasteners and riveted joints. (Level 6)



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			CO 5	Draw assembly drawing from disassembled views of important mechanical engineering assembly e.g. cotter joint, pin joint, bearing, coupling, pulley and valves. (Level 6)
7	3	Mechanical Measurement and Metrology Lab	CO 1	Identify different mechanical measurement and metrological instruments. (Level 1)
			CO 2	Describe the working of different mechanical measurement and metrological instruments. (Level 2)
			CO 3	Conduct experiments, observe, interpret data and report results of pressure, displacement, temperature, flow rate, angle, torque and strain measurement instruments. (Level 3)
			CO 4	Conduct experiments, observe, interpret data and report results of heights, lengths, diameter, various angles, accuracies in electrical and optical comparator, surface flatness and contour etc using various types of metrological instruments. (Level 3)
			CO 5	Calibrate vernier calipers, micrometer, height gauge, depth micrometer using slip gauge. (Level 3)
8	3	Engineering Thermodynamics Lab	CO 1	Demonstrate an ability to explain basic knowledge of laws of thermodynamics and its verification through experimentation . (Level 3, 5)
			CO 2	Describe construction and working of various types of boilers, boiler mountings, accessories, performance parameters and draught. (Level 2,6)
			CO 3	Describe various types of steam engine, steam turbines. (Level 2)
			CO 4	Describe surface and jet condenser. (Level 2)
			CO 5	Describe reciprocating air compressor. (Level 2)
9	3	Software lab	CO 1	Demonstrate various concepts of surface/solid modeling and sheet metal design. (Level 3)
			CO 2	Demonstrate an understanding of different features used in surface/solid modeling and sheet metal in engineering practice. (Level 3,2)
			CO 3	Design a part or assembly of parts using Computer-Aided Design software. (Level 6)
			CO 4	Apply top-down design principles to model a design. (Level 3)
			CO 5	Make appropriate selection of CAD functionality to use as tools in the design process and communicate effectively the geometry and intent of design features (Level 6, 3)
10	4		CO 1	Analyze and evaluate gas power cycles. (Level 4)



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		Applied Thermodynamics	CO 2	Analyze reciprocating air compressors.(Level 4)
		Applied Thermodynamics	CO 3	Analyze vapour power cycle.(Level 4)
		Applied Thermodynamics	CO 4	Analyze steam condenser and discuss working principle of cooling pond and cooling towers.(Level 4,1)
		Applied Thermodynamics	CO 5	Analyze thermodynamic system with compressible fluid.(Level 4)
11	4	Fluid Mechanics	CO 1	Explain fluid properties and basic principles of fluid statics and analyze the problem related to manometry, forces on submerge plane, buoyancy and flotation. (Level 1,3,)
		Fluid Mechanics	CO 2	Explain basic principles of fluid kinematics and analyze related practical problem. (Level 1,3,)
		Fluid Mechanics	CO 3	Explain basic principles of fluid dynamics and analyze related practical problem. (Level 1,3,)
		Fluid Mechanics	CO 4	Derive relationships for various flow characteristics of laminar flow, turbulent flow and energy losses in pipe flow and apply to analyze related practical problems. (Level 3)
		Fluid Mechanics	CO 5	Apply dimensional analysis to derive a relationship among connected variables and apply model laws to predict the behavior of the prototype in given circumstances. (Level 3)
12	4	Strength of Materials	CO 1	Apply the concept of stress and strain to analyze various types of structures. (Level 1,3,)
		Strength of Materials	CO 2	Determine the distribution of shear force, bending moment and transverse shear stress along the loaded beam. (Level 4,)
		Strength of Materials	CO 3	Determine the deflections and slope of loaded flexural members. . (Level 4,)
		Strength of Materials	CO 4	Analyze shaft and springs under torsional load. (Level 3)
		Strength of Materials	CO 5	Analyze various structural elements subjected to combined stresses/combined loads. (Level 3)
13	4	Manufacturing Process	CO 1	Describe various metal casting and allied processes.(Level 2)
		Manufacturing Process	CO 2	Describe various arc and gas welding processes. (Level 2)
		Manufacturing Process	CO 3	Describe resistance welding, other special type of welding , soldering, brazing and braze welding(Level 2)
		Manufacturing Process	CO 4	Describe construction, working and various machining operations of lathe, shaper and planer(Level 2)
		Manufacturing Process	CO 5	Describe construction, working and various machining operations of milling, broaching, drilling rimming and boring machine(Level 2)
14	4	Kinematic of Machine	CO 1	Describe the concepts of machines, mechanisms and related terminologies and analyze planar mechanism for displacement and velocity. (Level 2,3)



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			CO 2	Analyze planar mechanism for acceleration. (Level 3)
			CO 3	Analyze cam-follower mechanism. (Level 3)
			CO 4	Analyze gears and gear train. (Level 3)
			CO 5	Analyze bearings, belt-drive, brakes and dynamometer. (Level 3)
15	4	Fluid Mechanics Lab	CO 1	Demonstrate practical understanding of principles of buoyancy and flotation and determine meta-centric height. (Level 3,5)
			CO 2	Verify impulse momentum principle (Level 5)
			CO 3	Demonstrate practical understanding of the various terms in Bernoulli's equation and verify Bernoulli's theorem. (Level 3,5)
			CO 4	Calibrate flow measurement devices (Level 3)
			CO 5	Demonstrate practical understanding of Major and Minor Losses in pipe flow. (Level 3)
16	4	Material Testing Lab	CO 1	Analyze mechanical properties of various engineering materials under specific types of load in universal testing machine. (Level 3)
			CO 2	Analyze mechanical properties of engineering materials under impact loading. (Level 3)
			CO 3	Analyze mechanical properties of specimen under torsion (Torsion Testing Machine, Spring Testing Machine) (Level 3)
			CO 4	Determine hardness of given material. (Level 3)
			CO 5	Analyze mechanical properties of specimen under fatigue, deep drawing and buckling load. (Level 3)
17	4	Manufacturing Process Lab	CO 1	Demonstrate the use of green sand molding process for casting. (Level 3)
			CO 2	Demonstrate the use of various machine tools for important machining operations. (Level 3)
			CO 3	Explain the tool geometry of single point cutting tool and twist drill. (Level 2)
			CO 4	Explain the practicability of various metal joining processes like arc welding, resistance welding, soldering and brazing. (Level 2)
			CO 5	Obtain practical skills in inspection and testing of casting and welding defects. (Level 3,4)
18	4	Virtual Lab	CO 1	Perform experiments of material testing laboratory through virtual simulator. (Level 3)
			CO 2	Analyze different type of mechanism through virtual simulator. (Level 3)



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			CO 3	Analyze various heat transfer parameter in virtual laboratory.(Level 3)
			CO 4	Describe EDM, Laser cutting, ECM after learning the process through micromachining laboratory. (Level 2)
			CO 5	Describe casting/ 3D scanning after learning the process through fabrication laboratory. (Level 2)
19	5	Internal Combustion Engine	CO 1	Describe the construction and working principle of various internal combustion engines. Explain the concepts of fuel air cycle and actual cycle and apply it to analyze related practical problems.(LEVEL 2,3)
			CO 2	Explain the theory of combustion of S.I. engine and C.I. engine, describe I.C.Engine fuels and solve problem related to flue gas analysis. (LEVEL 2,3)
			CO 3	Discuss properties of air-petrol mixtures and describe fuel supply system of S.I. and C.I. Engine. (LEVEL 4)
			CO 4	Describe ignition system, cooling system, lubrication system and Engine emissions and its control. (LEVEL 3)
			CO 5	Describe various performance parameter of I.C. Engine, its method of testing and analyze related practical problems. (LEVEL 3)
20	5	Solid Mechanics	CO 1	Analyze problems related to deformable body under load using energy methods. (LEVEL 3)
			CO 2	Analyze fixed beams and continuous beams under load. (LEVEL 3)
			CO 3	Analyze thin and thick pressure vessels. (LEVEL 3)
			CO 4	Analyze column and find shear center. (LEVEL 3)
			CO 5	Solve plane stress and plain strain problems. (LEVEL 3,4)
21	5	Fluid Machines	CO 1	Explain the concepts of 'boundary layer theory' and ' lift and drag theory' and apply to solve related practical problems(LEVEL 2,3)
			CO 2	Explain the principle of impulse-momentum and impulse turbines and apply it to analyze related problems. (LEVEL 2,3)
			CO 3	Explain the construction and principle of operation of reaction turbine and apply it to analyze related problems. (LEVEL 2,3)
			CO 4	Explain the construction and principle of operation of centrifugal pump and apply it to analyze related problems. (LEVEL 2,3)
			CO 5	Explain the construction and principles of operation of reciprocating pump and apply it to analyze related problems. (LEVEL 2,3)
22	5	Dynamics of Machine	CO 1	Explain principles of operation of mechanical governors and analyze its performance parameters. (LEVEL 2,3)



