



# Vidyavardhini's College of Engineering & Technology

Founder President Late Padmashri H. G. Vartak

Approved by AICTE, DTE Maharashtra and Affiliated to University of Mumbai

NAAC accredited, 4 Programmes Accredited by NBA

**Criteria Number: 2**

**Criteria Name: Teaching, Learning and Evaluation**

**Sub-criteria Number: 2.6**

**Sub-criteria Name: Student Performance and Learning Outcome**

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

**The documentary evidence can be accessed by clicking on the link given.**

## Supporting Documents

Sr. No.	Document	Link
1	Website link for PO, PSO and COs of all Departments	<a href="#">Website links</a>
2	Geotag photos for dissemination of POs, PSOs, PEOs and COs	<a href="#">1_Snapshot_PO HOD cabin</a>
		<a href="#">2_Snapshot_PSO PEO HOD cabin</a>
		<a href="#">3_Snapshot_PO_laboratory</a>
		<a href="#">4_Snapshot_PSO PEO Laboratory</a>
		<a href="#">5_Snapshot_PSO TV display</a>
		<a href="#">6_Snapshot_PEO TV display</a>
		<a href="#">7_Snapshot_PO Classroom</a>
		<a href="#">8_Snapshot_PO PSO notice board</a>
3	PO, PSO and COs of all Departments	<a href="#">Rev 2019_COPO_Mech</a>
		<a href="#">Rev 2019_COPO_EXTC</a>
		<a href="#">Rev 2019_COPO_Comp</a>
		<a href="#">Rev 2019_COPO_IT</a>
		<a href="#">Rev 2019 COPO Civil</a>
		<a href="#">Rev 2019_COPO_AI&amp;DS</a>
		<a href="#">Rev 2019_COPO_CSEDS</a>



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## Website link for PO, PSO and COs of all Departments

Sr. No	Department	Link to the PO, PSO, COs on website
1	Mechanical Engineering (R19)	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/R-2019.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/R-2019.pdf</a>
2	Electronics & Telecommunication Engineering	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/Final_R19_COPO_EXTC_07.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/Final_R19_COPO_EXTC_07.pdf</a>
3	Computer Engineering(R19)	<a href="https://vcet.edu.in/wp-content/uploads/2023/10/NACC-COMP_PO_PSO_CO_R-19-updated.pdf">https://vcet.edu.in/wp-content/uploads/2023/10/NACC-COMP_PO_PSO_CO_R-19-updated.pdf</a>
4	Information TechnologyR19)	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_IT_R-2019_syllabus.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_IT_R-2019_syllabus.pdf</a>
5	Civil Engineering (R19)	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/Civil_R-19-COs.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/Civil_R-19-COs.pdf</a>
6	Artificial Intelligence and Data Science	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_Rev-2019_AIDS_Syllabus-.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_Rev-2019_AIDS_Syllabus-.pdf</a>
7	Computer Science Engineering (Data Science)	<a href="https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_Rev-2019_CSEDS_Syllabus.pdf">https://vcet.edu.in/wp-content/uploads/2023/11/2.6.1_Rev-2019_CSEDS_Syllabus.pdf</a>



## Vidyavardhini's College of Engineering & Technology

K.T. Marg, Vasai Road (W), Dist. Palghar - 401 202, Maharashtra

### DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

#### PROGRAM OUTCOMES (POs):

- ❖ **PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- ❖ **PO2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- ❖ **PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- ❖ **PO4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- ❖ **PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- ❖ **PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
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- ❖ **PO12. Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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### Vasai-Virar, Maharashtra, India

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Lat 19.383826°

Long 72.828553°

23/11/23 02:52 PM GMT +05:30







## Vidyavardhini's College of Engineering & Technology

K.T. Marg, Vasai Road (W), Dist. Palghar - 401 202, Maharashtra

### DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

#### PROGRAM EDUCATION OBJECTIVES (PEOs):

- ❖ The graduates will exhibit knowledge of mathematics, Science, Electronics and Communication and will be able to apply the same in diversified field.
- ❖ The graduates will develop a habit of continuous learning while working in multidisciplinary environment.
- ❖ The graduates will grow as an individual with proficiency in Technical Skills, Ethical Values, Communication Skills, Teamwork and Professionalism.

#### PROGRAM SPECIFIC OUTCOMES (PSOs):

- ❖ At the end of the program engineering graduates will be able to:
  1. Apply the knowledge of Electronics and Communication to analyse, design and implement application specific problems with modern tools.
  2. Adapt emerging technologies with continuous learning in the field of Electronics and Telecommunication Engineering with appropriate solutions to real life problems.

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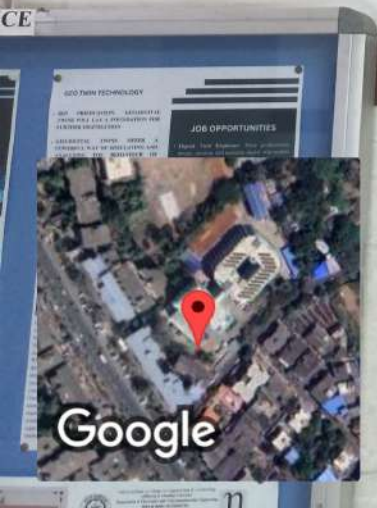
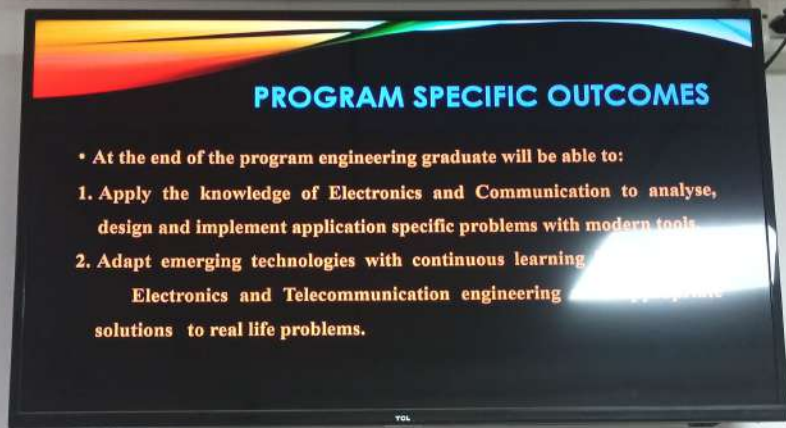
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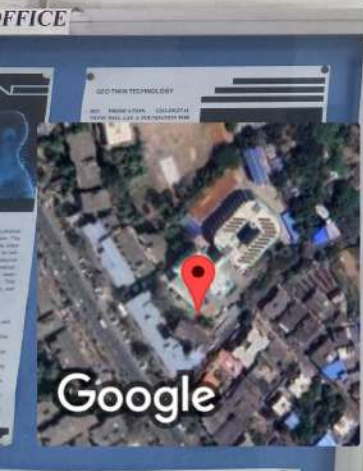
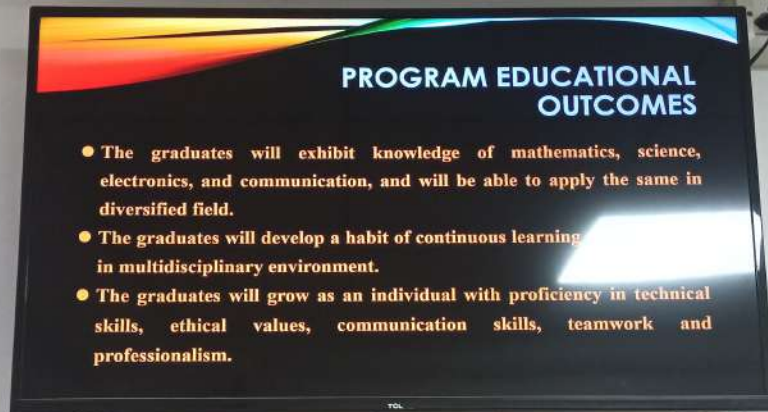
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## Vidyavardhini's College of Engineering & Technology

### PROGRAM OUTCOMES (POs)

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## Vidyavardhini's College of Engineering & Technology

### VISION

To be premier institution of technical education, aiming at becoming a valuable resource for industry and society

### MISSION

- ❖ To provide technologically inspiring environment for learning
- ❖ To promote creativity, innovation and professional activities
- ❖ To inculcate ethical and moral values
- ❖ To cater personal, professional and societal needs through quality education

#### Important Instructions for Students Appearing for University Exams

1. Answers are to be compulsorily written in **Black Ball Point Pen Only**. (Don't use any other colour pen or Gel Ink Pen)
2. No student will be allowed to appear for the examination without valid **College Identity Card and Hall Ticket**
3. Do not carry mobile phones or O/E mobile phones in the class / exam room. **Mobile phones and electronic gadgets are strictly banned in the exam room.**
4. Do not wear anything on your body parts, clothes, hand, wrist or ball-ticker instruments, etc.
5. Obey your state with the progress of the warning bell.



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## Vasai-Virar, Maharashtra, India

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Vidyavardhini's College of Engineering & Technology  
Department of Artificial Intelligence & Data Science

College of Engineering and Technology  
Department of Artificial Intelligence & Data Science

Academic Year: 2023-24  
Department: Artificial Intelligence & Data Science (AI&DS)

Sl. No.	Roll No.	Grade	Percentage	Remarks
1	19010101	B	65.00	
2	19010102	C	55.00	
3	19010103	D	45.00	
4	19010104	E	35.00	
5	19010105	F	25.00	
6	19010106	G	15.00	
7	19010107	H	5.00	
8	19010108	I	0.00	
9	19010109	J	0.00	
10	19010110	K	0.00	

Sl. No.	Roll No.	Grade	Percentage	Remarks
1	19010111	B	65.00	
2	19010112	C	55.00	
3	19010113	D	45.00	
4	19010114	E	35.00	
5	19010115	F	25.00	
6	19010116	G	15.00	
7	19010117	H	5.00	
8	19010118	I	0.00	
9	19010119	J	0.00	
10	19010120	K	0.00	

Sl. No.	Roll No.	Grade	Percentage	Remarks
1	19010121	B	65.00	
2	19010122	C	55.00	
3	19010123	D	45.00	
4	19010124	E	35.00	
5	19010125	F	25.00	
6	19010126	G	15.00	
7	19010127	H	5.00	
8	19010128	I	0.00	
9	19010129	J	0.00	
10	19010130	K	0.00	

Vidyavardhini's College of Engineering and Technology  
Department of Artificial Intelligence & Data Science

Seating Arrangement for B.L.O.C.  
Department of Artificial Intelligence & Data Science

Roll No.	Room No.
19010101 to 19010110	216
19010111 to 19010120	217

Vidyavardhini's College of Engineering and Technology  
Department of Artificial Intelligence & Data Science



**Vidyavardhini's College of Engineering & Technology**

**Vision**

To be a premier institution of technical education; always aiming at becoming a valuable resource for industry and society.

**Mission**

- To provide technologically inspiring environment for learning.
- To promote creativity, innovation and professional activities.
- To inculcate ethical and moral values.
- To cater personal, professional and societal needs through quality education.

Vidyavardhini's College of Engineering & Technology  
Department of Artificial Intelligence and Data Science

**Department Vision:**

To foster proficient artificial intelligence and data science professionals, making remarkable contributions to industry and society.

**Department Mission:**

- To encourage innovation and creativity with rational thinking for solving the challenges in emerging areas.
- To inculcate standard industrial practices and security norms while dealing with Data.
- To develop sustainable Artificial Intelligence systems for the benefit of various sections.

**Program Specific Outcomes (PSOs):**

- PSO1: Analyse the current trends in the field of Artificial Intelligence and Data Science and convey their findings by presenting/publishing at national/international forums.
- PSO2: Design and develop Artificial Intelligence and Data Science based solutions and applications for the problems in the different domains catering to industry and society.

Vidyavardhini's College of Engineering & Technology  
Department of Artificial Intelligence and Data Science

**Program Outcomes (POs):**

- Engineering Graduates will be able to:
- PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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  - PO11. Project management and finance:** Understand a project and understanding the engineering and management practices and apply these to one's own work, as a member and leader in teams, to manage projects and to establish effective milestones.
  - PO12. Lifelong learning:** Recognize the need for, and have the motivation and ability to engage in independent and lifelong learning in the broader context of technological change.

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**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

**Program Outcomes**

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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**Program Specific Outcomes**

<b>PSO1</b>	<b>The graduate will be able to identify, analyze, and develop a solution for the complex engineering problems in the Mechanical Engineering domain.</b>
<b>PSO2</b>	<b>The graduate will be able to integrate technical and interpersonal skills with the ethical and professional standards in their career.</b>

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

**Course Outcomes (FE to BE)**

At the end of the semester student will able to

<b>FEC101</b>	<b>Applied Mathematics-I</b>
FEC101.1	Illustrate the basic principles of partial differentiation.
FEC101.2	Illustrate the knowledge of maxima, minima and successive differentiation.
FEC101.3	Illustrate the basic concepts of Complex numbers.
FEC101.4	Apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic function.
FEC101.5	Apply principles of basic operations of matrices, rank and echelon form of matrices to solve simultaneous equations.
FEC101.6	Illustrate Scilab programming techniques to the solution of linear and simultaneous algebraic equations.

<b>FEC102</b>	<b>Engineering Physics-I</b>
FEC102.1	Describe the concept of superconductors and super capacitors
FEC102.2	List the properties of crystal structure and describe x-ray diffraction.
FEC102.3	Describe concepts of semiconductor physics and select its application
FEC102.4	Describe the concept of interference in thin films and select its application

<b>FEC103</b>	<b>Engineering Chemistry -I</b>
FEC103.1	Analyze the quality of water and suggest upto four methods of treatment.
FEC103.2	Illustrate the knowledge of polymers, fabrication methods, conducting polymers in industrial fields & calculate molecular weight of polymer.
FEC103.3	Explain the concept of microscopic chemistry in terms of atomic and molecular orbital theory and relate it to diatomic molecule.
FEC103.4	Describe the concept of aromaticity & interpret with relation to specific aromatic system.
FEC103.5	Interpret upto two phase transformations using thermodynamics.
FEC103.6	Illustrate the knowledge of upto four types of intermolecular forces & relate it real gases.

<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse-momentum principles



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Apply various network theorems to determine the circuit response / behavior
FEC105.2	Evaluate and analyse 1- $\Phi$ AC circuits.
FEC105.3	Evaluate and analyse 3- $\Phi$ AC circuits.
FEC105.4	Understand the constructional features and operation of 1- $\Phi$ transformer.
FEC105.5	Illustrate the working principle of 3- $\Phi$ machines and 1- $\Phi$ machines.

<b>FEL101</b>	<b>Engineering Physics-I</b>
FEL101.1	Draw miller indices
FEL101.2	Calculate energy band gap of semiconductor and studied about Hall effect.
FEL101.3	Calculate radius of curvature of a lens using Newton's ring set up and thickness of paper using Wedge shape film

<b>FEL102</b>	<b>Engineering Chemistry -I</b>
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of water using PH meter.
FEL102.5	Synthesize phenol-formaldehyde.

<b>FEL103</b>	<b>Engineering Mechanics</b>
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.