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			CO 2	Apply the theory of balancing to rotating and reciprocating masses. (LEVEL 3)
			CO 3	Analyze gyro-effect on moving bodies. (LEVEL 4)
			CO 4	Explain principles of vibrations of different systems and analyze related practical problems. (LEVEL 2,3)
			CO 5	Perform inertia force analysis of machine elements. Draw turning moment diagram of reciprocating engine and analyze performance parameter of flywheel. (LEVEL 3)
23	5	Operation Research	CO 1	Formulate and solve real-world problems as linear programs for better decision-making. (LEVEL 3,4)
			CO 2	Solve specialized linear programming models like the transportation and assignment Models. (LEVEL 3,4)
			CO 3	Model a dynamic system as a queuing model and compute important performance measures. (LEVEL 3)
			CO 4	Use CPM and PERT techniques, to plan, schedule and control project activities. (LEVEL 3)
			CO 5	Propose the best strategy using decision making methods under game theory & apply concepts of Simulation to optimize practical problems. (LEVEL 6,3)
24	5	Internal Combustion Engine Lab	CO 1	Describe the basic engine nomenclature and working principle of four stroke and two stroke Petrol and Diesel engine. (LEVEL 2,3)
			CO 2	Describe the fuel supply system of a Petrol and Diesel engine. (LEVEL 2,3)
			CO 3	Describe Ignition, Lubrication and cooling system of an internal combustion engine. (LEVEL 3)
			CO 4	Analyze the performance parameters of diesel engine. (LEVEL 3)
			CO 5	Analyze the performance parameters of petrol engine. (LEVEL 3)
25	5	Dynamics of Machine Lab	CO 1	Analyze the vibration parameters of various systems. (LEVEL 3)
			CO 2	Analyze gyroscopic parameters. (LEVEL 3)
			CO 3	Analyze various types of governors. (LEVEL 3)
			CO 4	Find the critical speed of different diameters of shafts. (LEVEL 1,2)
			CO 5	Analyze the effects of unbalance in machine and methods to reduce/eliminate these effects. (LEVEL 3)
26	5	Fluid Machines Lab	CO 1	Analyze the performance parameters of Pelton Turbine. (LEVEL 3)
			CO 2	Analyze the performance parameters of Francis and Kaplan Turbine. (LEVEL 3)



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			CO 3	Analyze the performance parameters of Centrifugal Pump and Reciprocating Pump. .(LEVEL 3)
			CO 4	Determine Lift and drag force over an air foil. .(LEVEL 4)
			CO 5	Explain the construction and working of various fluidic devices. .(LEVEL 2)
27	5	Project-I based on Summer Internship/ Industrial Training	CO 1	Technical Skills Development Students will be tasked with applying the technical skills they've acquired during their internship or training to solve real-world problems. This could involve implementing software solutions, conducting experiments, or troubleshooting technical issues encountered in the industry. (Level: 3)
			CO 2	Problem-Solving Abilities Students will analyze complex problems relevant to their field of study or industry. They will identify key issues, examine different approaches to problem-solving, and propose innovative solutions. This could involve case studies, simulations, or research-based projects. (Level: 4)
			CO 3	Communication Skills Enhancement Students will evaluate and improve their communication skills through project presentations, reports, or documentation. They will articulate their ideas, present findings, and defend their solutions effectively. Peer reviews and feedback sessions can be incorporated to enhance communication abilities. (Level: 5)
			CO 4	Professional Development Students will create a professional portfolio showcasing their achievements, experiences, and skills gained during the internship or training. They will reflect on their learning journey, set career goals, and develop a plan for continuous professional development. This could involve creating resumes, LinkedIn profiles, or personal branding materials. (Level: 6)
			CO 5	Teamwork and Collaboration Students will apply their teamwork and collaboration skills by working on group projects or collaborative assignments. They will demonstrate effective teamwork, leadership, and interpersonal skills while completing tasks and achieving project objectives. Group presentations or joint reports can be used to assess teamwork outcomes. (Level: 3)
28	6	Design of Machine Elements	CO 1	Select proper material for specific application with proper assumptions with respect to design stress, factor of Safety, stress concentration factor and theory of failure. (Level 5)
			CO 2	Design and analyze Mechanical Joints, keys and couplings. (Level 6,3)
			CO 3	Design and analyze shafts, axle and clutches. (Level 6,3)
			CO 4	Design and analyze threaded fastener and power screws. (Level 6,3)



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			CO 5	Design and analyze riveted and welded joint. (Level 6,3)
29	6	Manufacturing Technology	CO 1	Explain the principles and techniques of grinding and other surface finishing operations. (Level 2)
			CO 2	Explain the principles and appropriateness of unconventional machining processes and analyze related Process parameters. (Level 2)
			CO 3	Describe the principles and techniques of forging and extrusion operations; determine their suitability and Analyze related process parameters (Level 2,4)
			CO 4	Describe the principles and techniques of rolling and drawing operations and be able to analyze related Process parameters. (Level 2,4)
			CO 5	Describe the principles and techniques of sheet metal forming operation and be able to analyze related Process parameters. (Level 2,4)
30	6	Heat & Mass Transfer	CO 1	Explain the principles of heat transfer due to conduction, convection and radiation and analyze problems Related to conduction. (Level 2,4)
			CO 2	Analyze problems related to heat transfer from extended surfaces and unsteady state heat conduction. (Level 4)
			CO 3	Analyze problems related to forced convection and natural convection. (Level 4)
			CO 4	Apply basic concepts of phase change processes and principles of mass transfer to solve related practical problems. (Level 3)
			CO 5	Analyze heat exchangers and problems related to radiation. (Level 4)
31	6	Power Plant Engineering	CO 1	Describe the elements of power plant. (Level 2)
			CO 2	Describe the working principle and basic components of steam power plants and analyze and it's working. (Level 2,4)
			CO 3	Describe the working principle and basic components of hydro electric and diesel power station and analyze its working. (Level 2)
			CO 4	Describe the working principle and basic components of nuclear power station and analyze and it's working. (Level 2,4)
			CO 5	Discuss variable load problems and power station economic. (Level 4,5)
32	6	Principles of Management	CO 1	Describe the primary functions of management and the roles of managers and apply the concepts of PPC. (Level 2)
			CO 2	Apply concepts of marketing management and financial management Inventory control. (Level 3)
			CO 3	Apply the concept of work study and method study (Level 3)
			CO 4	Describe job evaluation and Wages and incentive plans. (Level 2)



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			CO 5	Describe Human resource management and apply statistical tool in quality control. (Level 2)
33	6	Design of Machine Elements Lab	CO 1	Design a daily use product by applying the conceptual design process and able to suggest some alternative material for it. (Level 6)
			CO 2	Design Flange coupling/ shaft/ single plate clutch/screw jack used in practical application and justify its design (Level 6,5)
			CO 3	Design welded joint/riveted joint/ bolted joint used in real life and justify its design. (Level 6,5)
			CO 4	Design machine element using software. (Level 6)
			CO 5	Design complete system/subsystem using design hand book and/or design software. (Level 6)
34	6	Computer Aided Modeling & Analysis Lab	CO 1	Demonstrate working knowledge in Computer Aided Design methods and procedures. (Level 3)
			CO 2	Construct solid modeling using 3D modeling standard software. (Level 6)
			CO 3	Describe boundary conditions for structural, heat and fluid flow problems. (Level 2)
			CO 4	Solve simple structural and heat problems using standard FEA software. (Level 3,4)
			CO 5	Solve fluid flow problems using standard FEA software. (Level 3,4)
35	6	Heat & Mass Transfer Lab	CO 1	Demonstrate conduction, convection and radiation heat transfer through experiments. (Level 3)
			CO 2	Determine thermal conductivity and temperature distribution in different system. (Level 4)
			CO 3	Determine heat transfer coefficient of different system. (Level 4)
			CO 4	Determine emissivity and Stefan-Boltzman constant of radiation. (Level 4)
			CO 5	Analyze the performance characteristics of heat transfer equipments. (Level 4)
36	6	Virtual Lab-2	CO 1	Analyze auto motive systems. (Level 4)
			CO 2	Analyze vibration through virtual simulator. (Level 4)
			CO 3	Analyze rotating machinery fault (Level 4)
			CO 4	Describe digital fabrication after learning the process through fabrication laboratory. (Level 2)
			CO 5	Describe metal forming processes, equipments and applications. (Level 2)
37	7		CO 1	Model, analyze and design spur gears. (Level 4)



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		Design of Transmission System	CO 2	Model, analyze and design helical and bevel gears. (Level 4)
			CO 3	Model, analyze and design springs and brakes. (Level 4)
			CO 4	Model, analyze and design bearings. (Level 4)
			CO 5	Model, analyze and design chain and belt drives. (Level 4)
38	7	Refrigeration & Air-Conditioning	CO 1	Analyze vapour compression refrigeration system. (Level 4)
			CO 2	Analyze gas and air cycle refrigeration system. (Level 4)
			CO 3	Analyze vapour absorption system, describe refrigerant and refrigeration equipment. (Level 4)
			CO 4	Explain terminologies of psychrometry and human comfort and apply to analyze related problems. (Level 3,4)
			CO 5	Carry out cooling load calculations and describe air-conditioning systems. (Level 2)
39	7	Automation in Manufacturing	CO 1	Illustrate the basic concepts of automation in machine. (Level 3)
			CO 2	Explain the fundamentals of CAD.. (Level 2)
			CO 3	Explain the basics of computer aided manufacturing.. (Level 2)
			CO 4	Discuss the low cost automation systems. (Level 4)
			CO 5	Explain the basic concepts of modeling and simulation. (Level 2)
40	7	Machine Tool Technology	CO 1	Demonstrate an understanding of cutting tool materials and tool geometries and apply mechanics of metal cutting for analysis of related problems. (Level 3)
			CO 2	Demonstrate an understanding of concepts of machinability, mechanism of tool failure, thermal aspects in machining and cutting fluid. (Level 3)
			CO 3	Describe the construction features of machine tool elements and analyze the forces and torque acting on it. (Level 2)
			CO 4	Design speed gear box. (Level 6)
			CO 5	Design feed gear box and describe acceptance tests of machine tools. (Level 6)
41	7	Non Conventional Energy Sources	CO 1	Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells. (Level 3)
			CO 2	Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation. (Level 3,2,4)



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			CO 3	Explore the concepts involved in wind energy conversion system by studying its components, types and performance. (Level 3)
			CO 4	Illustrate ocean energy and explain the operational methods of their utilization. (Level 3)
			CO 5	Acquire the knowledge on geothermal energy. (Level 1)
42	7	Refrigeration & Air-Conditioning Lab	CO 1	Describe the construction and working of different refrigeration and air conditioning equipments. (Level 2)
			CO 2	Analyze performance parameters of refrigeration system. (Level 4)
			CO 3	Analyze performance parameters of mechanical heat pump. (Level 4)
			CO 4	Analyze performance parameters of air conditioning system. (Level 4)
			CO 5	Simulate and analyze various air conditioning processes. (Level 3,6,4)
43	7	CIM & Automation Lab	CO 1	Demonstrate an understanding of concepts discussed in Computer Integrated Manufacturing course and its implementation in manufacturing (Level 3)
			CO 2	Write CNC part programs using CADEM simulation package for simulation of machining operations such as Turning, Drilling & Milling. (Level 6)
			CO 3	Write programs for Flexible Manufacturing Systems. (Level 6)
			CO 4	Write programs for Robotics. (Level 6)
			CO 5	Demonstrate an understanding of the operating principles of hydraulics, pneumatics and electro-pneumatic systems. (Level 3,2)
44	7	Project (Phase I)	CO 1	Technical Skills Development Students will apply programming languages (e.g., Java, Kotlin) and development frameworks (e.g., Android Studio) to build a functional mobile application. Level: 2
			CO 2	Problem-Solving Abilities Students will analyze user requirements and identify challenges in task management. They will devise solutions to address usability issues and enhance user experience through features such as task categorization and prioritization. Level: 3
			CO 3	Communication Skills Enhancement Students will evaluate user feedback obtained through surveys and usability testing. They will communicate their findings effectively through project reports and presentations, articulating improvements made based on user input. Level: 4



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			CO 4	Professional Development Students will create a professional portfolio showcasing their mobile application development skills. They will document the project's design process, coding practices, and testing methodologies to demonstrate their proficiency to potential employers. Level: 5
			CO 5	Collaboration and Teamwork Students will apply effective collaboration and teamwork skills throughout the project lifecycle. They will assign roles and responsibilities, communicate project milestones, and resolve conflicts to ensure the timely delivery of the mobile application. Level: 2
45	7	Industrial Training	CO 1	Technical Skill Development Participants will apply programming languages (e.g., Java, Python) and development frameworks (e.g., Spring Boot, Django) to create functional software applications. Level: 3
			CO 2	Problem-Solving Abilities Participants will analyze complex software problems and debug code effectively using problem-solving techniques such as root cause analysis and systematic debugging strategies. Level: 4
			CO 3	Communication and Documentation Participants will evaluate their ability to communicate technical concepts clearly through written documentation, such as technical specifications, user manuals, and project reports, ensuring effective knowledge transfer and collaboration. Level: 5
			CO 4	Project Management Skills Participants will create project plans, including task scheduling, resource allocation, and risk management strategies, demonstrating their ability to manage software development projects effectively. Level: 6
			CO 5	Collaboration and Teamwork Participants will apply effective teamwork and collaboration skills while working on group projects or collaborating with colleagues, fostering a positive team environment and achieving project goals collectively. Level: 2
46	8	Robotics	CO 1	Demonstrate the basic knowledge of terminologies, characteristics, components and applications of robotics systems. (Level 3)
			CO 2	Apply spatial transformation to obtain forward kinematics equation of robot manipulators. (Level 3)
			CO 3	Perform position analysis and velocity analysis of direct and inverse kinematic models of robots. (Level 3)
			CO 4	Describe sensing technologies and robotics vision system and choose the appropriate for a given application. (Level 2)
			CO 5	Develop and analyze the mathematical model for motion planning and control of robot manipulators and describe robotics applications. (Level 6)
47	8	Automobile Engineering	CO 1	Describe the basic structure of an automobile with applied engineering principle in its design. (Level 2)
			CO 2	Describe clutches and fluid flywheel and solve related problems. (Level 2)



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			CO 3	Describe construction and working principle of gear box and torque converter and analyze problem related automobile performance. (Level 2)
			CO 4	Describe construction and working of propeller shaft, differential, axle assembly, tyres and braking system of an automobile (Level 2)
			CO 5	Describe construction and working of steering and electrical systems with applied engineering principle in its design. (Level 2)
48	8	Production & Product Management	CO 1	Explain the product development process of a new product. (Level 2)
			CO 2	Explain product design methods. (Level 2)
			CO 3	Explain the concepts of design for manufacture. (Level 2)
			CO 4	Explain the concepts of Industrial design. (Level 2)
			CO 5	Discuss legal issue pertaining to product design and management of product development projects. (Level 5)
49	8	Robotics Lab	CO 1	Demonstrate the working of different types of robot (Level 3)
			CO 2	Demonstrate the knowledge of the robotic system design, sensors, actuators, vision systems and robotic application. (Level 3)
			CO 3	Design , model and analyze gripper (Level 6)
			CO 4	Write the program for linear and nonlinear trajectories and forward kinematic problems by using software. (Level 5,6)
			CO 5	Develop virtual model for kinematic and dynamic verification of robotics structure using software (Level 6)
50	8	Computer Aided Simulation & Analysis Lab	CO 1	Model and analyze structural problem using commercial simulation and analysis software. (Level 4)
			CO 2	Model and analyze Thermal problem using commercial simulation and analysis software. (Level 4)
			CO 3	Model and analyze Fluid Flow problem using commercial simulation and analysis software. (Level 4)
			CO 4	Analyze Coupled field problems using commercial simulation and analysis software. (Level 4)
			CO 5	Determine the natural frequency of an object using commercial simulation and analysis software. (Level 5)
51	8	Project (Phase-II)	CO 1	Demonstrate proficiency in using relevant software tools for data analysis. Level: 3
			CO 2	Analyze and interpret experimental results to draw meaningful conclusions. Level: 4
			CO 3	Critically evaluate existing research literature related to the project topic. Level: 5



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			CO 4	Design and implement a solution to address a specific problem identified in the project. Level: 6
			CO 5	Communicate project findings effectively through written reports and oral presentations. Level: 5