<b>FEL104</b>	<b>Basic Electrical Engineering</b>
FEL104.1	Implement DC circuits and analyze their behavior using network theorems
FEL104.2	Analyze frequency behavior of RLC circuit and calculate resonance frequency , Bandwidth and Q- factor.
FEL104.3	Determine relationship between voltage/current/power in three phase star/delta circuits.
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency.
FEL104.5	Illustrate the working of Single & Three Phase Induction Motor

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>FEL105</b>	<b>Basic Workshop Practice-I</b>
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL105.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL105.3	Perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring while taking care of electrical safety.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
FEL105.5	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL105.6	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking and crimping.

<b>FEC201</b>	<b>Engineering Mathematics-II</b>
FEC201.1	Understand and apply the basic concepts of ODE , LDE & Higher order Differential equations
FEC201.2	Illustrate the knowledge of beta & gamma function ,DUIS & Rectification.
FEC201.3	Apply the concepts of multiple integral.
FEC201.4	Apply Numerical methods to solve ODE of first order & first degree & Numerical integration Analytically & using scilab

<b>FEC202</b>	<b>Engineering Physics-II</b>
FEC202.1	Describe diffraction through single slit and grating and select its application
FEC202.2	Discuss the concept of LASER and Fiber-optics and list characteristics of LASER & Fiber-optics
FEC202.3	Describe basics of electrodynamics.
FEC202.4	Classify sensors based on their sensing technique.

<b>FEC203</b>	<b>Engineering Chemistry -II</b>
FEC203.1	Illustrate upto six types of corrosion & suggest control measures in industries
FEC203.2	Analyze the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Distinguish the ranges of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Illustrate the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Explain the concept of electrode potential & calculate EMF of cell.
FEC203.6	Illustrate the principles of green chemistry, synthesis and calculate % atom economy of chemical reaction.

<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines and Planes
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Apply the basic principles of projections in converting 3D view to 2D drawing.



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

FEC204.4

Visualize an object from the given two views.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>FEC205</b>	<b>C Programming</b>
FEC205.1	Formulate the simple algorithm for arithmetic, logical problems and translate them to programs in C language.
FEC205.2	Implement, test and execute programs consisting of control structures and demonstrate the use of arrays
FEC205.3	Implement solutions to the problem using the concept of strings and functions
FEC205.4	Understand the concept of pointers and structure-union

<b>FEC206</b>	<b>Professional Communication and Ethics-I</b>
FEC206.1	Write effective business/ technical documents.
FEC206.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
FEC206.3	Apply various techniques to be successful in group discussions, technical presentation and meetings
FEC206.4	Deliver successful professional presentations.
FEC206.5	Develop creative thinking and interpersonal skills.
FEC206.6	Apply codes of ethical conduct & organizational behaviour.

<b>FEL201</b>	<b>Engineering Physics-II</b>
FEL201.1	Determine wavelength of given colour using diffraction grating
FEL201.2	Determine number of lines on the grating using Laser source and numerical aperture of an optical fibre
FEL201.3	Studied I-V characteristics of Photodiode and ultrasonic distance meter

<b>FEL202</b>	<b>Engineering Chemistry -II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na, k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.

<b>FEL203</b>	<b>Engineering Graphics</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves.
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object.
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views.



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>FEL204</b>	<b>C programming</b>
FEL204.1	Translate given algorithms to a program.
FEL204.2	Correct syntax and logical errors
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in arrays, strings and structures and manipulate them through a program
FEL204.5	Declare pointers and demonstrate call by reference concept.

<b>FEL205</b>	<b>Professional Communication and Ethics-I</b>
FEL205	Listen and comprehend all types of spoken discourse successfully
FEL205	Speak fluently and make effective professional presentations.
FEL205	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205	Draft precise business letters, academic essays and technical guidelines.
FEL205	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205	Demonstrate principles of ethics in professional environment

<b>FEL206</b>	<b>Basic Workshop Practice-II</b>
FEL206.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL206.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL206.3	Perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring while taking care of electrical safety.
FEL206.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
FEL206.5	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL206.6	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking and crimping.

<b>MEC 301</b>	<b>Engineering Mathematics-III</b>
MEC 301.1	Apply the concept of Laplace transform to solve the real integrals in engineering problems
MEC 301.2	Apply the concept of inverse Laplace transform of various functions in engineering problems.
MEC 301.3	Apply the concept of Fourier series to expand periodic functions.
MEC 301.4	Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.
MEC 301.5	Apply matrix theory to solve the system of linear equations and eigen values and eigen vectors and their applications.
MEC 301.6	Solve Partial differential equations by applying numerical solution for one dimensional heat and wave equations.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEC 302</b>	<b>Strength of Materials</b>
MEC 302.1	Exhibit the concepts of direct stresses and strain in simple and compound bars.
MEC 302.2	Analyse the principal planes and stresses induced in thin shell subjected to internal and external pressure
MEC 302.3	Evaluate Shear force, Bending moment and plot variation for the different types of loads and support conditions
MEC 302.4	Analyse the stresses induced in engineering components due to shearing force, bending moment, twisting moment
MEC 302.5	Estimate the strain energy in Mechanical Elements subjected to different types of loading.
MEC 302.6	Estimate buckling and deflection phenomenon in columns, struts and beams by using different methods

<b>MEC 303</b>	<b>Production Processes</b>
MEC 303.1	Demonstrate principles and process pertaining to casting.
MEC 303.2	Demonstrate understanding of joining processes and its applications.
MEC 303.3	Illustrate principles and calculate parameters relating to forming processes.
MEC 303.4	Illustrate chip generating machine tools and machining processes
MEC 303.5	Demonstrate and choose conventional and non traditional machine tools.
MEC 303.6	Illustrate the concept of producing polymer, ceramic compound for moulding processes and manufacturing technology enabling industry 4.0.

<b>MEC304</b>	<b>Material and Metallurgy</b>
MEC304.1	Identify the various classes of materials and comprehend their properties w.r.t. their crystal structures , atomic bonding and defects.
MEC304.2	Apply phase diagram concepts to engineering applications
MEC304.3	Apply particular heat treatment for required property development
MEC304.4	Identify the probable mode of failure in materials and suggest measures to prevent them
MEC304.5	Choose or develop new materials for better performance
MEC304.6	Decide an appropriate method for processing and evaluating different components in service

<b>MEC 305</b>	<b>Thermodynamics</b>
MEC 305.1	Apply first law of thermodynamics for various flow and non-flow systems and compute heat and work interactions.
MEC 305.2	Compute quantification and grade of energy using second law, entropy and availability.
MEC 305.3	Use steam table and Mollier chart to compute properties of steam and Rankine cycle parameters.
MEC 305.4	Analyse gas power cycles like Otto, Diesel, Dual and Brayton cycles.
MEC 305.5	Apply the fundamentals of compressible fluid flow to the nozzle and diffuser.
MEC 305.6	Demonstrate the interrelations between thermodynamic functions.



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEL 301</b>	<b>Materials Testing</b>
MEL 301.1	Prepare metallic samples for studying its microstructure following the appropriate procedure.
MEL 301.2	Measure the hardness and distinguish the effect of heat treatment on microstructure and hardness
MEL 301.3	Perform the fatigue test and draw the S-N curve
MEL 301.4	Analyse the stress strain behaviour of materials.
MEL 301.5	Conduct the flexural test and measure the modulus of rupture, deflection and bending stresses
MEL 301.6	Measure the torsional and impact strength of the materials

<b>MEL 302</b>	<b>Machine Shop Practice</b>
MEL 302.1	Perform plain turning, taper turning, screw cutting, drilling and boring operations on lathe machine
MEL 302.2	Perform plane and inclined shaping on shaper machine
MEL 302.3	Perform rough and smooth grinding on pedestal grinder and precision grinding on surface grinder
MEL 302.4	Perform basic milling operations and gear cutting on universal milling machine
MEL 302.5	Perform forging and heat treatment operations to prepare forging tool
MEL 302.6	Prepare composite welded job using arc welding machine

<b>MESBL301</b>	<b>CAD-Modeling</b>
MESBL301.1	Visualize and prepare 2D modeling of a given object using Solidworks/AUTOCAD/Inventor.
MESBL301.2	Create 3D model of a given object using Solidworks/Inventor.
MESBL301.3	Visualize and develop the surface model of a given object using Solidworks/Inventor.
MESBL301.4	Generate assembly models of given objects using assembly tools of Solidworks/Inventor
MESBL301.5	Create manufacturing drawing using drafting tools.
MESBL301.6	Perform product data exchange among CAD systems.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEPBL 301</b>	<b>Mini Project -IA</b>
MEPBL 301.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEPBL 301.2	Implement the appropriate methodology with modern tools.
MEPBL 301.3	Compare theoretical/computational /experimental results to draw the proper inferences.
MEPBL 301.4	To develop interpersonal skills as a member of a group and excel in written and oral communication
MEPBL 301.5	To develop capabilities of self learning ,ethical values in a group which leads to life long learning
MEPBL 301.6	Implement project management principles during project work

<b>MEC 401</b>	<b>Engineering Mathemaics-IV</b>
MEC 401.1	Apply the concepts of vector calculus to evaluation of line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence.
MEC 401.2	Use the concepts of complex integration for evaluating integrals, computing residues & evaluate various contour integrals.
MEC 401.3	Apply the concepts of correlation, regression and curve fitting to the engineering problems.
MEC 401.4	Apply the concepts of probability and expectation for getting the spread of data and distributions of probabilities
MEC 401.5	Apply the concept of probability distribution to engineering problems & testing hypothesis of small samples using small sampling theory.
MEC 401.6	Apply the concept of parametric and non-parametric tests for analyzing practical problems.

<b>MEC 402</b>	<b>Fluid Mechanics</b>
MEC 402.1	Discuss properties of fluid
MEC 402.2	Evaluate hydrostatic forces on various surfaces/structures and predict stability of floating bodies
MEC 402.3	Differentiate velocity potential function and stream function
MEC 402.4	Formulate and solve equations of control volume for fluid flow systems and apply bernoulli's Equation to various flow measuring devices.
MEC 402.5	Calculate pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes.
MEC 402.6	Calculate resistance numerically/computationally to flow of fluid over surfaces.

<b>MEC 403</b>	<b>Kinematics of Machinery</b>
MEC 403.1	Illustrate various components of mechanisms.
MEC 403.2	Develop mechanisms to provide specific motion.
MEC 403.3	Draw velocity and acceleration diagrams of various mechanisms using graphical methods.
MEC 403.4	Plot s-t, v-t, a-t and j-t diagram for specific cam and follower motion.
MEC 403.5	Select appropriate power transmission for specific applications from belt, rope and chain drive.
MEC 403.6	Analyze power transmission through spur gears and gear trains.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEC404</b>	<b>CAD/CAM</b>
MEC404.1	Illustrate methods of geometric modelling using computer graphics techniques.
MEC404.2	Illustrate transformation of 2D and 3D objects.
MEC404.3	Develop 3D model using various types of available biomedical data.
MEC404.4	Create the CAM Toolpath NC G and M codes for a given operation.
MEC404.5	Demonstrate rapid prototyping & tooling concepts in real life application.
MEC404.6	Illustrate understanding of various cost effective alternatives for manufacturing products.

<b>MEC405</b>	<b>Industrial Electronics</b>
MEC405.1	Compare power diodes, power BJT, power MOSFET, IGBT and SCR on the basis of construction, characteristics, ratings & applications.
MEC405.2	Analyze controlled Rectifiers, inverter circuits for dc and ac motor speed control
MEC405.3	Analyse and demonstrate linear applications of Op-AMP and IC555 timer
MEC405.4	Examine the working of Combinational circuits and describe Sequential circuits
MEC405.5	Distinguish between microprocessor and microcontroller and interpret working of MSP430 microcontroller for applications.
MEC405.6	Compare DC and AC motors based on constructional features, working principle and their characteristics.

<b>MEL 401</b>	<b>Industrial Electronics</b>
MEL 401.1	Sketch and analyze characteristics of Semiconductor devices (SCR & TRIAC)
MEL 401.2	Analyze power electronics circuits for resistive and resistive inductive load.
MEL 401.3	Construct and analyze performance of integrated circuits (Opamp and 555 Timer).
MEL 401.4	Design and develop and analyze combinational circuits
MEL 401.5	Develop MSP430 programs
MEL 401.6	Analyze variation of speed of motor with change of given parameters (varying armature and field resistance)

<b>MEL 402</b>	<b>Kinematics of Machinery</b>
MEL 402.1	Illustrate various components and mechanisms.
MEL 402.2	Design and Develop mechanisms to provide specific motion.
MEL 402.3	Draw velocity up to six bar linkage mechanisms using ICR and relative velocity method.
MEL 402.4	Draw relative velocity and acceleration diagrams up to six bar linkage mechanisms using graphical methods
MEL 402.5	Plot s-t, v-t, a-t and j-t diagram and draw cam profile for specific cam and follower motion
MEL 402.6	Select appropriate power transmission for specific applications from gears, belt, rope and chain drive.



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEL 403</b>	<b>Python Programming</b>
MEL 403.1	Demonstrate and analyse basic concepts of Python Programming using new programming environment.
MEL 403.2	Develop and execute Python programs by making use of data structures and conditional statements.
MEL 403.3	Develop and execute Python programs with object oriented features.
MEL 403.4	Identify, install and utilize Python packages for plotting graphs.
MEL 403.5	Develop and build Python program to solve machine learning problems.
MEL 403.6	Prepare a case study report identifying appropriate libraries of Python.

<b>MESBL401</b>	<b>CNC and 3-D Printing</b>
MESBL401.1	Develop and execute tool path generation by conversion of part geometry from CAD to CAM.
MESBL401.2	Develop and execute part programming for given object using CNC Machine.
MESBL401.3	Demonstrate CAM Tool path and simulation for unconventional machining process.
MESBL401.4	Develop and analyze 3D model using biomedical data.
MESBL401.5	Develop 3D object using rapid prototyping method: Fused Deposition Modeling.
MESBL401.6	Generate 3D model of a object using 3D slicer image processing software.

<b>MEPBL 401</b>	<b>Mini Project -IB</b>
MEPBL 401.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEPBL 401.2	Implement the appropriate methodology with modern tools.
MEPBL 401.3	Compare theoretical/computational /experimental results to draw the proper inferences.
MEPBL 401.4	To develop interpersonal skills as a member of a group and excel in written and oral communication
MEPBL 401.5	To develop capabilities of self learning ,ethical values in a group which leads to life long learning
MEPBL 401.6	Implement project management principles during project work

<b>MEC501</b>	<b>Mechanical Measurements and Controls</b>
MEC501.1	Demonstrate inspection methods for different gauges.
MEC501.2	Illustrate working principle of measuring instruments to measure dimensional stability & functionality
MEC501.3	Illustrate various types of static characteristics and types of errors occurring in the measuring instruments.
MEC501.4	Demonstrate with the displacement, strain, pressure, flow and temperature measuring instruments for utilized for industrial applications.
MEC501.5	Design mathematical model of various types of control system/process with standard input responses in time domain and frequency domain and analyse for error coefficients.
MEC501.6	Analyse the problems associated with stability

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEC502</b>	<b>Thermal Engineering</b>
MEC502.1	Analyze the three modes of heat transfer in engineering application.
MEC502.2	Develop mathematical models for different modes of heat transfer.
MEC502.3	Analyze performance parameters of different types of heat exchangers.
MEC502.4	Identify and analyze the Transient heat Transfer in engineering applications.
MEC502.5	Explain construction and working of different components of internal combustion engines.
MEC502.6	Evaluate engine performance and emission characteristics.