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Department of Civil Engineering			
S.N.	Sem	Course Name	Course Outcome
1	3	Mathematics-III	CO1 Define Fourier series including half range series; analyze Harmonic analysis and variety of its applications. (level 1,4)
			CO2 Describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to illustrate ordinary differential equations. (level 1,2)
			CO3 Formulate and solve by direct integration method Linear equation of first order including Homogeneous and Non-Homogeneous Linear equations and also method of separation of variables. (level 5)
			CO4 Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. (level 3,6)
			CO5 Define Z-transform, Inverse Z-transform and solve by Convolution theorem, Partial fraction, Residue method Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations. (level 1, 3)
2	3	Introduction To Fluid Mechanics	CO1 Apply the concept of fluid statics in different engineering problems. (level 3)
			CO2 Apply the principle of fluid kinematics. (level 3)
			CO3 Apply the energy and momentum principle. (Level 3)
			CO4 Analyze the pipe flow and open channel flow. Level 4)
			CO5 Analyze the flow through the mouthpiece, orifice, notch and weir. (Level 4)
3	3	Introduction to Solid Mechanics	CO1 Apply the concept of stress and strain to analyze various types of structures. (Level 1, 3)
			CO2 Determine the deflections and slope of loaded flexural members. (Level 4)
			CO3 Determine the distribution of shear force, bending moment and transverse shear stress along the loaded beam. (Level 4)
			CO4 Analyze shaft and springs under torsional load. (Level 3)
			CO5 Analyze various structural elements subjected to combined stresses/combined loads. (Level 3)
4	3	Plan Surveying	CO1 Describe and apply elevations by applying different techniques. (Level 1, 3)
			CO2 Illustrate the minor instruments and will be familiar with their functioning. (Level 2)
			CO3 Analyze traverse survey, detect and rectify errors. (Level 4)



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			CO4	Classify and apply the various methods of traversing with Plane table. (Level 2, 3)
			CO5	Explain and apply the various curves with the field problems. (Level 2, 3)
5	3	Building Materials	CO1	Identify properties of construction material. (Level 1,2)
			CO2	Apply fundamental knowledge of fresh and harden concrete. (Level 3)
			CO3	Describe characteristic of timber and use of eco - friendly material in construction. (Level 2)
			CO4	Extend the knowledge about characteristic of paint, varnishes etc. (Level 2)
			CO5	Extend the knowledge about steel, aluminium, glass etc. (Level 2)
6	3	Fluid Mechanics Lab	CO1	Determine the meta centre height of the ship model and verification of Bernoulli's equation. (Level 5, 3)
			CO2	Verification of momentum equation and study the variation of coefficient of discharge with Reynolds number. (Level 3, 1)
			CO3	Study of coefficient of discharge of orifice meter. (Level 1)
			CO4	Determination of critical velocity in pipe and head loss coefficient. (Level 5)
			CO5	Determination of head loss coefficient in pipe bends. (Level 2)
7	3	Surveying lab	CO1	Determine the elevation of a point relative to a reference elevation using Fly Levelling techniques, enhancing their skills in accurate height measurement. (level 5)
			CO2	Measure the sensitivity of the bubble tube in a dumpy level, improving their understanding and precision in using levelling instruments. (level 5, 2)
			CO3	Applying the methods in contouring and plotting, enabling them to create detailed and accurate topographic maps. (level 3)
			CO4	Identify horizontal angles using both repetition and reiteration methods, ensuring precise angular measurements in their surveying tasks. (level 3)
			CO5	Determining the position of points using Plane Table Radiation and Intersection methods. (level 5)
8	3	Building Material Lab	CO1	Evaluate different properties of cement through various tests. (Level 6)
			CO2	Evaluate different parameters of aggregates. (Level 6)
			CO3	Examine various test of mild steel under given loading. (Level 4)
			CO4	Examine the compressive strength of wood. (Level 4)
			CO5	Evaluate various conventional construction materials like tiles, etc. (Level 6)



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9	3	Software Laboratory	CO1	Define various types of stress and strain developed on determinate and indeterminate member. (Level 2)
			CO2	Draw shear force and bending moment diagram for various types of transverse loading and support. (Level 3)
			CO3	Understand the force system and draw free body diagram to analyze rigid body equilibrium. (Level 2, 3)
			CO4	Apply stress strain relations in conjunction with elasticity and material properties. (Level 3)
			CO5	Determine the mechanical stresses and structural deformations that arise within a body under applied loads. (Level 4)
10	4	Structural Analysis-I	CO1	Find out indeterminacies of structures and be capable of differentiating the structure. (level 2, 4)
			CO2	Find out and apply suitable method for analysis of structures to evaluate displacements. (level 3, 4, 6)
			CO3	Applying strain energy method to find displacements of determinate structures. (level 2, 3, 4)
			CO4	Draw Influence Line Diagram for functions such as reactions at the supports, bending moment and shear force at a section and capable of evaluating maximum values of these functions for various load positions. (level 4, 6)
			CO5	Analyze suspension bridges and arches. (level 4)
11	4	Hydraulics Engineering	CO1	Analyze turbulent flow in pipe and solve problems of pipe network. (level 4)
			CO2	Analyze boundary layer flow and calculate drag and lift (level 4)
			CO3	Analyze the flow in open channel (level 4)
			CO4	Apply the dimensional analysis for fluid flow problem. (level 3)
			CO5	Analyze the flow in turbines and pipes. (level 4)
12	4	Surveying & Geomatics	CO1	Discuss the various aspects of Trilateration and Triangulation and apply the concepts to determine triangulation stations. (level 2, 3)
			CO2	Analyze and evaluate the relevant computations, errors and observations. (level 4, 6)
			CO3	Classify and apply the knowledge of Tacheometry, various systems, instruments etc. (level 2, 3)
			CO4	Discuss and identify the concepts of Photographic and aerial surveying and GPS. (level 2,4)
			CO5	Recognize and explain the various equipment and methods used in hydrographic surveying. (level 1, 2)
13	4	Building Construction	CO1	Recognize various parts of sub-structure with their functions. (level 2)
			CO2	Describe Masonry, Doors, Windows and Lintels. (level 2)
			CO3	Identify the suitability of various types of floors. (Level 2,4)



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			CO4	Identify the factors to be considered in construction of building and develop the construction practice and techniques.(Level 4)
			CO5	Recognize construction procedure with safety procedure in various types of bonds.(Level 2)
14	4	Engineering Geology	CO1	Show the Knowledge about Basic Concept of Geology. (level 3)
			CO2	Show the knowledge of Mineralogy and Crystallography (level 3)
			CO3	Show the knowledge of the petrology. (level 3)
			CO4	Interpret the knowledge about Structural Geology.(level 3)
			CO5	Illustrate the knowledge about the Engineering geology Landslides & Land subsidence.(level 3)
15	4	Hydraulics lab	CO1	Differentiate the one flow to another, Compute the discharge. (level 4)
			CO2	Computation of coefficient of discharges & To explain hydraulic jump (level 3,2)
			CO3	Discuss the discharge through spillway. (level 2)
			CO4	Show & Illustrate the performances and Characteristics of Turbines & Pumps (level 3)
			CO5	Describe the variation of friction factors.(level 2)
16	4	Surveying and Geomatics Lab	CO1	Demonstrate the various practical aspects of Trilateration and Triangulation survey. (level 3)
			CO2	Compute the relevant adjustment, errors and observations(Level 3)
			CO3	Apply the knowledge of Tacheometry, various systems, instruments etc. (Level 3)
			CO4	Show the expression and perform by Tangential method. (Level 3)
			CO5	Illustrate the (Auto Level, Total station) instruments and familiar with their functioning. (Level 3)
17	4	Geology Lab	CO1	Show the Knowledge about Basic Concept of Geology. (level 3)
			CO2	Show the knowledge of Mineralogy and Crystallography (level 3)
			CO3	Show the knowledge of the petrology. (level 3)
			CO4	Interpret the knowledge about Structural Geology.(level 3)
			CO5	Illustrate the knowledge about the Engineering geology Landslides & Land subsidence.(level 3)
18	4	Virtual Lab	CO1	Understand the basic concept of hydraulic and fluid mechanics. (level 1)
			CO2	Understanding and learning opportunity of basic parts of the structure. (level 1)
			CO3	Draw maps on a suitable scale by using different surveying instrument. (level 2)