<b>MEC503</b>	<b>Dynamics of Machinery</b>
MEC503.1	Apply principles of governors and Gyroscopic effects on the mechanical systems
MEC503.2	Illustrate basic concepts of inertia, static and dynamic forces in mechanical system components.
MEC503.3	Determine natural frequency of element/system
MEC503.4	Determine vibration response of mechanical elements / systems
MEC503.5	Select vibration isolation system for a specific application
MEC503.6	Demonstrate basic concepts of balancing using forces and couples

<b>MEC504</b>	<b>Finite Element Analysis</b>
MEC504.1	Develop the finite element equations to model engineering problems governed by second order differential equations.
MEC504.2	Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional element structural analysis, heat transfer and fluid flow (stepped and taper bars, fluid network, spring-Cart Systems)
MEC504.3	Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements for analysis of Plane trusses, Analysis of Beams.
MEC504.4	Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional two Dimensional Vector Variable Problems.
MEC504.5	Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system
MEC504.6	Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system.

<b>MEDLO5011</b>	<b>Optimisation Techniques</b>
MEDLO5011.1	Identify the types of optimization problems and apply the calculus method to single variable problems.
MEDLO5011.2	Formulate the problem as Linear Programming problem and analyse the sensitivity of a decision variable.
MEDLO5011.3	Apply various linear and non-linear techniques for problem solving in various domain.
MEDLO5011.4	Apply multi-objective decision making methods for problem in manufacturing environment and other domain.
MEDLO5011.5	Apply multi criterion decision making methods for problem in manufacturing environment and other domain.
MEDLO5011.6	Apply Design of Experiments method for Optimization

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEDLO5012</b>	<b>Design of Experiments</b>
MEDLO5012.1	Understand basic principles of DOE and apply basic statistical methods.
MEDLO5012.2	Design the experiment with Full factorial design method and interpret results by ANOVA method.
MEDLO5012.3	Design the experiment with fractional factorial design method
MEDLO5012.4	Apply appropriate method on model to create a robust design.
MEDLO5012.5	Apply first order and second order response surface model to optimize process.
MEDLO5012.6	Identify methods which are alternative to classical designed experiments

<b>MEDLO5013</b>	<b>Computational Methods</b>
MEDLO5013.1	Understand and develop mathematical models of physical systems.
MEDLO5013.2	Identify an appropriate mathematical formulation to linear algebraic equations.
MEDLO5013.3	Build an appropriate mathematical formulation to non-linear algebraic equations.
MEDLO5013.4	Evaluate and interpret the data regression, curve fitting and statistics.
MEDLO5013.5	Apply the numerical techniques and numerical schemes.
MEDLO5013.6	Formulate the concept of numerical methods in realistic applications.

<b>MESBL 501</b>	<b>Professional Communication &amp; Ethics</b>
MESBL 501.1	Write effective business/ technical documents.
MESBL 501.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry.
MESBL 501.3	Apply various techniques to be successful in group discussions, technical presentation and meetings
MESBL 501.4	Deliver successful professional presentations.
MESBL 501.5	Develop creative thinking and interpersonal skills.
MESBL 501.6	Apply codes of ethical conduct & organizational behaviour.

<b>MEDLO5012</b>	<b>Statistical Techniques</b>
MEDLO5012.1	Apply the concepts of statistical distributions in engineering applications
MEDLO5012.2	Use sampling theory for a given data set
MEDLO5012.3	Apply the best fitting curve for a given data set
MEDLO5012.4	Determine the Correlation values of regression equation from a given data set.
MEDLO5012.5	Perform analysis of variance from the available experimental data.
MEDLO5012.6	Demonstrate the understanding of Statistical Decision making and Hypothesis testing



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEL501</b>	<b>Thermal Engineering</b>
MEL501.1	Estimate thermal conductivity of engineering materials.
MEL501.2	Compute heat transfer coefficient in natural and forced convection
MEL501.3	Analyse heat exchanger performance
MEL501.4	Perform load test/speed test on engine setup
MEL501.5	Calculate performance of multi cylinder engine
MEL501.6	Analyse engine performance and draw heat balance sheet

<b>MEL502</b>	<b>Dynamics of Machinery</b>
MEL502.1	Plot and analyse governor characteristics
MEL502.2	Analyse gyroscopic effect on laboratory model
MEL502.3	Estimate natural frequency of mechanical system
MEL502.4	Analyse vibration response of mechanical systems
MEL502.5	Determine damping coefficient of a system
MEL502.6	Analyse the balancing of rotating masses in rotor system

<b>MEL503</b>	<b>Finite Element Analysis</b>
MEL503.1	Analysis of one dimensional Bar element
MEL503.2	Analysis of one dimensional Truss element
MEL503.3	Analysis of one dimensional Beam element
MEL503.4	Analysis of Beam element for Modal and Harmonic conditions
MEL503.5	Analysis of Two dimensional plate
MEL503.6	Analysis of Axisymmetric Element

<b>MESBL501</b>	<b>Professional communication and ethics - II</b>
MESBL501.1	Write effective business/ technical documents.
MESBL501.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
MESBL501.3	Apply various techniques to be successful in group discussions, technical presentation and meetings
MESBL501.4	Deliver successful professional presentations.
MESBL501.5	Develop creative thinking and interpersonal skills.
MESBL501.6	Apply codes of ethical conduct & organizational behaviour.

<b>MEPBL501</b>	<b>Mini Project – 2 A</b>
MEPBL501.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEPBL501.2	Implement the appropriate methodology with modern tools.
MEPBL501.3	Compare theoretical/computational /experimental results to draw the proper inferences.
MEPBL501.4	To develop interpersonal skills as a member of a group and excel in written and oral communication.
MEPBL501.5	To develop capabilities of self learning ,ethical values in a group which leads to life long learning.
MEPBL501.6	Implement project management principles during project work

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEC 601</b>	<b>Machine Design</b>
MEC 601.1	Illustrate the basic principle and procedure of machine design and various parameters involved in machine design
MEC 601.2	Design Knuckle Joint, cotter joint and Screw Jack
MEC 601.3	Design shaft under various conditions and coupling
MEC 601.4	Select bearings for a given applications and Design of hydrodynamically lubricated Bearing
MEC 601.5	Select and/or design belts and flywheel for given applications
MEC 601.6	Design springs, clutches and brakes

<b>MEC 602</b>	<b>Turbo Machinery</b>
MEC 602.1	Identify various steam generators, boiler mountings and accessories, compute boiler performance and define various parameters pertaining to Turbomachines
MEC 602.2	Classify hydraulic turbines and estimate the performance parameters and efficiencies for hydraulic turbines
MEC 602.3	Explain working of pumps and compute performance of reciprocating and centrifugal pumps
MEC 602.4	Identify various air compressors and compute performance of reciprocating and centrifugal compressors
MEC 602.5	Classify steam turbines and estimate the performance parameters and efficiencies for steam turbines
MEC 602.6	Describe Brayton cycle, classify gas turbines and jet propulsion engines and compute performance of gas turbines

<b>MEC603</b>	<b>Heating, Ventilation, Air conditioning and Refrigeration</b>
MEC603.1	Demonstrate fundamental principles of refrigeration & air conditioning and analyse Bell Coleman and aircraft air refrigeration systems.
MEC603.2	Explain vapour absorption refrigeration system, heat pump and analyze vapour compression refrigeration system.
MEC603.3	Illustrate refrigeration and air conditioning processes using psychometric chart and estimate cooling & heating load calculations.
MEC603.4	Design and explain air distribution system and air handling unit.
MEC603.5	Identify and explain HVAC&R components like compressors, condensers, expansion devices, evaporators, insulation.
MEC603.6	Explain applications of refrigeration and air conditioning.

<b>MEC604</b>	<b>Automation and Artificial Intelligence</b>
MEC604.1	Illustrate basics of industrial Automation and AI
MEC604.2	Design and develop pneumatic/ hydraulic circuits
MEC604.3	Design electro-pneumatic circuits and write a program in PLC for process Industry
MEC604.4	Demonstrate basic working of robotic control system
MEC604.5	Demonstrate understanding of Machine learning Algorithms
MEC604.6	Demonstrate understanding of Artificial Neural Network

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEDLO6021</b>	<b>Press Tool Design</b>
MEDLO6021.1	Demonstrate press working operation for mass production of sheet metal parts
MEDLO6021.2	Design and Select elements pertaining to requirements of progressive tool
MEDLO6021.3	Develop components having bend and draw operation
MEDLO6021.4	Illustrate construction and working of different types of press tools
MEDLO6021.5	Illustrate presses and setting parameters for load and energy consideration
MEDLO6021.6	Illustrate automation and safety aspects in press working

<b>MEDLO6023</b>	<b>Metal Forming Technology</b>
MEDLO6023.1	Demonstrate the concept of different metal forming process
MEDLO6023.2	Illustrate relationships between geometry of rolls with forces
MEDLO6023.3	Illustrate principles and forces analysis in forging process
MEDLO6023.4	Illustrate principles and forces analysis in Extrusion process
MEDLO6023.5	Demonstrate various Drawing process with load analysis
MEDLO6023.6	Demonstrate non-conventional sheet metal forming process.

<b>MEL601</b>	<b>Machine Design</b>
MEL601.1	Design Knuckle Joint / cotter joint
MEL601.2	Design Screw Jack
MEL601.3	Design of Shafts and Flexible flange couplings
MEL601.4	Select bearings for a given applications and Design of hydrodynamically lubricated Bearing
MEL601.5	Select and/or design belts and flywheel for given applications
MEL601.6	Design of Leaf springs , Clutches and Brakes

<b>MEL 602</b>	<b>Turbo Machinery</b>
MEL 602.1	Differentiate boilers, boiler mountings and accessories
MEL 602.2	Compute and analyze the performance of Reciprocating air compressor
MEL 602.3	Compute and analyze the performance of Impulse and Reaction Hydraulic Turbine.
MEL 602.4	Compute and analyze the performance of Reciprocating and Centrifugal pumps.
MEL 602.5	Write technical report of Industrial Visit to a Power Plant.

<b>MEL603</b>	<b>Heating, Ventilation, Air conditioning and Refrigeration</b>
MEL603.1	Identify parts, operate and evaluate performance of HVAC & R systems.
MEL603.2	Plot processes on psychrometric chart.
MEL603.3	Compute performance of cooling tower.
MEL603.4	Present the impact of professional engineering solutions in societal and environmental contexts.
MEL603.5	Communicate effectively through the preparation of report and practical presentation.
MEL603.6	Analyze design aspects of HVAC & R in various applications



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MESBL601</b>	<b>Measurements and Automation</b>
MESBL601.1	Apply inspection gauge to check or measure geometrical dimensions.
MESBL601.2	Measure various parameters of gear tooth profile & Screw threads.
MESBL601.3	Determination of displacement, pressure, strain by using sensors.
MESBL601.4	Analyse the response of a control systems.
MESBL601.5	Design and develop electro pneumatic systems and ladder logic program on PLC.
MESBL601.6	Make use of Roboanalyzer software for visualization of DH (Denavit–Hartenberg) parameters

<b>MEPBL601</b>	<b>Mini Project – 2 B</b>
MEPBL601.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEPBL601.2	Implement the appropriate methodology with modern tools.
MEPBL601.3	Compare theoretical/computational /experimental results to draw the proper inferences.
MEPBL601.4	To develop interpersonal skills as a member of a group and excel in written and oral communication
MEPBL601.5	To develop capabilities of self learning ,ethical values in a group which leads to life long learning
MEPBL601.6	Implement project management principles during project work

<b>MEC701</b>	<b>Design of Mechanical System</b>
MEC701.1	Analysis of optimum design for mechanical elements
MEC701.2	Select appropriate gears for power transmission on the basis of given load and speed
MEC701.3	Design material handling systems such as hoisting mechanism of EOT Crane
MEC701.4	Design material handling systems such as belt conveyor
MEC701.5	Design engine components such as cylinder, piston, connecting rod and crankshaft from system design point of view
MEC701.6	Design pumps for given application

<b>MEC702</b>	<b>Logistics and Supply Chain Management</b>
MEC702.1	Understand the concepts of Logistics and Supply Chain Management and their role in today's business environment.
MEC702.2	Identify the drivers of Supply Chain performance and risks in Supply Chain Management.
MEC702.3	Apply various techniques of inventory management and their practical situations.
MEC702.4	Apply optimized transportation mode and techniques to minimize overall logistics cost.
MEC702.5	Comprehend the emerging trends and application of IT in Supply Chain Management leading to sustainability.
MEC702.6	Examine various models to design the Supply Chain network.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEDLO7031</b>	<b>Automotive Power Systems</b>
MEDLO7031.1	Demonstrate the working of Fuel supply and ignition system of I.C. engines
MEDLO7031.2	Illustrate the working of lubrication, cooling and supercharging systems
MEDLO7031.3	Comprehend the different technological advances in engines and alternate fuels
MEDLO7031.4	Identify and describe the history and different EV/HEV drivetrain topologies
MEDLO7031.5	Compare and evaluate various energy sources and energy storage components for EV and HEV application
MEDLO7031.6	Comprehend EV and HEV working through Case studies

<b>MEDLO7032</b>	<b>Renewable Energy Systems</b>
MEDLO7032.1	Describe the need for renewable energy and its potential for the development of a sustainable environment
MEDLO7032.2	Calculate and Analyze different solar collectors using geometrical parameters
MEDLO7032.3	Describe the working principle and life cycle of photovoltaics cell by using different parameters.
MEDLO7032.4	Identify and analyze various wind turbine energy harnessment techniques
MEDLO7032.5	Design biogas plant from organic waste and Describe significance of hydrogen energy for future needs
MEDLO7032.6	Describe the operating principle of geothermal and ocean energy and discuss energy management and economics for sustainable development

<b>MEDLO7033</b>	<b>Vehicle Systems</b>
MEDLO7033.1	Illustrate various systems like clutch, transmission and drive lines in an automobile.
MEDLO7033.2	Illustrate significance and feature of various systems like differential, brake and steering in an automobile.
MEDLO7033.3	Describe the automotive system and components like suspension, wheels and tyres
MEDLO7033.4	Illustrate the working of different Vehicle Electrical systems and subsystems
MEDLO7033.5	Demonstrate different Vehicle Body systems and layouts.
MEDLO7033.6	Comprehend the different technological advances in vehicle systems.

<b>MEDLO7041</b>	<b>Machinery Diagnostics</b>
MEDLO7041.1	Apply the concepts of vibration with condition monitoring of machine
MEDLO7041.2	Illustrate concepts and working of vibration measuring instruments
MEDLO7041.3	Select appropriate data acquisition system and signal processing techniques in machinery diagnosis
MEDLO7041.4	Illustrate common faults in mechanical system using vibration spectrum
MEDLO7041.5	Illustrate faults in machine elements using vibration spectrum
MEDLO7041.6	Analyse the vibration signals of Industrial machines

<b>MEDLO7042</b>	<b>Vibration Controls</b>
MEDLO7042.1	Apply basic concepts of Vibration Isolation and Damping.
MEDLO7042.2	Identify suitable Vibration Absorber
MEDLO7042.3	Identify suitable Vibration Isolator
MEDLO7042.4	Apply suitable method to Control the vibrations to the acceptable level.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>ILO7013</b>	<b>Management Information System</b>
ILO7013.1	Identify the impact of information systems on an organization
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making
ILO7013.3	Identify the threats to information systems and apply security controls for IS
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management

<b>ILO7015</b>	<b>Operation Research</b>
ILO7015.1	Solve the LP problems using simplex algorithm and Interpret the optimum solution of it
ILO7015.2	Perform sensitivity analysis on LPP problem and Solve specialized LPP problems like the transportation and assignment problems.
ILO7015.3	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
ILO7015.4	Compute important performance measures of queuing model
ILO7015.5	Solve simulation problem using Monte Carlo Technique
ILO7015.6	Solve game theory problem and to determine optimal order quantity with price breaks, shortage, and with /without discount.

<b>ILO7016</b>	<b>Cyber Security and Laws</b>
ILO7016.1	Describe the characteristics of cybercrime and concept cyber-frauds, cybercriminal types with their motives and relate legal issues with respect to cybercrime.
ILO7016.2	Identify the security challenges presented by mobile devices and infer measures for protecting the same.
ILO7016.3	Understand the tools and Methods used in Cyber line
ILO7016.4	Interpret and apply IT law in various legal issues
ILO7016.5	Distinguish different aspects of cyber law
ILO7016.6	Apply Information Security Standards compliance during software design and development

<b>ILO7017</b>	<b>Disaster Management and Mitigation Measures</b>
ILO7017.1	Illustrate scenario of disaster and its effects in India
ILO7017.2	Compare Manmade and Natural disasters and their extent and possible effects on the economy
ILO7017.3	Outline the Government Policies, acts and administration
ILO7017.4	Employ the knowledge of Institutional Framework for Disaster Management in India
ILO7017.5	Apply the knowledge of Financing and Relief Measures
ILO7017.6	Utilize the knowledge of preventive and mitigation measures to know the simple do's and don'ts in disasters

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>ILO7018</b>	<b>Energy Audit and Management</b>
ILO7018.1	Compare the present state of energy security and its importance to achieve sustainability
ILO7018.2	Explore the basic principles and methodologies adopted in energy audit of an utility
ILO7018.3	Evaluate the energy performance of electrical installations and identify the energy saving opportunities
ILO7018.4	Evaluate the energy performance of some common thermal installations and identify the energy saving opportunities
ILO7018.5	Analyse the data collected during performance evaluation and recommend energy saving measures

<b>MEL701</b>	<b>Design of Mechanical System</b>
MEL701.1	Apply the Concept of system Design
MEL701.2	Design the gears and gear box housing
MEL701.3	Design of EOT Crane
MEL701.4	Design of belt conveyer system
MEL701.5	Design engine components such as cylinder,piston,connecting rod and crankshaft
MEL701.6	Design gear pump and centrifugal pump

<b>MEL702</b>	<b>Maintenance Engineering</b>
MEL702.1	Differentiate maintenance tools based on function and application
MEL702.2	Demonstrate assembly and dismantling of mechanical systems
MEL702.3	Apply different maintenance strategies based on function and mode of failure
MEL702.4	Demonstrate the process of servicing a machine
MEL702.5	Identify common faults in Machinery using Vibration Spectrum.
MEL702.6	Interpret the Vibration Signals for Monitoring and Prognosis.

<b>MEL703</b>	<b>Industrial Skills</b>
MEL703.1	Skillfully prepare and edit documents and slides on MS Word and MS Powerpoint.
MEL703.2	Execute functions on MS Excel.
MEL703.3	Navigate tasks and execute functions in G-Suite.
MEL703.4	Understand and practice metacognitive skills of creativity and problem solving.
MEL703.5	Hone team building and leadership skills.

<b>MEP701</b>	<b>Major Project I</b>
MEP701.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEP701.2	implement the appropriate methodology with modern tools.
MEP701.3	Manufacture the product for experimentations and correlate with theoretical/computational results to draw the proper inferences.
MEP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
MEP701.5	Write and present their work effectively with ethical values.
MEP701.6	Engage themselves in their area of interest and explore engineering advancements to structure open problem competency.



**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEC801</b>	<b>Operations Planning and Control</b>
MEC801.1	Illustrate operations functions and manage operations in a better way.
MEC801.2	Apply various strategies to develop aggregate production plan based on the demand forecasting.
MEC801.3	Apply various algorithms in scheduling and sequencing of manufacturing and service operations
MEC801.4	Illustrate Material Requirements Plans (MRP) to estimate the planned order releases.
MEC801.5	Design line balancing to optimize the resources and apply various techniques for facility layout planning
MEC801.6	Demonstrate the importance of implementation of JIT, Lean, Agile and Synchronous manufacturing in manufacturing and service organizations.

<b>MEDLO8051</b>	<b>Composite Materials</b>
MEDLO8051.1	Discuss the different manufacturing methods of composite material.
MEDLO8051.2	Develop relationship in stresses and strains through the elastic constants for a given lamina.
MEDLO8051.3	Evaluate elastic properties of a lamina based on the properties of its constituents.
MEDLO8051.4	Design of lamina under the given loading condition and predict failure.
MEDLO8051.5	Analyse the composite lamina for failures using different inspection methods
MEDLO8051.6	Apply the methods to repair the composites using different methods and repair.

<b>MEDLO8052</b>	<b>Smart Materials</b>
MEDLO8052.1	Classify and select different types of smart materials
MEDLO8052.2	Comprehend Important Concepts and principles of Smart Materials
MEDLO8052.3	Understand and classified the synthesis, sensing and actuation of Piezoelectric Materials, Magneto strictive Materials, Shape Memory Alloys, Electroactive Polymers
MEDLO8052.4	Understand and classified the synthesis, sensing and actuation of Ferrofluids and Magneto rheological Fluids, Soft Matter, Carbon Nanotubes and Carbon nanostructures, Thermoelectric Materials
MEDLO8052.5	Classify and select Smart Materials for Energy Applications: Materials used for energy storage
MEDLO8052.6	Classify and select Composite Materials, Nano Composite Materials

<b>MEDLO8053</b>	<b>Micro Electro Mechanical Systems</b>
MEDLO8053.1	Apply laws of scaling for development of a MEMS device
MEDLO8053.2	Understand the materials and their processing to make MEMS
MEDLO8053.3	Select and use microfabrication techniques for microsystems
MEDLO8053.4	Understand the development of micro sensors and actuators
MEDLO8053.5	Analyze microsystems technology for technical feasibility as well as practicality
MEDLO8053.6	Develop useful applications of MEMS.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>MEDLO8061</b>	<b>Product Design and Development</b>
MEDLO8061.1	Apply concepts of product development and outline product planning process.
MEDLO8061.2	Identify concept generation activities and summarize the methodology involved in concept selection and testing.
MEDLO8061.3	Apply and integrate customer needs in establishing product specifications.
MEDLO8061.4	Apply the various techniques for stimulating creativity and innovation thinking.
MEDLO8061.5	Apply the concepts of Industrial design outlining the human, serviceability and environmental factors considered while designing.
MEDLO8061.6	Apply principles of prototyping in product development.

<b>MEDLO8063</b>	<b>Total Quality Management</b>
MEDLO8063.1	Illustrate significance of Quality Management System and principles of Total Quality Management in organizational development process.
MEDLO8063.2	Use the Quality Control & Quality Management tools in process improvement.
MEDLO8063.3	Apply Statistical Quality Control techniques to improve process quality.
MEDLO8063.4	Use Six Sigma project in Total Quality Management Implementation
MEDLO8063.5	Illustrate Quality Management System and Certifications for Quality Accreditation
MEDLO8063.6	Choose and Apply the advanced tools for Quality Sustainability.

<b>ILO8021</b>	<b>Project Management</b>
ILO8021.1	Apply selection criteria and select an appropriate project from different options
ILO8021.2	Write work break down structure for a project and develop a schedule based on it
ILO8021.3	Identify opportunities and threats to the project and decide an approach to deal with them strategically
ILO8021.4	Use Earned value technique and determine & predict status of the project
ILO8021.5	Capture lessons learned during project phases and document them for future reference

<b>ILO8025</b>	<b>Professional Ethics and CSR</b>
ILO8025.1	Understand rights and duties of business.
ILO8025.2	Analyze and explore duties of business and professional ethics in the marketplace.
ILO8025.3	Analyze and Demonstrate professional ethics of consumer protection and job discrimination.
ILO8025.4	Describe and analyze different aspects of corporate social responsibility
ILO8025.5	Analyze interrelatedness of enterprises and corporate social responsibility.
ILO8025.6	Understand legal aspects of corporate social responsibility.

**Vidyavardhini's College Of Engineering & Technology**  
**Department of Mechanical Engineering**  
**C-2019**

<b>ILO8029</b>	<b>Environmental Management</b>
ILO8029.1	Illustrate the significance of Environment Management and sustainable development
ILO8029.2	Identify Global Environmental Concerns and Hazards
ILO8029.3	Employ the Concept of Ecology and interdependence between ecosystem and living organisms
ILO8029.4	Utilize the knowledge of Scope of Environment Management and Corporate Environmental Responsibility
ILO8029.5	Outline the EMS Certification and ISO-14000
ILO8029.6	Interpret Environment related legislations and acts

<b>MEL801</b>	<b>Product Design and Development</b>
MEL801.1	Explain the need for developing the products
MEL801.2	Select suitable Product Design and Development Processes
MEL801.3	Apply the creativity and industrial design methods to design and develop the chosen product
MEL801.4	Design and Develop product through collaborative work in a team
MEL801.5	Effectively communicate the result of project and other assignment both in written and oral format
MEL801.6	Demonstrate the result of project and other assignment both in written and oral format.

<b>MEL802</b>	<b>Laboratory based on IoT</b>
MEL802.1	Develop simple applications using microcontroller and Arduino platform.
MEL802.2	Interface simple peripheral devices to a Microcontroller
MEL802.3	Interface sensors to a Microcontroller.
MEL802.4	Interface actuators to a Microcontroller.
MEL802.5	Illustrate wireless peripherals for exchange of data
MEL802.6	Setup cloud platform and log sensor data

<b>MEP801</b>	<b>Major Project II</b>
MEP801.1	Identify societal needs, industrial, research problems and investigate them through in-depth literature survey for defining the problem statement.
MEP801.2	Implement the appropriate methodology with modern tools.
MEP801.3	Manufacture the product for experimentations and correlate with theoretical/computational results to draw the proper inferences.
MEP801.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
MEP801.5	Write and present their work effectively with ethical values.
MEP801.6	Engage themselves in their area of interest and explore engineering advancements to structure open problem competency.



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# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>Department of Electronics &amp; Telecommunication Engineering</b>
<b>Academic Year 2022-23</b>
<b>Revise 2019-20</b>
<b>Program Outcomes</b>
<b>PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</b>
<b>PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.</b>
<b>PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.</b>
<b>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.</b>
<b>PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.</b>
<b>PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.</b>
<b>PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</b>
<b>PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</b>
<b>PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</b>
<b>PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</b>
<b>PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</b>
<b>PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.</b>





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>Program Specific Outcomes</b>	
<b>At the end of the program engineering graduate will be able to:</b>	
<b>PSO1. Apply the knowledge of Electronics and Communication to analyse, design and implement application-specific problems with modern tools.</b>	
<b>PSO2: Adapt emerging technologies with continuous learning in the field of Electronics and Telecommunication engineering with appropriate solutions to real life problems.</b>	
<b>Course Outcomes</b>	
<b>At the end of the semester, the student will able to</b>	
<b>FEC101</b>	<b>Engineering Mathematics-I</b>
FEC101.1	Apply the concepts of Complex Numbers to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Compute the partial differentiation of functions of two & three variables.
FEC101.4	Find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Solve the system of linear algebraic and transcendental equation numerically and also by using Scilab.
<b>FEC102</b>	<b>Engineering Physics-I</b>
FEC102.1	Analyse the motion of free particle using time independent & time dependent Schrodinger wave equation
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction technique
FEC102.3	Explore the concepts of semiconductor physics and apply them for applications like LED, photoconductor and photovoltaic cell.
FEC102.4	Employ the concept of interference in thin films in measurements.
FEC102.5	Examine the properties of superconductors and super capacitors and apply them for the applications in-hand
FEC102.6	Explore the properties of engineering materials and their applications



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>FEC103</b>	<b>Engineering Chemistry-I</b>
FEC103.1	Analyse the quality of water and suggest methods of its treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three-dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles
<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Analyse DC circuits and apply Superposition, Thevenin's, Nortons', Maximum Power Transfer theorems to determine their response
FEC105.2	Analyse single-phase AC circuit and determine their response
FEC105.3	Analyse three-phase circuits and determine voltage/current/power relationship in star and delta connections.
FEC105.4	Understand the construction and operation of single-phase transformer and evaluate its equivalent circuit and efficiency.
FEC105.5	Compare single phase & three phase machines on the basis of working principle, constructional details and operation
<b>FEL101</b>	<b>Engineering Physics-I Lab</b>
FEL101.1	Perform the experiments based on interference in thin films and analyse the results.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

FEL101.2	Determine the crystal structure and study/draw miller indices
FEL101.3	Determine energy band gap of semiconductor.
FEL101.4	Study Hall Effect in semiconductor devices
FEL101.5	Design a solution for a real-world problem using knowledge gained in this course
<b>FEL102</b>	<b>Engineering Chemistry-I Lab</b>
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Identify nature of solution based on its pH value.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics Lab</b>
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering Lab</b>
FEL104.1	Implement DC circuits and analyse their behavior using network theorems
FEL104.2	Analyse frequency behavior of RLC circuit and calculate resonance frequency, Bandwidth and Q- factor.
FEL104.3	Determine relationship between voltage/current/power in three phase star/delta circuits.
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency.
FEL104.5	Illustrate the working of Single & Three Phase Induction Motor
<b>FEL105</b>	<b>Basic Workshop practice-I</b>
FEL105.1	Use different fitting tools and perform the basic operations such as square, hexagonal and V male-female joint.
FEL105.2	Develop the skill required for hardware maintenance, and installation of operating system and system drivers.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

FEL105.3	Identify the network components and perform basic networking and crimping.
FEL105.4	Develop the skill to use different plumbing tools and accessories for domestic water line.
<b>FEC201</b>	<b>Engineering Mathematics-II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S.to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solids.
FEC201.6	Solve Differential equations & Definite integrals using Numerically and also by using Scilab.
<b>FEC202</b>	<b>Engineering Physics-II</b>
FEC202.1	Examine the diffraction through single slit and its applications.
FEC202.2	Apply the foundation of laser and fiber optics in development of modern communication technology.
FEC202.3	Explore the fundamentals of Electrodynamics and its application in the field of engineering.
FEC202.4	Explore the fundamentals of special theory of relativity
FEC202.5	Assimilate the scope of nanotechnology in modern developments and its role in emerging innovating applications.
FEC202.6	Select appropriate sensing technology for physical measurements in modern instrumentations.
<b>FEC203</b>	<b>Engineering Chemistry-II</b>
FEC203.1	Identify types of corrosion & select corrosion control measures.
FEC203.2	Analyse the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques and determine possibility of molecular transitions.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Illustrate the principles of green chemistry & examine its environmental impact.