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			CO4	Knowledge of the strength of materials so that student can perform different test on different materials. (level 1)
			CO5	Discuss the Virtual lab provides remote experimentation which furnishes basic learning skill and built advanced concepts as well. (level 2)
19	5	Structural Engineering Design-I	CO1	Recall the importance of reinforced cement concrete. (Level 1)
			CO2	Demonstrate about the various design philosophies used in structural engineering design. (Level 2,6)
			CO3	Analyze and design singly and doubly reinforced sections using WSM. (Level 4,6)
			CO4	Analyze and design singly and doubly reinforced sections using LSM. (Level 4,6)
			CO5	Design elements such as slabs, columns, footing and staircases. (Level 6)
20	5	Hydrology & Water Resources Engineering	CO1	Explain the hydrologic cycle and water budget equation and Identify the different forms of precipitation and their characteristics in India (level 2, 1)
			CO2	Explain the evaporation process and its estimation methods and Analyzing the interpret hydrographs and separate base flow from runoff hydrographs (Level 2, 4)
			CO3	Determine the water requirements of different crops and Evaluate different irrigation methods and their suitability. (level 3, 5)
			CO4	Design canal systems including alignment and estimation of design discharge and Discuss causes, effects, and remedial measures for water logging. (level 6, 2)
			CO5	Compute reservoir capacity using mass curve and demand curve methods and Explain the flood routing using graphical and trial and error methods. (level 3,2)
21	5	Geotechnical Engineering	CO1	Define different properties of soil (level 1)
			CO2	Analyze permeability, compaction and effective stress (level 4)
			CO3	Analyze consolidation of soil and shear strength. (level 4)
			CO4	Evaluate the stability of slope of different types of soil (level 6)
			CO5	Discover soil in field. (level 3)
22	5	Transportation Engineering	CO1	Describe Various terminologies of highway engineering and design geometric elements of highways and expressways. (Level 1)
			CO2	Illustrate the traffic studies and the implement traffic regulation and control measures. (Level 4)
			CO3	Evaluate the highway construction material and design rigid and flexible pavements as per IRC. (Level 4, 6)



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			CO4	Conversant with various terminologies of railway Engineering. (Level 2)
			CO5	Will Design the turnouts in railway. (Level 4)
23	5	Structural Analysis-II	CO1	Differentiate and analyze the different kinds of structures- determinate and indeterminate. (Level-4)
			CO2	Apply suitable method for given structure - rigid jointed or pin-jointed plane frames. (Level-3)
			CO3	Analyze indeterminate beams and frame (sway and non-sway) using Moment distribution. (Level-4)
			CO4	Analyze indeterminate beams and frame (sway and non-sway) using slope deflection method. (Level-4)
			CO5	Draw influence line diagram for determinate and indeterminate beams using Muller Breslau. (Level-3)
24	5		Structural Analysis Lab	CO1
		CO2		Use SAP2000 software. (Level-3)
		CO3		Apply suitable method for analysis of structures to evaluate displacements (Level-3)
			CO4	Apply suitable method for analysis of structures to evaluate shear force and bending moment diagram. (Level-3,6)
			CO5	Find out and apply suitable method for analysis of structures in MS-excel. (Level-3)
25	5	Transportation Engineering Lab	CO1	Will determine the crushing strength value of aggregate. (Level-6)
			CO2	Study of abrasion value of aggregate. (Level-1)
			CO3	List the physical properties of bitumen for road construction. (Level-1)
			CO4	List index properties of aggregate. (Level-1)
			CO5	Determine flash and fire point of bitumen. (Level-2)
26	5	Geotechnical Engineering Lab	CO1	Examine field density of soil using different methods. (level 4)
			CO2	Evaluate the consistency limit of soil (level 6)
			CO3	Analyze consolidation of soil and shear strength. (level 4)
			CO4	Analyze permeability, compaction and effective stress (level 4)
			CO5	Estimate moisture content of field soil. (level 2)
27	6	Structure Engineering Design -II	CO1	Differentiate between plastic and elastic analysis. (Level-4)



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31	6	Construction Engineering & Management	CO1	Understand the fundamentals of construction, including project types, phases, and resource management. (level 2)
			CO2	Apply project planning techniques to develop construction schedules and plans. (Level 3)
			CO3	Analyze various construction methods and equipment for effective project execution. (level 4)
			CO4	Explain project monitoring and control methods to ensure project quality and safety. (level 5)
			CO5	Describe effective contract management strategies to handle construction project disputes and cost management. (level 1)
32	6	Structural Engg. Lab	CO1	Analyze and interpret results of design packages. (Level- 3,4)
			CO2	Design RCC Frames using design package. (Level-5)
			CO3	Design RCC Column and Isolated Footing using design package. (Level-5)
			CO4	Design RCC Multistoried structure subjected to various types and combinations of load using design package. (Level-5)
			CO5	Design Steel frames subjected to various types and combinations of load using design package. (Level-5)
33	6	Environmental Engg.	CO1	Determine the pH using pH meter, acidity and alkalinity in a water/ waste water sample. (Level-4)
			CO2	Find hardness And turbidity in water/waste water using turbidity meter. (Level -4)
			CO3	Determine the chloride content in various water/wastewater samples. (Level -4)
			CO4	Determine the D.O. content in any water/wastewater samples. (Level -4)
			CO5	Compare the BOD and COD values for a given sewage /industrial waste water sample in BOD incubator. (Level -2)
34	6	Computer Aided Civil Engg. Drawing lab	CO1	Use the AutoCAD Interface & Commands. (Level-3)
			CO2	Sketch Single Line Plan Of Various Structures. (Level- 3)
			CO3	Draw the Plan & Cross-Section Of Foundation. (Level- 3)



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			CO4	Draw Working Drawing of Residential Buildings. (Level- 3)
			CO5	Draw The Different Perceptive View In Software. (Level-3)
35	6	Concrete Technology Lab	CO1	Discuss the concrete making materials. (level 2)
			CO2	Distinguish admixtures and interpret the property of Fresh concrete (level 2,3)
			CO3	Analyze the hardened concrete and durability. (level 4)
			CO4	Develop concept of concrete mix design. (level 5)
			CO5	Show property & need of special concrete & concreting method. (level 3)
36	7	Structure Engineering Design- III	CO1	Analyze and design eccentric and moment connections in steel structures. (Level-4,6)
			CO2	Analyze and design Plate Girder. (Level-4,6)
			CO3	Analyze and design column bases and gantry girders. (Level-4,6)
			CO4	Analyze and design members subjected to combined forces (Level-4,6)
			CO5	Analyze and design roof trusses under different loads. (Level-4,6)
37	7	Design of Hydraulic Structures	CO1	Understand Types and Design of Gravity Dams(level 1, 6)
			CO2	Analyze and Design Spillways and Energy Dissipaters(Level 4, 6)
			CO3	Analyze the Types, Components, and Design of Diversion Headworks(level 4, 6)
			CO4	Evaluate the necessity, location, and Design of regulation works (level 5,6)
			CO5	Design different types of cross drainage works (level 6)
38	7	Foundation Engineering	CO1	Evaluate and design of shallow foundation. (level 6,5)
			CO2	Analyze settlement of foundation with field test. (level 4)
			CO3	Analyze consolidation of soil and shear strength. (level 4)
			CO4	Evaluate and design of pile foundation. (level 6,5)
			CO5	Distinguish the underground structure and tunnel. (level 4)
39	7	Construction equipment & techniques	CO1	Describe various construction equipments. (Level-2)
			CO2	Explain the equipment for production of concrete. (Level-2)
			CO3	Discuss various sub structure construction techniques. (Level-2)



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			CO4	Describe super structure construction techniques. (Level-2)
			CO5	Discuss Repair Construction. (Level-2)
40	7	Environmental Management & Legislation	CO1	Develop an understanding about various International and National Protocols. (Level-5)
			CO2	Apply the ISO procedures. (Level-3)
			CO3	Apply the knowledge gained for green procurement. (Level-3)
			CO4	Efficiently use the environmental management instruments. (Level-3)
			CO5	Apply concept of sustainable development for engineering design and decision-making. (Level-3)
41	7	Advance Geotechnical Engg.	CO1	Design of shallow foundation.(level 5)
			CO2	Analyze the soil under permeability test.(level 4)
			CO3	Analyze the soil using bearing ratio and penetration test. (level 4)
			CO4	Design and Drawing of pile foundation. (level 5)
			CO5	Design and Drawing of well foundation. (level 5)
42	7	Advance Environmental Engg. Lab	CO1	Determine the fluoride and nitrates content in sewage / industrial waste.(Level -5)
			CO2	Determination of phosphates in sewage/ industrial waste.(Level -5)
			CO3	Determine the iron content in various water/wastewater samples.(Level -5)
			CO4	Study & Determine the MPN value .(Level -1,5)
			CO5	Study of air quality and air quality samples.(Level -2)
43	7	Project Phase I	CO1	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level-1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (level-3, 5)
			CO3	function in a team and adapt as per requirement to achieve desired goal with ethical practices (level-4, 6)
			CO4	Apply principles to solve problems and interpret the result. (level-3, 5,)
			CO5	Relate the impact of engineering solutions in society and classify modern tools .(level-2,3)
			CO6	compile and describe their work through seminars and written methods using effective communication.(level-1,5)