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines and Planes
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Apply the basic principles of projections in converting 3D view to 2D drawing.
FEC204.4	Visualize an object from the given two views.
<b>FEC205</b>	<b>C programming</b>
FEC205.1	Write an algorithm to support Structure Programming approach.
FEC205.2	Use variables, derived data types and control structures to write c program
FEC205.3	Decompose a problem into functions and synthesize a complete program
FEC205.4	Use Array and String for solving complex computational problem
FEC205.5	Use Structure-Union for solving complex computational problem
FEC205.6	Use Pointers for solving complex computational problem
<b>FEC206</b>	<b>Professional Communication and Ethics-I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages
FEC206.4	Write/ Draft academic, business and technical letter/email
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
<b>FEL201</b>	<b>Engineering Physics -II Lab</b>
FEL201.1	Perform the experiments based on diffraction through slits using Laser source and analyse the results.
FEL201.2	Determine the number of lines on the grating surface using LASER Source.
FEL201.3	Perform the experiments using optical fibre and analyse its characteristics
FEL201.4	Perform the experiments on various sensors and analyse the result.
FEL201.5	Implement a solution for a real-world problem using knowledge gained in this course
<b>FEL202</b>	<b>Engineering Chemistry-II Lab</b>



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na, k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Determine saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics Lab</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
<b>FEL204</b>	<b>C programming Lab</b>
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
<b>FEL205</b>	<b>Professional Communication and Ethics-I Lab</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully.
<b>FEL206</b>	<b>Basic Workshop practice-II</b>
FEL206.1	Use different carpentry tools and perform the basic operations like joints and wood turning practise.
FEL206.2	Understand the safe practices to adopt in electrical workshop.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

FEL206.3	Demonstrate the wiring practices for the connection of simple electrical load.
FEL206.4	Demonstrate the use of furnace and produce the simple forging job.
<b>ECC301</b>	<b>Engineering Mathematics III</b>
ECC301.1	Understand and apply the concept of Laplace transform to solve the real integrals in engineering problems.
ECC301.2	Apply the concept of inverse Laplace transform of various functions and its applications in engineering problems.
ECC301.3	Expand the periodic function by using Fourier series for real life problems and complex engineering problems.
ECC301.4	Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function.
ECC301.5	Apply the concept of matrix algebra to solve the engineering problems.
ECC301.6	Apply the concepts of vector calculus in real life problems.
<b>ECC302</b>	<b>Electronic Devices &amp; Circuits</b>
ECC302.1	Understand the working principles of semiconductor devices and its characteristics.
ECC302.2	Illustrate biasing techniques of BJT, JFET and MOSFET.
ECC302.3	Analyse small signal performance parameters for BJT (CE) amplifier and EMOSFET (CS) amplifier
ECC302.4	Illustrate frequency response of BJT and MOSFET amplifier.
ECC302.5	Compare the power amplifier based on efficiency and power consumption.
ECC302.6	Explain the working principal of differential amplifier.
<b>ECC303</b>	<b>Digital System Design</b>
ECC303.1	Understand Number systems and logical operations.
ECC303.2	Explain working of logic gates and logic families.
ECC303.3	Apply the concepts of logic operations to design and implement combinational circuits.
ECC303.4	Apply the concepts of logic operations to design and implement sequential circuits.
ECC303.5	Classify types of memories and Programmable Logic Devices (PLDs).
ECC303.6	Apply concepts of VHDL / Verilog to describe digital circuits.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>ECC304</b>	<b>Network Theory</b>
ECC304.1	Apply the knowledge of KVL and KCL in analyzing Circuits by using network theorems.
ECC304.2	Apply the time and frequency method of analysis.
ECC304.3	Evaluate circuit using graph theory.
ECC304.4	Find the various parameters of two port network.
ECC304.5	Explains network functions for one port and two port and analyse their behaviour in terms of poles and zeros.
ECC304.6	Synthesize the network using passive elements.
<b>ECC305</b>	<b>Electronic Instrumentation &amp; Control Systems</b>
ECC305.1	Explain the working principle of testing and measuring instruments.
ECC305.2	Explain working principle of sensors and transducers with their applications
ECC305.3	Apply various techniques to compute Transfer Function of a system
ECC305.4	Analyze transient and steady-state response of first and second-order control systems for different standard test signals
ECC305.5	Analyze the stability of a system in the time domain
ECC305.6	Analyze stability of a system in the frequency domain
<b>ECL301</b>	<b>Electronic Devices &amp; Circuits Lab</b>
ECL301.1	Explain working principal of electronics devices.
ECL301.2	Observe the characteristics of semiconductor devices.
ECL301.3	Demonstrate the performance of BJT and MOSFET amplifiers.
ECL301.4	Demonstrate the frequency response of an amplifier.
ECL301.5	Demonstrate the performance of power amplifier.
ECL301.6	Demonstrate performance of differential amplifier.
<b>ECL302</b>	<b>Digital System Design Lab</b>
ECL302.1	Implement basic gates using universal gates.
ECL302.2	Demonstrate Boolean functions using logic gates.
ECL302.3	Design and Implement Combinational circuits.
ECL302.4	Demonstrate working of flip flops and their interconversions.
ECL302.5	Design and Implement Sequential circuits.
ECL302.6	Simulate digital circuits using VHDL / Verilog.
<b>ECL303</b>	<b>Electronic Instrumentation &amp; Control Systems Lab</b>
ECL303.1	Demonstrate the performance characteristics of transducers





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECL303.2	Demonstrate the working principle of the bridge circuit
ECL303.3	Demonstrate the response of the Type 0, 1, and 2 systems
ECL303.4	Analyze the transient and steady-state response of a given system
ECL303.5	Analyze the stability of a given system in the time domain.
ECL303.6	Analyze the stability of a given system in the frequency domain
<b>ECL304</b>	<b>Skill Lab: C++ and Java Programming</b>
ECL304.1	Describe the basic principle of C++.
ECL304.2	Apply the concepts of control structures for effective programming in C++.
ECL304.3	Develop programming applications using object-oriented language in C++.
ECL304.4	Describe the basic principle of JAVA.
ECL304.5	Implement different programming applications using JAVA Packaging.
ECL304.6	USE exceptional handling to develop programs in JAVA.
<b>ECM301</b>	<b>Mini Project 1A</b>
ECM301.1	Identify problems based on societal, research, and industry needs.
ECM301.2	Investigate the problem thoroughly and propose an appropriate solution to solve the problem.
ECM301.3	Build PCB layout and fabricate the same.
ECM301.4	Implement and troubleshoot the circuit.
ECM301.5	Develop interpersonal skills to work as a member of a group or leader.
ECM301.6	Write and present their work effectively with ethical values.
<b>ECC401</b>	<b>Engineering Mathematics IV</b>
ECC401.1	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
ECC401.2	Apply the concept of Correlation and Regression to engineering problems in data science, machine learning, and AI.
ECC401.3	Apply the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
ECC401.4	Apply the concept of vector spaces and orthogonalization process in Engineering Problems.
ECC401.5	Use the concept of Quadratic forms and Singular value decomposition which are very useful tools in various Engineering applications.
ECC401.6	Find the extremals of the functional using the concept of Calculus of variation.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>ECC402</b>	<b>Microcontrollers</b>
ECC402.1	Understand the elements of the microprocessor-based system.
ECC402.2	Understand the memory of microprocessor-based system
ECC402.3	Illustrate the detailed architecture of the 8051 microcontrollers.
ECC402.4	Write assembly language program for 8051 microcontroller.
ECC402.5	Illustrate the detailed architecture of advance microcontroller ARM7.
ECC402.6	Illustrate microcontroller-based applications.
<b>ECC403</b>	<b>Linear Integrated Circuits</b>
ECC403.1	Understand the working of OPAMP and its applications.
ECC403.2	Apply the fundamentals of OPAMP in linear IC application.
ECC403.3	Apply the fundamentals of OPAMP in Nonlinear IC application.
ECC403.4	Understand the working of IC 555 and its applications.
ECC403.5	Apply the fundamentals of regulator to design it with given specification.
ECC403.6	Explain the working of special purpose linear IC's.
<b>ECC404</b>	<b>Signals &amp; Systems</b>
ECC404.1	Classify and Analyse different types of signals and systems.
ECC404.2	Analyse continuous time LTI signals and systems in transform domain
ECC404.3	Analyse discrete time LTI signals and systems in transform domain
ECC404.4	Represent signals using Fourier Series and Analyse the systems using the Fourier Transform.
ECC404.5	Classify and realize basic structures of DT systems
ECC404.6	Demonstrate the concepts learnt in Signals and systems Course using modern engineering tools.
<b>ECC405</b>	<b>Principles of Communication Engineering</b>
ECC405.1	Explain the basic components and types of noise in the communication system
ECC405.2	Analyse the concepts of Amplitude Modulation and Demodulation techniques
ECC405.3	Analyse the concepts of Angle Modulation and Demodulation techniques.
ECC405.4	Examine the performance of AM and FM receivers.
ECC405.5	Describe analog and digital pulse modulation and demodulation techniques.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECC405.6	Explain the principles of multiplexing and demultiplexing techniques.
<b>ECL401</b>	<b>Microcontrollers Lab</b>
ECL401.1	Understand different development tools required to develop microcontroller-based systems
ECL401.2	Write a program for arithmetic and logical operations.
ECL401.3	Write a program using code conversion and data transfer operation.
ECL401.4	Write an assembly language program for arrays.
ECL401.5	Write assembly language programs for general-purpose I/O, Timers, and interrupts.
ECL401.6	Write a program to interface input-output device with 8051 microcontroller.
<b>ECL402</b>	<b>Linear Integrated Circuits Lab</b>
ECL402.1	Understand the workings of OPAMP and its application.
ECL402.2	Demonstrate the performance of linear applications using OPAMP.
ECL402.3	Demonstrate the performance of nonlinear applications using OPAMP.
ECL402.4	Implement Astable and Monostable multivibrators using IC 555 with given specifications.
ECL402.5	Demonstrate the Regulation characteristics of the voltage regulator.
ECL402.6	Simulate any application of linear ICs using Simulation Software.
<b>ECL403</b>	<b>Principles of Communication Engineering Lab</b>
ECL403.1	Demonstrate AM transmission systems in time and frequency domain using hardware and software (MATLAB)
ECL403.2	Demonstrate FM transmission systems in time and frequency domain using hardware and software (MATLAB)
ECL403.3	Demonstrate AM and FM radio receivers and observe waveforms in time and frequency domain
ECL403.4	Implement PWM modulation and demodulation circuit using 555 IC and observe waveforms.
ECL403.5	Verify the Sampling theorem in (MATLAB) and observe the effect by changing the sampling frequency
ECL403.6	Demonstrate the working principle of Time Division Multiplexing/ Demultiplexing.
<b>ECL404</b>	<b>Skill Lab: Python Programming</b>



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECL404.1	Understand the syntax and semantics in Python
ECL404.2	Illustrate functions and file-handling operations.
ECL404.3	Demonstrate the concept of object-oriented programming in Python
ECL404.4	Demonstrate the concept of GUI and image processing in Python
ECL404.5	Use Python libraries for various applications
ECL404.6	Implement machine learning applications using Python
<b>ECM401</b>	<b>Mini Project 1B</b>
ECM401.1	Identify problems based on societal, research, and industry needs.
ECM401.2	Investigate the problem thoroughly and propose appropriate solutions to solve the problem.
ECM401.3	Apply the knowledge of interfacing devices to Arduino/Raspberry pi.
ECM401.4	Implement and troubleshoot the proposed method using Arduino/Raspberry pi.
ECM401.5	Develop interpersonal skills to work as a member of a group or leader.
ECM401.6	Write and present their work effectively with ethical values.
<b>ECC501</b>	<b>Digital Communication</b>
ECC501 .1	Apply the concepts of information theory in source coding.
ECC501 .2	Compare different error control systems and apply various error detection codes.
ECC501 .3	Analyze different error correction codes
ECC501 .4	Compare various baseband transmission methods for digital signals
ECC501 .5	Evaluate the performance of optimum baseband detection in the presence of white noise
ECC501 .6	Compare the performances of different digital modulation techniques.
<b>ECC502</b>	<b>Discrete-Time Signal Processing</b>
ECC502 .1	Analyse discrete-time systems using DFT and FFT.
ECC502 .2	Design digital IIR filters for given specifications.
ECC502 .3	Design digital FIR filters for given specifications.
ECC502 .4	Analyse different realization structures of Digital IIR and FIR filters.
ECC502 .5	Analyze the impact of finite word length on the performance of digital filters.
ECC502 .6	Apply signal processing concepts and algorithms in biomedical and audio signal processing applications.





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>ECC503</b>	<b>Digital VLSI</b>
ECC503.1	Illustrate MOS operation and fabrication process.
ECC503.2	Illustrate the performance parameters of the CMOS inverter.
ECC503.3	Realize combinational and sequential circuits using different design styles and compare their performance parameter.
ECC503.4	Explain the operation of semiconductor memories.
ECC503.5	Illustrate data path elements and system-level design issues.
ECC503.6	Illustrate the RTL Design Process with its Case Studies.
<b>ECC504</b>	<b>Random Signal Analysis</b>
ECC504.1	Apply theory of probability and solve relevant problems
ECC504.2	Differentiate continuous and discrete random variables and their distributions.
ECC504.3	Apply the concepts of expectations and functions of one-dimensional random variables to solve relevant problems.
ECC504.4	Apply the concepts of expectations and functions of multi-dimensional Random variables to solve relevant problems.
ECC504.5	Apply fundamentals of Random process in identifying it's type.
ECC504.6	Explain linear regression algorithms for predictive applications.
<b>ECCDLO5013</b>	<b>IT Infra and Security</b>
ECCDLO5013.1	Explain the fundamentals of IT Infrastructure and its Management.
ECCDLO5013.2	Understand the concept of Access Control Policies and Models, Authentication, and Access Control Services.
ECCDLO5013.3	Illustrate software vulnerabilities and attacks.
ECCDLO5013.4	Analyze the protection mechanisms for operating systems and database security.
ECCDLO5013.5	Explore the security aspects of wireless network infrastructure and protocols.
ECCDLO5013.6	Investigate the different attacks on Web Applications and Web services.
<b>ECCDLO5014</b>	<b>Data Structures and Algorithm</b>
ECCDLO5014.1	Understand the fundamentals of data structures and asymptotic analysis of functions.
ECCDLO5014.2	Apply various operations on stack and queue data structures and their applications.
ECCDLO5014.3	Apply addition and deletion operations on the Linked list data structures.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECCDLO5014.4	Apply insertion, deletion, and searching operations on trees and graphs.
ECCDLO5014.5	Select a suitable searching & sorting technique for a database application.
ECCDLO5014.6	Select a suitable hash function and collision resolution technique for a database application.
<b>ECCDLO5015</b>	<b>Sensor Technology</b>
ECCDLO5015.1	Understand the transduction principle of various sensors.
ECCDLO5015.2	Select sensors suitable for the required application
ECCDLO5015.3	Illustrate working of various MEMS sensors and actuators for a particular application
ECCDLO5015.4	Analyze wireless sensing techniques for various application
ECCDLO5015.5	Explain data acquisition and signal conditioning methods.
ECCDLO5015.6	Create an application using various sensor technologies.
<b>ECL501</b>	<b>Digital Communication Lab</b>
ECL501.1	Compare various source coding schemes
ECL501.2	Design and simulate different error correction codes
ECL501.3	Design and simulate cyclic encoder and decoder
ECL501.4	Students will be able to Compare various line coding techniques
ECL501.5	Implement and analyze various digital modulation techniques
ECL501.6	Students will be able to Compare various source coding schemes
<b>ECL502</b>	<b>Discrete-Time Signal Processing Lab</b>
ECL502.1	Apply different operations on discrete signals using MATLAB
ECL502.2	Determine the output response of the digital filter using different convolution methods in MATLAB.
ECL502.3	Design Butterworth IIR digital filters for given specifications using MATLAB.
ECL502.4	Analyze the response of FIR filters using MATLAB.
ECL502.5	Analyze the realization methods of IIR filters using the MATLAB Simulink tool.
ECL502.6	Analyze frequency response and pole-zero plots of frequency selective filters using MATLAB
<b>ECL503</b>	<b>Digital VLSI Lab</b>
ECL503.1	Observe the Characteristics of MOSFET for various performance parameters.
ECL503.2	Observe the transfer characteristics of the CMOS inverter.
ECL503.3	Implement combinational circuits using LT spice.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECL503.4	Sketch the layout for combinational circuits using different design styles.
ECL503.5	Implement sequential circuits using LT spice.
ECL503.6	Sketch the Datapath component.
<b>ECL504</b>	<b>Business Communication and Ethics Lab/Professional Communication &amp; Ethics - II</b>
ECL504.1	Write technical papers and solicited and unsolicited proposals effectively.
ECL504.2	Write a cover letter and prepare a resume, and statement of purpose, participate in GD, and apply for personal interviews.
ECL504.3	Understand the roles and responsibilities of the members of the meeting, prepare meeting documentation, and participate as a member in a meeting.
ECL504.4	Deliver technical business presentations individually and contribute as a team member to building content and visuals in GD
ECL504.5	Demonstrate skills like leadership, motivation, negotiation, etc during their projects.
ECL504.6	Understand Intellectual property rights and demonstrate ethical conduct while analyzing technical papers.
<b>ECM501</b>	<b>Mini Project 2A Embedded System Project</b>
ECM501.1	Understand embedded systems and various Microcontrollers.
ECM501.2	Identify problems based on societal, research, and industry needs.
ECM501.3	Investigate the problem thoroughly and propose an appropriate solution to solve the problem.
ECM501.4	Implement and troubleshoot the proposed method using a Microcontroller
ECM501.5	Develop interpersonal skills to work as a member of a group or leader.
ECM501.6	Write and present their work effectively with ethical values.
<b>ECC601</b>	<b>Electromagnetics and Antenna</b>
ECC601.1	Explain the electromagnetic field including static and dynamic in terms of Maxwell's equations.
ECC601.2	Apply Maxwell's equation to solve various electromagnetic phenomena.
ECC601.3	Explain the fundamentals of Antennas, EM wave radiation, and linear wire antenna elements.
ECC601.4	Design different types of Antenna arrays.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECC601.5	Explain the working of special types of Antennas and their properties.
ECC601.6	Describe the concept of radio wave propagation.
<b>ECC602</b>	<b>Computer Communication Networks</b>
ECC602.1	Explain network topologies, hardware devices, addressing schemes, and protocol stacks.
ECC602.2	Compare various transmission media and broadband technologies.
ECC602.3	Analyze the flow control, error control, and medium access control techniques.
ECC602.4	Design computer networks using IP addressing and subnetting schemes.
ECC602.5	Analyse connection-oriented and connectionless services.
ECC602.6	Describe application layer protocols.
<b>ECC603</b>	<b>Image Processing and Machine Vision</b>
ECC603.1	Apply basic fundamentals of image processing for various applications
ECC603.2	Analyze image enhancement using spatial and frequency domain techniques.
ECC603.3	Analyze images using morphology and restoration techniques.
ECC603.4	Apply image segmentation algorithms based on the principle of discontinuity and similarity
ECC603.5	Explain the concept of machine vision and descriptors
ECC603.6	Describe machine vision algorithms for image classification.
<b>ECC604</b>	<b>Artificial Neural Network and Fuzzy Logic</b>
ECC604.1	Apply the basic concepts of neural networks in applications.
ECC604.2	Analyse the supervised learning algorithms.
ECC604.3	Analyse Unsupervised Learning algorithms for Mean Square Error and Sum Squared Error, Gradient Descent
ECC604.4	Explain the basic concept of Machine Learning and its algorithms.
ECC604.5	Understand and explain the architecture of CNN and its application in image classification.
ECC604.6	Analyze the application of neural networks and fuzzy logic to real-world problems.
<b>ECCDLO6014</b>	<b>Database Management System</b>
ECCDLO6014.1	Describe the fundamentals of database systems, different data models, and design issues in databases.





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECCDLO6014.2	Design ER diagram & relational schema for the problem definition
ECCDLO6014.3	Differentiate between Relational Algebra and calculus for computational capabilities and apply concepts of normalization.
ECCDLO6014.4	Implement views, and constraints and query the database using SQL to retrieve the data from the database
<b>ECCDLO6015</b>	<b>IoT and Industry</b>
ECCDLO6015.1	Explain the Basics of IoT & M2M communication using Case Studies.
ECCDLO6015.2	Illustrate various protocols of web connectivity.
ECCDLO6015.3	Understand and use tools for data management and analytics in IoT.
ECCDLO6015.4	Explain various frameworks for industry 4.0 standards.
ECCDLO6015.5	Illustrate case studies on applications of IIOT.
ECCDLO6015.6	Understand advanced concepts and applications of industry 4.0
<b>ECL601</b>	<b>Electromagnetics and Antenna Lab</b>
ECL601.1	Demonstrate the radiation pattern plot and calculate beam width, front/back ratio, and gain of wire antennas.
ECL601.2	Design and analyze the performance of antenna arrays for given specifications using MATLAB
ECL601.3	Demonstrate the radiation pattern plot and calculate beam width, front/back ratio, and gain of reflector antenna
ECL601.4	Design and analyze the performance of Microstrip antenna for given specifications using simulation software HFSS.
ECL601.5	Demonstrate the radiation pattern plot and calculate beam width, front/back ratio, and gain of Horn antenna
ECL601.6	Design and analyze the radiation patterns of antennas using simulation software 4NEC2.
<b>ECL602</b>	<b>Computer Communication Networks Lab</b>
ECL602.1	Demonstrate knowledge of small or medium-sized computer network that meets a customer 's specific needs.
ECL602.2	Perform configurations on routers and Ethernet switches.
ECL602.3	Compare routing algorithms and protocols.
ECL602.4	Simulate computer networks for services and analyze the simulation results.
ECL602.5	Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model.
ECL602.6	Analyse connectionless and connection-oriented services and protocols.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

<b>ECL603</b>	<b>Image Processing and Machine Vision Lab</b>
ECL603.1	Analyze grayscale resolution using point processing algorithms in python.
ECL603.2	Implement histogram equalization for image enhancement using Python
ECL603.3	Analyze spatial domain and frequency domain filtering for image enhancement using Python.
ECL603.4	Apply morphological operations for various image processing applications using Python.
ECL603.5	Apply basic concepts of Neural Networks for image processing using Python.
ECL603.6	Apply image processing base algorithms for real-time applications.
<b>ECL604</b>	<b>Skill Lab: Linux and Networking and Server Configuration</b>
ECL604.1	Demonstrate installation Linux using Debian, Ubuntu, or Kali Linux platform and execute standard Linux commands.
ECL604.2	Implement Process management, scheduling, and Inter-process communication in Linux.
ECL604.3	Implement shell script programs for common administrative tasks and managing user accounts.
ECL604.4	Implement shell script programs for conditional and looping statements in bash.
ECL604.5	Configure DHCP server, DNS server, and NFS file server.
ECL604.6	Configure and Deploy Mail server, Telnet server, FTP server, and Web server.
<b>ECM601</b>	<b>Mini Project 2B- FPGA-based Projects</b>
ECM601.1	Understand various FPGA families and methods of FPGA synthesis and implementation.
ECM601.2	Identify problems based on societal, research, and industry needs.
ECM601.3	Investigate the problem thoroughly and propose an appropriate solution to solve the problem.
ECM601.4	simulate and synthesize circuits in Verilog HDL.
ECM601.5	Develop interpersonal skills to work as a member of a group or leader
ECM601.6	Write and present their work effectively with ethical values.
<b>ECC701</b>	<b>Microwave Engineering</b>
ECC701.1	Illustrate transmission line parameters and design distributed Impedance matching networks.



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECC701.2	Analyze the different modes of rectangular waveguides for the various parameters.
ECC701.3	Analyze the waveguide multiport junctions and their applications.
ECC701.4	Analyze the microwave linear and cross-field tubes for various parameters.
ECC701.5	Illustrate the working principle of microwave semiconductor devices.
ECC701.6	Describe the different microwave measurement techniques for different parameters.
<b>ECC702</b>	<b>Mobile Communication System</b>
ECC702.1	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems
ECC702.2	Classify different types of propagation models and analyze the link budget.
ECC702.3	Compare and contrast GSM, GPRS, HSCSD, EDGE, and IS-95 Technologies
ECC702.4	Apply the concepts of 3G technologies for UMTS and CDMA 2000.
ECC702.5	Describe the features and working principles of 3GPP LTE.
ECC702.6	Discuss the emerging technologies for upcoming mobile communication systems.
<b>ECCDLO 7012</b>	<b>Deep Learning</b>
ECCDLO 7012.1	Understand the fundamentals of Deep Learning.
ECCDLO 7012.2	Apply knowledge of deep Learning in TensorFlow.
ECCDLO 7012.3	Apply the Regularization and Optimization techniques of deep learning models.
ECCDLO 7012.4	Compare architectures of Convolution Neural Networks based on its evaluation parameters.
ECCDLO 7012.5	Analyze the Architecture of Recurrent Neural Network and its application.
ECCDLO 7012.6	Able analyse the types of Autoencoders and their real-life applications
<b>ECCDLO 7013</b>	<b>Cloud Computing</b>
ECCDLO 7013.1	Explain the fundamentals of cloud computing.
ECCDLO 7013.2	Interpret the significance of virtualization in the context of cloud computing
ECCDLO 7013.3	Illustrate cloud computing services working on AWS, Azure, and Google Cloud platforms



# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECCDLO 7013.4	Determine design aspects of cloud computing for Various services.
ECCDLO 7013.5	Interpret security aspects of cloud computing.
ECCDLO 7013.6	Use of cloud computing in emerging technology.
<b>ECCDLO 7023</b>	<b>Internet Communication Engineering</b>
ECCDLO 7023.1	Explain internet standards and architecture model
ECCDLO 7023.2	Illustrate application layer protocols in the internet
ECCDLO 7023.3	Justify the internet security protocols to address safety concerns in the society.
ECCDLO 7023.4	Illustrate relevant protocols and compression algorithms for various multimedia standards
ECCDLO 7023.5	Compare integrated & differentiated service models for quality of service.
ECCDLO 7023.6	Discuss new networking trends in industry and automation.
<b>ECL701</b>	<b>Microwave Engineering Lab</b>
ECL701.1	Analyse S-parameters and design distributed types
ECL701.2	Design the transmission lines using simulation software.
ECL701.3	Design rectangular waveguide using simulation software.
ECL701.4	Demonstrate the characteristics of waveguide junctions.
ECL701.5	Analyze characteristics of different modes of Reflex Klystron.
ECL701.6	Determine the VSWR, Frequency, and wavelength of the signal.
<b>ECL702</b>	<b>Mobile Communication System Laboratory</b>
ECL702.1	Demonstrate the effect of cellular system design parameters on system capacity and quality of service.
ECL702.2	Implement orthogonal codes of length n for 2G and G mobile systems and verify properties.
ECL702.3	Analyze the effect of load on call blocking probability in GSM and CDMA systems
ECL702.4	Examine the effect of small-scale fading parameters on the performance of radio channel characteristics.
ECL702.5	Analyse link budget for various propagation path-loss models.
ECL702.6	Analyze the effect of multipath diversity on Bit Error Rate.
<b>ECC801</b>	<b>Optical Communication and Networks</b>
ECC801.1	Explain the significance of fiber optic communication, it's ents.
ECC801.2	Analyze transmission characteristics of optical fiber Communication.





# Vidyavardhini's College of Engineering & Technology

## Department of Electronics and Telecommunication Engineering

ECC801.3	Illustrate the working principles and characteristics of Optical Sources and detectors.
ECC801.4	Distinguish network system components and Multiplexing schemes SDH, PDH, and WDM for Different real-time applications
ECC801.5	Illustrate the concept of optical packet-switching and Access Networks.
ECC801.6	Describe the transmission system model, network management functions, and next-generation optical networks.
<b>ECCDLO 8013</b>	<b>Wireless Networks</b>
ECCDLO 8013.1	Explain fundamental architecture, design issues, and standards of wireless networks.
ECCDLO 8013.2	Compare different types of Personal Area Network (PAN) technologies such as ZigBee, Bluetooth, UWB, NFC and WPAN.
ECCDLO 8013.3	Analyze different LAN topologies, technologies, and ad hoc networks.
ECCDLO 8013.4	Compare various types of network protocols, ad hoc Vehicle networks and Wireless MANs.
ECCDLO 8013.5	Evaluate the planning and design of the Performance of GSM and CDMA systems in Wireless WANs.
ECCDLO 8013.6	Explain the basic network architecture of Wireless sensor Networks for IoT applications.
<b>ECCDLOC 8023</b>	<b>Network Management in Telecommunication</b>
ECCDLOC 8023.1	Understand the concepts of network management in telecommunications (NMT), architectures, and protocols.
ECCDLOC 8023.2	Differentiate between network management models.
ECCDLOC 8023.3	Apply network management fundamental principles in TCP/IP.
ECCDLOC 8023.4	Understand the TMN framework.
ECCDLOC 8023.5	Understand the network management TMN management services.
ECCDLOC 8023.6	Describe Broadband networks, its services, and ATM
<b>ECL801</b>	<b>Optical Communication and Networks Laboratory</b>
ECL801.1	Observe different parameters for the propagation of light inside the optical fiber.
ECL801.2	Illustrate fiber optic links to find propagation losses.
ECL801.3	Observe the performance characteristics of the optical source and detector.



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## Department of Electronics and Telecommunication Engineering

ECL801.4	Illustrate the optical link to find bandwidth.
ECL801.5	Estimate link power and rise time budget in optical Network.
ECL801.6	Implement an optical network using the simulator.
<b>ECP801</b>	<b>Major Project-II</b>
ECP801.1	Explore beyond the curriculum to identify the problem of society, industrial or research needs to investigate the problem through an in-depth literature survey and propose appropriate solutions to solve the problem.
ECP801.2	Implement the methodology with modern tools and provide sustainable solutions with effective utilization of the resources available.
ECP801.3	Analyze and compare the results with the standard results.
ECP801.4	Work as an individual and contribute as a team member with Effective management skills to achieve a common objective.
ECP801.5	Write and present their work effectively with ethical values.
ECP801.6	Engage themselves in areas of their interest by applying the knowledge gained and explore new technical trends.