44	8	Structure Engineering Design- IV	CO1	Analyze and design continuous beam, building frames, strap beam and raft footing. (Level-4,5)
			CO2	Analyze and design cantilever and counter fort retaining wall. (Level-4,5)
			CO3	Analyze and design water tank and its staging. (Level-4,5)
			CO4	Analyze and design bridges as per the BIS code of practice. (Level-4,5)
			CO5	Analyze pre stressed concretes beam for flexure and losses. (Level-4)
45	8	Construction Management	CO1	Identify owner's perspective/perspective of project participants towards construction projects. (Level-1)
			CO2	Identify the structure of project participant's organization and effect of project risks. (Level-1)
			CO3	Design methodology feasibility aspect and value engineering in design and construction. (Level-4)
			CO4	Discuss the importance of labour productivity, material and equipment utilization. (Level-2)
			CO5	Differentiate the approaches of cost estimation of construction project. (Level-4)
46	8	Air Pollution & Control Measure	CO1	Discuss about the basics of air pollution and meteorological parameter in atmospheric conditions. (Level-2)
			CO2	Discuss about the sources of air pollution their effects and control techniques. (Level-2)
			CO3	Describe Air pollution monitoring. (Level-2)
			CO4	Discuss mechanism of air pollution and its effects. (Level-2)
			CO5	Demonstrate the understanding of air quality criteria and emission standards, air pollution act and global effects of air pollution. (Level-3)
47	8	Structure Engineering Lab	CO1	Able to prepare BIM for various elements of steel structure. (Level-4)
			CO2	Able to prepare BIM for various joints used in steel structure. (Level-4)
			CO3	Able to prepare BIM for steel plate Girder (welded/Bolted). (Level-4)
			CO4	Able to prepare BIM for steel Industrial shed/Railway Bridge. (Level-4)
			CO5	Able to prepare BIM for Fabrication/Erection. (Level-4)
48	8	Computer Application in Civil Engineering Lab	CO1	Develop a C++ program for friction factor in pipe. (Level-5)
			CO2	Create a C++ program for Network analysis & Determine Critical path. (Level-5)
			CO3	Develop a C++ program for Design of simply supported beam (Level-5)
			CO4	Construct a C++ program for bearing capacity of soil. (Level-5)



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			CO5	Derive a C++ program for friction factor in pipe. (Level-5)
49	8	Project Phase II	CO1	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level-1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (level-3, 5)
			CO3	function in a team and adapt as per requirement to achieve desired goal with ethical practices (level-4, 6)
			CO4	Apply principles to solve problems and interpret the result. (level-3, 5)
			CO5	Relate the impact of engineering solutions in society and classify modern tools .(level-2,3)
			CO6	compile and describe their work through seminars and written methods using effective communication. (level-1,5)



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Department of Electrical and Electronics Engineering				
S.N.	Sem	Course Name	Course Outcome	
1	3	Mathematics-III	CO1	describe Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to illustrate ordinary differential equations.(level 1,2)
			CO2	formulate and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. (level 5)
			CO3	Analyse the of Discrete and continuous probability distributions and other related parameters.
			CO4	solve difficult problems of interpolation using different theorems of analysis an (level 3)
			CO5	define and solve Ordinary Differential Equations using different methods and compare the result. (level3, 4)
2	3	Electric circuit Analysis	CO1	Describe the different types of electrical sources and networks (level 1)
			CO2	confirm current through or voltage across any branch of a given Electrical network using theorems (level 2)
			CO3	Discover series and parallel resonance conditions in series and parallel circuits and its impact on network voltage and current magnitudes. (level 3)
			CO4	Illustrate balanced and unbalanced poly phase circuits. (level 2)
			CO5	Analyze the behaviour of non-sinusoidal waveforms
3	3	Electrical Machines-I	CO1	Survey, classify and differentiate the fundamental of machines and different working conditions of transformer.(Level 4)
			CO2	Interpret and analyse principles of auto transformer and single phase transformer.(Level 3,4)
			CO3	classify and differentiate the fundamental of machines and different working conditions of three phase transformer and its special connection.(Level 4)
			CO4	Identify and recognize the various types of d.c. machine operations like starting, speed control, tests etc.(Level 1)
			CO5	Recognize and apply the operating principle of DC machines for special purpose and applications.(Level 1,3)
4	3	Electronics Devices & circuits	CO1	Predict and design rectifier and filter as per circuit requirement.(Level 4)
			CO2	Design transistor biasing circuits .(Level 3,4)



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			CO3	Apply the concept of feedback in amplifier circuits. (Level 3)
			CO4	Analyse the performance of amplifier under different configurations (level 3)
			CO5	Design the amplifier and oscillator of different frequency. (Level 1)
5	3	Renewable & Environment Engineering	CO1	Describe the scenario of various sources of energy and define and calculate various factors related to electrical power generation. (Level 1)
			CO2	explain the working of solar energy sources and its applications along with future scopes. (Level 2)
			CO3	Analyze operating principles of green energy sources and their impact on society and evaluate various parameters. (Level 4, 5)
			CO4	Apply the understanding of pollution and waste disposal. (Level 3)
			CO5	Predict and analyse social and environmental issue. (Level 3)
6	3	Electrical Machines-I lab	CO1	Predict the performance of DC machines and Transformers using standard equivalent circuit models. (level 2)
			CO2	Choose the appropriate machines based on the application requirements. (level 3)
			CO3	Illustrate laboratory data and experimental results using professional quality graphical representations. (level 2)
			CO4	Work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (Level 4)
			CO5	Describe the behavior of transformer and DC machines. (Level 1)
7	3	Electronic Devices & circuit lab	CO1	Analyze and design various applications of diode and rectifier circuits. (level4)
			CO2	Classify in the specific electronic circuits and their performance. (level3)
			CO3	Illustrate laboratory data and experimental results and characteristics of transistors circuits. (level2)
			CO4	Work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level4)
			CO5	Perform different operations in typical electronic circuits like oscillators and investigate the outcomes. (level3)
8	3	Electric circuit lab	CO1	Analyze and design various applications of AC & DC circuits. (level4)
			CO2	Classify in the specific area of electric circuits and theorems. (level3)
			CO3	Illustrate laboratory data and experimental results of electric circuits. (level 2)



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			CO4	Work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level 4)
			CO5	Perform different operations in electric circuits and investigate the outcomes. (level 3)
9	3	Software lab	CO1	CREATE and DESIGN the program by using C basic rules for interchange the value of two variables (LEVEL 4)
			CO2	Evaluate and develop the program to learn about taking input through system. (LEVEL5)
			CO3	Analyse and organise the listing of textbox and queries of table. (level 3)
			CO4	Apply the nested switch statement for detecting even or odd. (level 3)
			CO5	Describe the logic of each a problem introduced. (level 1)
10	4	Electro Magnetic Field	CO1	Transform coordinate axes and describe electric field intensity for various charge distribution (level 1,2,3)
			CO2	Identify and evaluate Electric flux and potential for various charge distribution (level 1,2,3)
			CO3	Apply knowledge of boundary conditions for Electric and magnetic fields and properties of dielectric material (level 1, 2)
			CO4	Evaluate magnetic field intensity and magnetic flux density using Ampere's circuital Law and Stoke's theorem (level 1,2,3)
			CO5	Analyze Maxwell's equations for time varying fields and solve them for specific regular geometries. (level 1,2,3,4)
11	4	Electrical Machines-II	CO1	Differentiate the behavior and principle of electrical machines and behavior of synchronous machine. (level 4)
			CO2	Describe the construction, Armature winding, working principles of synchronous machines and andperformace in power system. (level 1)
			CO3	Analyse the characteristic of salient pole synchronous machine. And visulise the performance of synchronous machine. (level 5)
			CO4	Analyze the principle of operation of induction motor and voltage regulations, losses and efficiency. (level 4)
			CO5	Evaluate theperformance of three phase and single phase induction motor using different methods. (level 6)
12	4		CO1	Explain the application of Laplace transform in networks. (Level 1,3)