*A. Ruperec*

Dr. Amtria Ruperec

(HoD, EXTC)

**HEAD**

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**Vidyavardhini's college of Engineering & Technology Vasai(w)**  
**Department of Computer Engineering**  
**Course Outcomes for R-2019 Syllabus**

<b>Program Outcomes</b>	
<b>PO1. Engineering knowledge:</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2. Problem analysis:</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3. Design/development of solutions:</b>	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4. Conduct investigations of complex problems:</b>	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5. Modern tool usage:</b>	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO6. The engineer and society:</b>	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO7. Environment and sustainability:</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8. Ethics:</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9. Individual and teamwork:</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10. Communication:</b>	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11. Project management and finance:</b>	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12. Life-long learning:</b>	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
<b>Program Specific Outcomes</b>	
<b>PSO1:</b>	Analyze problems and design applications of database, networking, security, web technology, cloud computing, machine learning using mathematical skills, and computational tools.
<b>PSO2:</b>	Develop computer-based systems to provide solutions for organizational, societal problems by working in multidisciplinary teams and pursue a career in the IT industry.
<b>Course Outcomes</b>	
<b>At the end of the semester student will able to</b>	
<b>FEC101</b>	<b>Applied Mathematics I</b>
FEC101.1	Apply the concepts of Complex Numbers, to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Apply Compute the partial differentiation of functions of two & three variables.
FEC101.4	Apply find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Apply the concept of Numerical Methods to solve system of linear algebraic equations, transcendental equation.
<b>FEC102</b>	<b>Applied Physics I</b>
FEC102.1	Know the fundamentals of quantum mechanics and its applications.
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Bragg's diffractometer
FEC102.3	Apply concepts of semiconductor physics to understand principle and working of LED, photoconductor and photovoltaic cell.
FEC102.4	Use concept of interference in thin films in measurements.
FEC102.5	Discuss properties of superconductors and super capacitor.
FEC102.6	Know the principles of engineering materials.
<b>FEC103</b>	<b>Applied Chemistry I</b>
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles

<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Analyze DC circuits and apply Superposition, Thevenin's Norton's, Maximum power transfer theorems to determine their response.
FEC105.2	Analyse 1- $\Phi$ AC circuits and determine their response.
FEC105.3	Analyse 3- $\Phi$ circuits and determine voltage-current relationship in star and delta connection.
FEC105.4	Perform oc/sc test on 1- $\Phi$ Transformer and evaluate /determine its equivalent circuit and efficiency.
FEC105.5	Understand the working principle, constructional details and operation of 1- $\Phi$ & 3- $\Phi$ Machines.
<b>FEL101</b>	<b>Engineering Physics-I Lab</b>
FEL101.1	Draw Miller indices for a given unit cell.
FEL101.2	Calculate energy band gap of semiconductor for a given semiconductor material.
FEL101.3	Calculate Hall coefficient of material and carrier concentration of a given material.
FEL101.4	Calculate radius of curvature of a lens using Newton's ring set up.
FEL101.5	Calculate thickness of paper using Wedge shape film.
<b>FEL102</b>	<b>Engineering Chemistry-I Lab</b>
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of different solutions using PH meter.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics Lab</b>
FEL103.1	Verify the law of polygon, Varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering</b>
FEL104.1	Implement DC circuits and analyze their behavior using network theorem
FEL104.2	Implement RLC circuit and calculate resonance frequency, Bandwidth and Q-factor
FEL104.3	Determine relationship between line/ phase voltage/ current in three phase star / delta circuit
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency
FEL104.5	Identify the components of a D.C. Machine
FEL104.6	
<b>FEL105</b>	<b>Basic Workshop Practice I</b>
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail lap joint.
FEL105.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL105.3	Perform various basic House Wiring techniques while taking care of electrical safety.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
<b>FEC201</b>	<b>Applied Mathematics II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S. to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area & Mass.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solid.
FEC201.6	Solve Differential equations & Definite integrals using Numerical Methods.
<b>FEC202</b>	<b>Applied Physics II</b>
FEC202.1	Calculate wavelength of light using diffraction grating and resolving power of grating.
FEC202.2	Apply the principles of Laser and fibre optics in modern communication technology.
FEC202.3	Relate the fundamentals of electrodynamics for satellite communication, antenna theory.
FEC202.4	Know the fundamentals of relativity.
FEC202.5	Select Tools for characterisation of nanomaterials and method to synthesize nanomaterial
FEC202.6	Classify sensors based on their sensing technique.
<b>FEC203</b>	<b>Applied Chemistry II</b>
FEC203.1	Identify types of corrosion & discuss corrosion control measures.
FEC203.2	Analyse the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Understand the principles of green chemistry &
<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Visualize the given 3D object and draw Orthographic projections
FEC204.4	Draw Isometric view from the given orthographic projections
FEC204.5	Draw Orthographic and Isometric Projection using AutoCad



<b>FEC205</b>	<b>C programming</b>
FEC205.1	Identify the terminologies in operating system used for computer programming and illustrate the algorithms to support Structure
FEC205.2	Use Variables, derived data types and control structures to write C program.
FEC205.3	Implement solutions to the problem using strings and functions.
FEC205.4	Decompose a problem into functions and synthesize a complete program.
FEC205.5	Structure-Union and Files for solving complex Computational problem.
FEC205.6	Use Pointers for solving complex Computational problem.
<b>FEC206</b>	<b>Professional Communication and Ethics- I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages.
FEC206.4	Write/ Draft academic, business and technical letter/email.
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
<b>FEL201</b>	<b>Engineering Physics-II Lab</b>
FEL201.1	Calculate wavelength of given colour using diffraction grating
FEL201.2	Calculate number of lines on the grating using Laser source
FEL201.3	Calculate numerical aperture of an optical fibre
FEL201.4	Determine I-V characteristics of photodiode
FEL201.5	Calculate volume of room using ultrasonic distance meter.
<b>FEL202</b>	<b>Engineering Chemistry-II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na,k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics Lab</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
<b>FEL204</b>	<b>C programming Lab</b>
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
<b>FEL205</b>	<b>Professional Communication and Ethics- I Lab</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully
<b>FEL201</b>	<b>Basic Workshop Practice II</b>
FEL201.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL201.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL201.4	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking
<b>CSC301</b>	<b>Engineering Mathematics-III</b>
CSC301.1	Apply the concept of Laplace transform and its application to solve the real integrals in engineering problems.
CSC301.2	Apply the concept of inverse Laplace transform of various functions and its application in engineering problems.
CSC301.3	Expand the periodic function by using the fourier series for real life problems and complex engineering problems.
CSC301.4	Apply complex variable theory,application of harmonic conjugate to get orthogonal trajectories and analytic functions.
CSC301.5	Apply the concept of correlation and Regression to the engineering problems .
CSC301.6	Apply the concept of probability and expectation for getting the spread of the data and distribution of probabilities.
<b>CSC302</b>	<b>Discrete Structures and Graph Theory</b>
CSC302.1	Apply logical reasoning methods for problem solving .
CSC302.2	Apply set notations ,functions and relations for problem solving.
CSC302.3	Analyze posets and Lattice using relations .

CSC302.4	Solve problems using counting techniques .
CSC302.5	Use of groups and codes in Encoding-Decoding
CSC302.6	Use graphical terminologies to identify connected and isomorphic graphs.
<b>CSC303</b>	<b>Data Structure</b>
CSC303.1	Identify the Linear and Non Linear Data Structures for a given problem
CSC303.2	Apply insertion, deletion operations on stacks and queue data structures.
CSC303.3	Apply insertion and deletion operations on Linked Lists
CSC303.4	Apply insertion,deletion and searching operations on AVL, B Tree, B+ Tree, Expression Tree, Huffman Encoding
CSC303.5	Examine Graph Traversal algorithms to determine shortest path and connectivity between nodes
CSC303.6	Select appropriate searching technique and hashing function for a database application
<b>CSC304</b>	<b>Digital Logic &amp; Computer Organization and Architecture</b>
CSC304.1	Convert one number system to another and realize logic circuits using basic/universal gates.
CSC304.2	Apply the arithmetic algorithms to solve ALU operations.
CSC304.3	Analyze the truth table of digital components and identify the elements, their functions in processor architecture.
CSC304.4	Compare a hardwired / microprogrammed control unit.
CSC304.5	Classify parameters of cache and implement memory mapping techniques.
CSC304.6	Compare serial/parallel processing and ISA, PCI, USB buses.
<b>CSC305</b>	<b>Computer Graphics</b>
CSC305.1	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSC305.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSC305.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSC305.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSC305.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSC305.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
<b>CSL301</b>	<b>Data Structures Lab</b>
CSL301.1	Implement Linear Data Structure and handle insertion, deletion, traversal operations using array.
CSL301.2	Apply stack operations to convert and evaluate expression
CSL301.3	Implement linear, circular or priority queues using arrays
CSL301.4	Implement Singly, Circular or Doubly Linked list
CSL301.5	Implement Abstract data type using Linked list
CSL301.6	Implement Graph Traversal Techniques: BFS and DFS.
<b>CSL302</b>	<b>Digital Logic &amp; Computer Organization and Architecture Lab</b>
CSL302.1	Verify the truth table of logic, universal gates, and realize logic circuits using hardware.
CSL302.2	Implement combinational circuits design using hardware.
CSL302.3	Implement sequential & code conversion circuits design using hardware.
CSL302.4	Write Booth's, Restoring, and Non-Restoring algorithms for arithmetic operations using C-Programming language.
CSL302.5	Implement ripple carry adder, carry look ahead adder, ALU design using virtual lab.
CSL302.6	Implement CPU, memory and Cache memory designs using a virtual lab.
<b>CSL303</b>	<b>Computer Graphics Lab</b>
CSL303.1	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSL303.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSL303.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSL303.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSL303.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSL303.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
<b>CSL304</b>	<b>Skill based Lab Course: Object Oriented Programming with Java</b>
CSL304.1	Apply programming constructs of decision making and looping for solving arithmetic problems.
CSL304.2	Apply the concept of packages, classes and objects for solving given problem.
CSL304.3	Use strings, arrays and vectors for solving given problem.
CSL304.4	Implement the concept of inheritance and interfaces.
CSL304.5	Implement the concept of exception handling and multithreading.
CSL304.6	Develop GUI based application.
<b>CSM301</b>	<b>Mini Project A</b>
CSM301.1	Identify societal, industrial needs and formulate problem statements followed by requirement analysis.
CSM301.2	Investigate the problem through appropriate literature Surveys.
CSM301.3	Design and develop solution using modern tools for the given problem.
CSM301.4	Work as an individual , contribute as a team member with effective management skills and ethical values.
CSM301.5	Develop effective communication/ technical writing skills through project presentation, Group discussion and report writing activities.
CSM301.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC401</b>	<b>Engineering Mathematics-IV</b>
CSC401.1	Apply the concept of eigenvalues and eigenvectors in engineering problems.
CSC401.2	Apply the concepts of Complex Integration for evaluating integrals,computing residues & evaluate various contour integrals.

CSC401.3	Apply the concept of Z-transformation and inverse in engineering problems.
CSC401.4	Apply the concept of probability distribution and sampling theory to engineering problems
CSC401.5	Apply the concept of Linear Programming Problems to optimization
CSC401.6	Solve Non-Linear Programming Problems for Optimization of engineering problems.
<b>CSC402</b>	<b>Analysis of Algorithms</b>
CSC402.1	Calculate the Space and Time Complexity of algorithms
CSC402.2	Apply Divide and Conquer approach to solve problems and analyze its complexity
CSC402.3	Apply Greedy Methods to solve problems on Single source shortest path and Minimum spanning tree, and analyze its complexity
CSC402.4	Apply Dynamic Programming Approaches to solve problems on Single source and All pair shortest path
CSC402.5	Apply backtracking, and branch & bound strategies to solve problems on decision and optimization
CSC402.6	Apply String Matching techniques for finding the occurrences of patterns in a text
<b>CSC403</b>	<b>Database Management System</b>
CSC403.1	Identify characteristics of database management system.
CSC403.2	Design ER/EER diagram for given case study.
CSC403.3	Construct relational model and apply relational algebra queries for a given problem.
CSC403.4	Apply SQL queries for a given schema.
CSC403.5	Apply normalization techniques to relational database design.
CSC403.6	Use transaction, concurrency and recovery techniques to analyze conflicts in multiple transactions.
<b>CSC404</b>	<b>Operating System</b>
CSC404.1	Identify the objectives, functions and structure of the operating system.
CSC404.2	Analyze performance of Process Scheduling algorithms based on CPU utilization and throughput.
CSC404.3	Use process synchronization techniques for deadlock detection, prevention, recovery.
CSC404.4	Analyze performance of memory allocation based on space complexity and page replacement policies based on time complexity.
CSC404.5	Use concepts of file management to access, share and manipulate file systems.
CSC404.6	Evaluate performance of disk scheduling algorithms using concepts of I/O management.
<b>CSC405</b>	<b>Microprocessor</b>
CSC405.1	Identify the components and their functions in Intel 8086 microprocessors.
CSC405.2	Write assembly, mixed language programs using instruction set of 8086 and analyze updated values of control flag after execution of assembly language
CSC405.3	Design 8086 microprocessor-based system for the given specifications using memory and peripheral chips.
CSC405.4	Identify the components and their functions in Intel 80386DX processor.
CSC405.5	Identify the components and their functions in the Pentium processors.
CSC405.6	Compare 8086, 80386, Pentium I, II, III and Identify the components, their functions for Pentium 4: Net burst microarchitecture.
<b>CSL401</b>	<b>Analysis of Algorithms Lab</b>
CSL401.1	Implement and Analyze Time Complexity of Insertion and Selection sort algorithms
CSL401.2	Implement Divide and Conquer approaches to solve problems and analyze its complexity
CSL401.3	Implement Greedy Algorithms for Single source shortest path, Fractional Knapsack, Minimum cost spanning trees
CSL401.4	Implement Dynamic Programming algorithms for Single source shortest path, All pairs Shortest path, 0/1 Knapsack Problem, Travelling Salesperson Problem
CSL401.5	Implement Backtracking, and Branch and Bound algorithms for Nqueen Problem, Sum of Subset Problem, Travelling Salesperson Problem, 15 puzzle problem
CSL401.6	Implement String Matching Techniques
<b>CSL402</b>	<b>Database Management system Lab</b>
CSL402.1	Design ER and EER diagram for the real life problem with software tool.
CSL402.2	Construct database tables with different DDL and DML statements and apply integrity constraints
CSL402.3	Apply SQL queries ,triggers for given Schema
CSL402.4	Apply procedure and functions for given schema
CSL402.5	Use transaction and concurrency control techniques to analyze conflicts in multiple transactions.
CSL402.6	Construct database tables and JDBC/ ODBC connectivity for given application
<b>CSL403</b>	<b>Operating System Lab</b>
CSL403.1	Use the Linux commands to write Shell scripting program using system calls.
CSL403.2	Analyze the performance of process scheduling algorithms based on CPU utilization and throughput.
CSL403.3	Write a program for deadlock detection and avoidance algorithm using C programming language.
CSL403.4	Analyze the performance of memory management techniques based on space complexity.
CSL403.5	Analyze the performance of virtual memory management algorithms based on time complexity.
CSL403.6	Write a program for file management and I/O management techniques using C programming language.
<b>CSL404</b>	<b>Microprocessor Lab</b>
CSL404.1	Write assembly language programs to perform basic arithmetic operations on 8-bit/16-bit data.
CSL404.2	Write assembly language programs for 16-bit addition, subtraction, multiplication, and division (menu based)
CSL404.3	Write assembly language programs based on string instructions.
CSL404.4	Write assembly language program using procedure.
CSL404.5	Write assembly language programs using macros.
CSL404.6	Write a mixed language program.