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		Network Analysis & synthesis	CO2	Write equations to solve any DC and AC circuits using Network Theorems and analyze the different types of network functions. (Level 1,4)
			CO3	Examine the performance of two port networks using network parameters and also derive interrelationship between various parameters. (Level 4)
			CO4	Identify and develop the impedance/admittance functions using various techniques of synthesis. (Level 1,5,4)
			CO5	Design design the low pass and high pass filter. (Level 4, 3)
13	4	Electrical Measurement & Instrumentation	CO1	Define low, medium & high Resistances using suitable bridges. [Level 1]
			CO2	Match the values of inductor and capacitor with the help of A.C. Bridge & they can draw phasor diagram of bridges. [Level 2]
			CO3	Interpret test and calibrate ammeter, voltmeter, and Wattmeter and energy meter. [Level 3]
			CO4	Select proper instrument for measurement various Electrical elements. [Level 4]
			CO5	Organize oscilloscope and perform experiments by using for different tests. [Level 5]
14	4	Digital Electronics	CO1	Distinguish the different number systems and be able to convert from one form to other. [Level 2]
			CO2	Show the laws of Boolean algebra to simplify circuits. [Level 3]
			CO3	Define the significance of logic circuit, multiplexer and array. [Level 1]
			CO4	Analyse the sequential logic circuit and evaluate performance [Level 3]
			CO5	Interpret programmable logic circuit devices and its usage. [Level 4]
15	4	Electrical Measurement & Instrumentation Lab	CO1	analyze and design various applications of AC & DC Bridges. (level4)
			CO2	Explain the principles of electrical measurements. (level1)
			CO3	illustrate laboratory data and experimental results of measuring instruments. (level2)
			CO4	work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level4)
			CO5	Perform calibration of single phase energy meter. (level3)
16	4	Electrical Machines II Lab	CO1	Predict the performance of DC machines and Transformers using standard equivalent circuit models. (level 2)
			CO2	Choose the appropriate machines based on the application requirements. (level 3)



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			CO3	Illustrate laboratory data and experimental results using professional quality graphical representations. (level 2)
			CO4	Work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (Level 4)
			CO5	Describe the behavior of transformer and DC machines. (Level 1)
17	4	Digital Electronics Lab	CO1	analyze and design various applications logic gates and flip-flop. (level4)
			CO2	classify in the specific area of digital electronics. (level 3)
			CO3	illustrate laboratory data and experimental results of gates, flip-flops, and arithmetic tools. (level2)
			CO4	work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level4)
			CO5	perform arithmetic operation, digital clock operation. (level3)
18	4	Virtual Lab	CO1	describe the basic fundamentals of PLC. (level 1)
			CO2	interpret various functions of PLC. (level 3)
			CO3	simulate models to analyze basic electrical and electronic circuits. (level 3,4)
			CO4	illustrate different applications by PLC. (Level 2)
			CO5	describe the specific instructions in PLC. (level 1)
19	5	Signal & System	CO1	Identify the terminology of signals and basic engineering systems. (level 1)
			CO2	Apply fourier transformation in signal and evaluate the properties. (level 3)
			CO3	Apply the laplace transform and sampling theorem and interpret the result. (level 2)
			CO4	Describe the principle of Z transform for signal characteristics. (level 1)
			CO5	Identify probability and function of random variable (level2)
20	5	Control System	CO1	Identify different types of control system components and their operations and model a control system. (Level 1)
			CO2	Describe and explain Time Response of First And Second Order System. (Level 1,2)
			CO3	Apply the knowledge of Time and Frequency Response by different plots and evaluate systems. (Level 3, 6)
			CO4	Develop and analyze controllers and compensators and their characteristic. (Level 5,4)
			CO5	Design and analyse model for linear systems. (Level 1)



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21	5	Electrical Power System-I	CO1	Calculate resistance, capacitance and inductance of transmission line under different configuration. (Level 1)
			CO2	Describe Characteristics and performance of transmission lines and their parameters. (Level 1,2)
			CO3	Evaluate underground cable performance and Calculate sag & tension, of transmission line considering mechanical design. (Level 3, 6)
			CO4	Analyze nature of voltage variation and methods to power factor correction techniques. (Level 5,4)
			CO5	Classify and compare distribution system of electrical power system. (Level 3)
22	5	Microprocessor & microcontroller	CO1	Identify the architecture Microprocessor 8085. (level 1)
			CO2	Identify the architecture of 8051 microcontroller. (level 1)
			CO3	Apply and describe the instruction set and programme for 8051 microcontroller. (level 4)
			CO4	Write interrupt programming and interpret data. (level 1,3)
			CO5	Apply assembly language programming for interfacing various peripheral devices. (level 4)
23	5	Testing & commissioning of Electrical Equipment	CO1	Describe main features and functions of power transformer with accessories and Analyse different conditions related to testing and commissioning. (level 1, 4)
			CO2	Illustrate the practical considerations of current and potential transformer and Explain the principle of operation of traction and rectifier transformer. (level 2)
			CO3	Understand and classify different fault finding and testing methods in DC machines and induction machine. (level 3)
			CO4	State the practical standards of protection and cooling systems and Select proper maintenance method to rotating machines. (level 1, 4)
			CO5	Summarise safety precautions related to electric shocks and live line maintenance and Select proper maintenance procedure at site. (level 2, 4)
24	5	Control system Lab	CO1	Identify different types of control system components. (Level 1)
			CO2	Recall and explain fundamental of continuous time system. (Level 1,2)
			CO3	Acquire the knowledge of Time domain frequency domain plots and can use to evaluate linear time invariant systems. (Level 6)



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			CO4	Develop and analyze controllers and compensators. (Level 5,4)
			CO5	Acquire fundamental knowledge of discrete time systems. (Level 1)
25	5	Electrical power system I lab	CO1	select and identify various components of power system like cable, conductor and insulators along with different bus bar schemes. (level 1,4)
			CO2	Perform calculations on ABCD constants of a transmission line programs. (level 3)
			CO3	Find the rating of capacitors for power factor improvement and corelate with synchronous phase modifier. (level 3)
			CO4	work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level 4,5)
			CO5	Confirm the Ferranti effect on transmission line and study lay outs and structure substation. (level3)
26	5	Microprocessor & Microcontroller lab	CO1	select and identify various applications of microprocessor. (level 1,4)
			CO2	prepare programs. (level 3)
			CO3	interpret and interface microprocessor with peripheral devices.. (level 3)
			CO4	work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level 4,5)
			CO5	perform arithmetic and logical operations. (level3)
27	6	Power Electronics	CO1	Explain various application of semiconductor switches by understanding their static and dynamic characteristics. (level 1,2)
			CO2	Describe the principle of phase controlled rectifier and analyzed different circuit. (level 1,4)
			CO3	Describe the basics of DC-DC converters and Evaluate their performance under continuous discontinuous mode of conduction for RLE loads. (level 1,4,6)
			CO4	Identify and Formulate the requirements for four quadrants operation of DC motor (level 1,2,4)
			CO5	Understand and analyze the significance of various commutation circuits and their consequence on device stress. (level 1,2)
28	6	Electrical power system II	CO1	Recall the concept of per unit and single line diagram, impedance diagram representation of three phase power system component. (Level 1)
			CO2	Compute symmetrical components of currents, voltages and develop different sequence network. (Level 3,5)
			CO3	Analyze the unsymmetrical fault and calculating its fault parameter. (Level 4,5)



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			CO4	Predict carefully the constraint involved in the economic load dispatch and compute optimal solution through unit commitment and Economic load dispatch including transmission. (Level 3)
			CO5	Formulated Y bus to compute the load flow solution using different iterative methods
29	6	Digital Signal Processing	CO1	Analyze signals using the discrete Fourier transform (DFT) and FFT. (level 4)
			CO2	Describe FIR filter and its application. (level 1)
			CO3	Illustrate IIR filters and evaluate performance. (level 2)
			CO4	Illustrate basic structures of non-recursive digital filters. (level 1)
			CO5	classify digital filters in a variety of forms: using different methods like coefficient quantization, and multiplication round-off. (level 4)
30	6	Distributed Generation	CO1	Explain concept of distributed generation and their social and economical implication. (level 1,2)
			CO2	Describe the principal of direct energy conversion and application of solar-PV cell. (level 1,4)
			CO3	Describe the process and principle of operation of fuel cell and OTEC. (level 1,4,6)
			CO4	Describe the principle of operation of hydrogen energy, ocean energy, hydel and geo thermal energy with hybrid interconnection. (level 1,4,6)
			CO5	Understand the significance of deregulated system and their scope. (level 1,2,6)
31	6	Energy Auditing and management	CO1	Explain various application and impact of energy management and energy planning. (level 1,2)
			CO2	Describe the status of global energy resources and analyze the characteristic of per capita energy consumption. (level 1,4)
			CO3	Describe the process and principle of energy audit and Evaluate their impacts under different condition. (level 1,4,6)
			CO4	Identify and signify the energy conservation principle and their implementation. (level 1,2,4)
			CO5	Understand and analyze the significance of various demand side management techniques and their consequence on power system. (level 1,2,6)
32	6	Power Electronics Lab	CO1	able to identify different characteristics of semiconductor devices (Level 1)
			CO2	difference between controlled and uncontrolled semiconductor switches and their applications (Level 4) (Level 3)



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			CO3	measure and evaluation voltage, current, frequency and phase of any waveform using CRO(Level 6)
			CO4	Analyzes Behaviour of converter, with change in load (like R and RL) (Level 4)
			CO5	Different of force and natural commutation and their application (Level 3)
33	6	Electrical Power System II lab	CO1	Determine Phase sequence and vector group of transformer.
			CO2	Determine and Interpret sequence impedances of synchronous generator .
			CO3	Develop and draw single line diagram in per unit and simulate various conditions
			CO4	Determine and described different fault current of power system
			CO5	Analyse theprogramme output for Gauss seidel, Newton Raphson and ABCD constant applicable in power system in power system
34	6	Computer Simulation Lab	CO1	Analyze simulation results of different controller and filters.
			CO2	Interpret results of chopper control and rectifier circuits .
			CO3	Develop and draw single line diagram in per unit and simulate various conditions
			CO4	describe operation of power system and faults of transmission line by different simulation situations
			CO5	Analyse theprogramme output for Gauss seidel ,Newton Raphson and ABCD constant applicable in power system in power system
35	6	Digital signal Processing Lab	CO1	analyze and design various applications of analog and digital filters. (level4)
			CO2	To classify in the specific area of digital signal processing.(leve3)
			CO3	illustrate experimental results.(level2)
			CO4	work in teams to perform experiments, analyz erresults, and develop technically sound reports of outcomes. (level4)
			CO5	apply different filters in signal and image processing. (level3)
36	7	Power System Protection	CO1	Describe and explain types and operation of relay withRelevant protection systems of power system.[Level 1, 3]
			CO2	Define and analyse generator and transformer protection schems. [Level 3]
			CO3	Apply the scheme with over current, differential, and ratio protection devices and their application in a coordinated protection scheme.[Level 3]
			CO4	Analysis and illustrate transmission line protection, bus bar protection and feeder protection methods.[Level 4]



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			CO5	Describe and recall the operation of different types of circuit breaker. [Level 5]
37	7	Electrical Drive	CO1	Express the operation of electrical drives and Interpret the data of various parameters. (level 2, 3)
			CO2	Model different modes of operation of drives with its control and analyse thermal model (level 3, 4)
			CO3	Explain the performance of dc drives and categorise different controllers. (level 2,4)
			CO4	Explain the performance of induction motor and synchronous motor drives and categorise different controllers under different conditions. (level 2,4)
			CO5	Illustrate the traction model and interpret parameters. (level 2, 3)
38	7	High Voltage Engineering	CO1	Describe breakdown phenomena in gases and to elucidate the concept used for the generation of high voltage and current. (Level 1,6)
			CO2	Elucidate the concepts used for the insulation phenomena in liquid and solid. (level 6)
			CO3	Understand the concept used for the measurement of high voltage and current and design corresponding circuits. (Level 1)
			CO4	Understand and analyze high voltage testing techniques of power apparatus and causes of over voltage in power system (Level 1,4)
			CO5	Evaluate the role of insulation level and coordination between apparatus. (Level 6)
39	7	Soft Computing	CO1	Identify the concepts of feed forward neural networks. (level 1)
			CO2	Classify and describe feedback neural networks. (level 1, 3)
			CO3	Analyze the concept of fuzziness involved in various systems. (level 4)
			CO4	Illustrate principle and application of fuzzy set theory. (level2)
			CO5	Classify fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm. (level 3,5)
40	7	Non conventional Energy sources	CO1	Describe Various non-conventional energy sources, Need, availability, classification, Relative merits & demerits. Energy storage, distribution and conservation. (Level 1)
			CO2	Illustrate Solar Cells; Theory of Solar Cells, Materials, Solar Cell Power Plants, merits / demerits. Solar Thermal Energy: Solar energy collectors, Applications, storage, Solar Thermal Power Plants, merits / demerits. (Level 2)
			CO3	Show Basic Principles of Wind Energy conversion Site Selection criterion; wind Data & Energy Estimation, Types of Rotors, Characteristics, performance & limitations of energy conversion systems. (Level 3)



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			CO4	Differentiate Basic Principles, Components, Conversion Technology, Classification, Operation and impact of Tidal Plants, Bio-Mass Energy and Geo-Thermal Energy. (Level 4)
			CO5	Plan Principle of working open cycle / close cycle system. Advantages & Disadvantages Thermo Electric Power – Basic Principles, Thermo Electric Materials, Performance & Limitations. Thermionic Conversion – Principles of working. Hydrogen Energy – Principles of conversion, production of H ₂ . (Level 5)
41	7	Power system Protection lab	CO1	analyze and design various applications of relay and protection (level4)
			CO2	classify in the specific area of switchgear & Protection system. (level3)
			CO3	illustrate laboratory data and experimental results of switchgear & protection. (level2)
			CO4	work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes. (level4)
			CO5	perform different operations in high voltage and investigate the outcomes. (level3)
42	7	High voltage Engg Lab	CO1	analyze and design various applications of high voltage Testing equipments. (level4)
			CO2	classify in the specific area of high voltage. (level3)
			CO3	illustrate laboratory data and experimental results of high voltage. (level2)
			CO4	work in teams to conduct experiments, analyz erresults, and develop technically sound reports of outcomes. (level4)
			CO5	perform different operations in high voltage and investigate the outcomes. (level3)
43	7	Project Phase I	CO1	Recognise the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (level 3, 5)
			CO3	function in a team and adapt as per requirement to achieve desired goal with ethical practices (level 4, 6)
			CO4	Apply principles to solve problems and interpret the result. (level 3, 5,)



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			CO5	Relate the impact of engineering solutions in society and classify modern tools .(level 2,3)
			CO6	compile and describe their work through seminars and written methods using effective communication. (level1, 5)
44	8	Computer Aided Power System	CO1	Design and analysis of electrical power networks and investigate typical case study problems of Ybus, Zbus, fault analysis and load flow methods. (level 5)
			CO2	Identify the symmetrical and unsymmetrical fault and can design the rating of circuit breakers. (level 1)
			CO3	Predict the constraints involved in the AC load flow with different load flow methods. (level 2)
			CO4	Assess the steady state and transient stability studies in the power system network using equal area criterion method and apply numerical solutions to swing equations.(level 6)
			CO5	Analyze contingency and security systems of power system network. (level 4)
45	8	EHV AC DC Transmission	CO1	define the key technology and system composition in modern HVAC & HVDC design . [Level 1] [Level 5]
			CO2	explain the hvdc& transmission technology under different configuration. [Level 2]
			CO3	Analyse the converter characteristic with different connection. [Level 3]
			CO4	Describe the control of HVDC converter and different control hierarchy. [Level 4]
			CO5	Illustrate the principle of protection of DC line and reactors. [Level 5]
46	8	Management Concepts and Technique	CO1	Describe project planning phases and identify different management aspects. (Level 1)
			CO2	Express the ideas of marketing and apply those in projects. (level2,3)
			CO3	Apply production planning tools and interpret data. (level3)
			CO4	Recognize the role of management information system and collect necessary data. (level 1, 3)
			CO5	Consider social and ethical issue and apply those in practical life. (level6,3)
47	8	Computer Aided Power System Lab	CO1	Fundamental knowledge of MATALAB programming, plotting and modeling. (level 1)
			CO2	evaluate power, losses and parameters of power system components by MATLAB coding. (level 6)
			CO3	model various power system components that are adequate for the basic studies of power system. (level 3)



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			CO4	analyzethe system by drawing plots in MATLAB. (level 4)
			CO5	predict the behavior of power system and control systems by programming or modeling. (level 2)
48	8	Installation Maintenance and Testing Lab	CO1	Apprise calibration of ammeter, voltmeter, wattmeter, energy meter and operation of meggar. (level 6)
			CO2	Describe the testing of current transformer and induction motor with installation methods.. (level 1)
			CO3	Classify plate and pipe earthing schemes and interpret data of earth tester. (level 3)
			CO4	Explain and Analyze the performance of substation equipments. (level1,4)
			CO5	Illustrate the operations of sodium and mercury vapour lamp and investigate different illumination schemes. (level 2,4)
49	8	Project Phase II	CO1	Recognize the need and identify the problem related to industry and society through literature and environment focusing on practical conditions. (Level1)
			CO2	Develop and select a solution to identified problem in a cost effective manner. (level 3, 5)
			CO3	function in a team and adapt as per requirement to achieve desired goal with ethical practices (level 4, 6)
			CO4	Apply principles to solve problemsand interpret the result. (level 3, 5,)
			CO5	Relate the impact of engineering solutions in society and classify modern tools .(level 2,3)
			CO6	compile and describe their work through seminars and written methods using effective communication. (level1 5)