<b>CSL405</b>	<b>Skill Base Lab Course: Python Programming</b>
CSL405.1	Apply concepts of Input / Output, control statements and object oriented programming in python for performing arithmetic operations
CSL405.2	Use features of files, directories and regular expression in python for file manipulation
CSL405.3	Implement linked list, stacks, queues and dequeues data structures
CSL405.4	Develop Graphical User Interface, perform database operations and create web applications with Django web framework
CSL405.5	Implement multi-threading in python
CSL405.6	Use NumPy and Pandas packages for matrix manipulation and data analysis
<b>CSM401</b>	<b>Mini Project B</b>
CSM401.1	Identify societal, industrial needs and formulate problem statements followed by requirement analysis.
CSM401.2	Investigate the problem through appropriate literature Surveys.
CSM401.3	Design and develop solution using modern tools for the given problem.
CSM401.4	Work as an individual , contribute as a team member with effective management skills and ethical values.
CSM401.5	Develop effective communication/ technical writing skills through project presentation, Group discussion and report writing activities.
CSM401.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC501</b>	<b>Theoretical Computer Science</b>
CSC501.1	Apply NFA/DFA techniques for pattern matching.
CSC501.2	Construct Finite Automata for the given regular expression.
CSC501.3	Apply specified well defined rules for syntax verification.
CSC501.4	Design .pushdown automata to recognize the language.
CSC501.5	Design Turing machine for formal language.
CSC501.6	Use compatibility, decidability, undecidability, complexity classes for formal languages.
<b>CSC502</b>	<b>Software Engineering</b>
CSC502.1	Select process models for software project development.
CSC502.2	Identify requirements, analyze, and prepare Software Requirement Specification document format (IEEE).
CSC502.3	Apply Software Estimation techniques.
CSC502.4	Prepare effective project schedule.
CSC502.5	Design, develop the software projects & identify risks, manage the change to assure quality in software projects.
CSC502.6	Apply testing principles on software projects & maintenance models.
<b>CSC503</b>	<b>Computer Network</b>
CSC503.1	Apply appropriate topologies for end to end communication.
CSC503.2	Compare Twisted pair, Coaxial, Fiber optics transmission media.
CSC503.3	Analyze algorithms for error detection, error correction, multiple access control and identify IP Addressing.
CSC503.4	Analyze routing and congestion control algorithms.
CSC503.5	Apply sliding Window technique for TCP Flow control.
CSC503.6	Use HTTP, SMTP, Telnet, FTP, DHCP protocol at application layer.
<b>CSC504</b>	<b>Data warehousing and mining</b>
CSC504.1	Design a data warehouse for a given application and perform OLAP operations to take business decisions.
CSC504.2	Apply pre-processing techniques for a given data set to perform data cleaning, data transformation, data reduction, and data discretization
CSC504.3	Apply decision tree induction and Bayesian classification on a given data set for prediction
CSC504.4	Apply Partition and Hierarchical Clustering algorithms on a given data set to form the clusters
CSC504.5	Apply association mining techniques to identify interesting patterns
CSC504.6	Apply web mining algorithms on a given data for deriving complex information
<b>CSDO501</b>	<b>Internet Programming</b>
CSDLO5012.1	Develop responsive web page(s) using HTML and CSS
CSDLO5012.2	Design interactive web site using JavaScript
CSDLO5012.3	Develop web page(s) with server side processing using servlets and JSP
CSDLO5012.4	Develop rich internet application web page(s) using AJAX
CSDLO5012.5	Develop web page(s) with XML and PHP extensions
CSDLO5012.6	Develop web applications using React js
<b>CSDO501</b>	<b>Advanced Database Management System</b>
CSDLO5013.1	Design distributed database using query processing techniques.
CSDLO5013.2	Analyze query processing ,transaction and concurrency management techniques to avoid conflicts in multiple transactions.
CSDLO5013.3	Organize the data using XML and JSON database for better interoperability.
CSDLO5013.4	Compare different types of NoSQL databases.
CSDLO5013.5	Formulate NoSQL queries using MongoDB.
CSDLO5013.6	Compare various trends in advance databases through temporal, graph based and spatial based databases.
<b>CSL501</b>	<b>Software Engineering Lab</b>
CSL501.1	Identify requirements and apply software process model to a given case study.
CSL501.2	Design Data Flow Diagrams for given case study.
CSL501.3	Use software engineering tools for project scheduling and preparation of WBS.
CSL501.4	Develop architectural models for the selected case study.
CSL501.5	Develop test cases for the given case study on white box testing.
CSL501.6	Use computer-aided software engineering (CASE) tools.
<b>CSL502</b>	<b>Computer Network Lab</b>
CSL502.1	Use network simulator NS3 to explore networking algorithms and protocols.
CSL502.2	Implement and analyze routing strategies for an IP based networking infrastructure.
CSL502.3	Implement and analyze TCP/UDP socket programming for Chatting Application.



CSL502.4	Apply Linux networking commands for packet filtering.
CSL502.5	Use Network tools and simulators such as NS2, Wireshark etc. to explore networking algorithms and protocols
CSL502.6	Use network simulator NS3 to explore networking algorithms and protocols.
<b>CSL503</b>	<b>Data Warehousing and Mining Lab</b>
CSL503.1	Design data warehouse and perform OLAP operations on a given input.
CSL503.2	Implement Pre-processing and Classification algorithms on a given data set.
CSL503.3	Implement Clustering algorithms on a given data set.
CSL503.4	Implement association rule mining algorithm on a given data set.
CSL503.5	Implement Web Mining algorithms on a given data set.
CSL503.6	Simulate Clustering, Classification and Association mining algorithms using WEKA tool
<b>CSL504</b>	<b>Business Comm. &amp; Ethics II</b>
CSL504.1	Write effective business/ technical documents.
CSL504.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
CSL504.3	Apply various techniques to be successful in group discussions, technical presentation and meetings
CSL504.4	Deliver successful professional presentations.
CSL504.5	Develop creative thinking and interpersonal skills
CSL504.6	Apply codes of ethical conduct & organizational behaviour.
<b>CSM501</b>	<b>Mini Project : 2A</b>
CSM501.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM501.2	Investigate the problem through appropriate literature surveys.
CSM501.3	Design and develop solution using modern tools for the given problem
CSM501.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM501.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM501.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC601</b>	<b>System Programming &amp; Compiler Construction</b>
CSC601.1	Distinguish between application and system programs.
CSC601.2	Design of single pass and two pass assembler.
CSC601.3	Design of two pass macro processor, absolute loader and direct linking loader.
CSC601.4	Demonstrate the compilation process for given program statement.
CSC601.5	To solve the parsing problems using appropriate parsing techniques.
CSC601.6	Apply Intermediate code generation and code optimization techniques on given input program statement.
<b>CSC602</b>	<b>Cryptography &amp; System Security</b>
CSC602.1	Use classical encryption techniques for data encryption.
CSC602.2	Apply symmetric and asymmetric key cryptography to solve confidentiality and authentication problems
CSC602.3	Analyze the cryptographic hash functions and message digest algorithms to check data integrity
CSC602.4	Analyze the cryptographic hash functions and message digest algorithms to check data integrity
CSC602.5	Evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
CSC602.6	Examine malicious code using system security concepts.
<b>CSC603</b>	<b>Mobile Computing</b>
CSC603.1	Identify basic concepts and principles in mobile communication & computing, cellular architecture.
CSC603.2	Identify the components and functioning of mobile networking.
CSC603.3	Classify Medium Access, Internet and Transport Layer Protocols in Mobile networking.
CSC603.4	Apply the concepts of WLAN for local as well as remote applications.
CSC603.5	Apply the concepts of mobility management to solve security issues in Mobile Computing.
CSC603.6	Identify the components of Long-Term Evolution (LTE) architecture.
<b>CSC604</b>	<b>Artificial Intelligence</b>
CSC604.1	Identify the types of environment and illustrate the working of intelligent agents
CSC604.2	Solve given problem using uninformed and informed search techniques.
CSC604.3	Solve given problem using local search and adversarial search techniques
CSC604.4	Use knowledge representation language for knowledge presentation and apply reasoning techniques to solve given problem.
CSC604.5	Use planning techniques to generate a plan for given planning problem.
CSC604.6	Analyze the real world AI applications.
<b>CSDLO6011</b>	<b>Internet of Things(IoT)</b>
CSDLO6011.1	Identify the characteristics and challenges of an IoT application.
CSDLO6011.2	Select appropriate Sensor, Actuators and implement methodology, sensor network for an IoT application.
CSDLO6011.3	Design and manage communication network and process data for an IoT application.
CSDLO6011.4	Select appropriate protocols for web based IoT application.
CSDLO6011.5	Design smart IoT application for societal and industrial need.
CSDLO6011.6	Construct an IoT application using Arduino/Raspberry Pi
<b>CSDLO6013</b>	<b>Quantitative Analysis</b>
CSDLO6013.1	Examine the problem and identify the appropriate presentation method
CSDLO6013.2	Analyze the problem and identify the suitable data collection and the sampling method

CSDLO6013.3	Analyze the data using Regression for the purpose of estimation
CSDLO6013.4	Analyze the data using Multiple Linear Regression for the purpose of estimation
CSDLO6013.5	Analyze the data and identify the appropriate Statistical inference method
CSDLO6013.6	Analyze the data and perform testing of hypothesis
<b>CSL601</b>	<b>System Programming &amp; Compiler Construction Lab</b>
CSL601.1	Design and develop databases for two pass assembler with data structure.
CSL601.2	Design and develop two pass Macro-Processor with data structure.
CSL601.3	Implement Lexical analyzer phase of compiler
CSL601.4	Implement syntax analyzer phase of compiler.
CSL601.5	Implement synthesis phase of compiler.
CSL601.6	Implement synthesis phase of compiler.
<b>CSL602</b>	<b>Cryptography &amp; System Security Lab</b>
CSL602.1	Implement classical encryption techniques
CSL602.2	Implement symmetric and asymmetric key cryptography
CSL602.3	To analyze performance of hashing algorithm
CSL602.4	To Apply digital signature algorithm to verify integrity and achieve authentication
CSL602.5	To use network reconnaissance tools to gather information about networks and use tools like sniffers and ARP spoofing
CSL602.6	To use various attacks like buffer-overflow and web application attack
<b>CSL603</b>	<b>Mobile Computing Lab</b>
CSL603.1	Develop and demonstrate mobile applications using frequency reuse and Bluetooth technologies.
CSL603.2	Implement Code Division Multiple Access (CDMA) to test the orthogonality and autocorrelation of a code.
CSL603.3	Implement security algorithms for mobile communication network
CSL603.4	Configure the access point of Wi-Fi
CSL603.5	Develop mobile application using GUI components and database.
CSL603.6	Use GPS location tracking technology in an application.
<b>CSL604</b>	<b>Artificial Intelligence Lab</b>
CSL604.1	Analyze PEAS descriptors of an Intelligent agent.
CSL604.2	Implement Uninformed searching algorithms for problem solving
CSL604.3	Implement Informed searching algorithms for problem solving.
CSL604.4	Create a knowledge base using any AI language.
CSL604.5	Create Inference system using reasoning technique for given AI problem
CSL604.6	Identify the components of AI applications in the field of NLP and Healthcare.
<b>CSL605</b>	<b>Skill base Lab Course: Cloud Computing</b>
CSL605.1	Create virtual machines using open source technology.
CSL605.2	Compare cloud computing services SaaS/PaaS/IaaS for a given application
CSL605.3	Design and develop real world web applications and deploy them on commercial clouds.
CSL605.4	Deploy cloud services to address security issues .
CSL605.5	Identify commercially available cloud services and recommend the appropriate one for the given application
CSL605.6	Implement the concept of containerization.
<b>CSM601</b>	<b>Mini Project Lab: 2B</b>
CSM601.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM601.2	Investigate the problem through appropriate literature surveys.
CSM601.3	Design and develop solution using modern tools for the given problem
CSM601.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM601.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities
CSM601.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSM601</b>	<b>Mini Project Lab: 2B</b>
CSM601.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM601.2	Investigate the problem through appropriate literature surveys.
CSM601.3	Design and develop solution using modern tools for the given problem
CSM601.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM601.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities
CSM601.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC701</b>	<b>Machine Learning</b>
CSC701.1	Identify a Machine Learning technique for the given problem and understand the concepts of Training Error, Generalization Error, Overfitting and Underfitting
CSC701.2	Apply Regression and Decision Tree techniques on the given data and examine the performance of the model
CSC701.3	Compare and Contrast Ensemble approaches for combining multiple Machine Learning Techniques
CSC701.4	Determine the type of Support Vector Machines variant which can applied on the given data
CSC701.5	Apply Unsupervised Learning technique on the given data for getting insights from unlabeled data
CSC701.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
<b>CSC702</b>	<b>Big Data Analytics</b>
CSC702.1	Identify issues and challenges in Big data analytics.
CSC702.2	Apply Hadoop and MapReduce techniques to solve real world problems.
CSC702.3	Identify suitable NoSQL systems to handle big data.

CSC702.4	Apply filtering techniques, counting distinct element and counting ones in window algorithms on data stream.
CSC702.5	Analyze case study of Big data applications
CSC702.6	Apply statistical computing techniques and graphics for analyzing big data using R programming language.
<b>CSDC7011</b>	<b>Machine Vision</b>
CSDC7011.1	Describe the components of Machine Vision
CSDC7011.2	Perform transformation and interpolation for image, video pre-processing
CSDC7011.3	Identify hardware and software components for machine vision applications
CSDC7011.4	Apply filtering and segmentation techniques for preprocessing of digital image
CSDC7011.5	Apply motion analysis techniques on video for motion tracking
CSDC7011.6	Analyze the case study of machine vision applications
<b>CSDC7013</b>	<b>Natural Language Processing</b>
CSDC7013.1	Identify Challenges of NLP and ambiguities in natural language
CSDC7013.2	Apply Morphological analysis approaches on the given data.
CSDC7013.3	Apply Syntactic analysis approaches on the given data
CSDC7013.4	Apply Semantic Analysis techniques on the given data.
CSDC7013.5	Apply Pragmatic and Discourse Analysis techniques on the given data.
CSDC7013.6	Design NLP based application.
<b>CSDC7021</b>	<b>Augmented and Virtual Reality</b>
CSDC7021.1	Describe working of VR systems
CSDC7021.2	Apply geometric presentation of the virtual world and its operations
CSDC7021.3	Apply the concepts of motion and tracking in VR systems to real world problem
CSDC7021.4	Apply the knowledge of hardware that enables VR systems while developing it.
CSDC7021.5	Apply the knowledge of working of AR systems to analyze the hardware requirement of AR.
CSDC7021.6	Apply the knowledge of AR concepts to select a problem statement which has a better candidature for AR system.
<b>CSDC7022</b>	<b>Block Chain</b>
CSDC7022.1	Explain general blockchain concepts
CSDC7022.2	Apply the knowledge of Cryptocurrency Wallets used in the blockchain
CSDC7022.3	Apply the concepts of smart contracts used in the blockchain
CSDC7022.4	Apply the concept of public blockchain technology
CSDC7022.5	Illustrate the various private blockchain technologies
CSDC7022.6	Evaluate various tools and applications of blockchain
<b>ILO7013</b>	<b>Management Information System</b>
ILO7013.1	Identify the impact of information systems on an organization
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making
ILO7013.3	Identify the threats to information systems and apply security controls for IS
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
<b>ILO7016</b>	<b>Cyber Security and Laws</b>
ILO7016.1	Illustrate the concept of cybercrime, cyber-frauds, cybercriminal types with their motives with respect to cybercrime.
ILO7016.2	Analyze and discriminate cyberattack types with tools used for attacks.
ILO7016.3	Identify the security challenges presented by mobile devices and infer measures for protecting the same.
ILO7016.4	Discover and apply different aspects of cyber law and Information Security Standards compliance.
ILO7016.5	Discover and understand different aspects of cyber laws.
ILO7016.6	Distinguish different aspects of cyber crime and Indian IT Act.
<b>CSL701</b>	<b>Machine Learning Lab</b>
CSL701.1	Analyze the data and Apply appropriate Regression Technique on the given Dataset
CSL701.2	Analyze the results obtained by applying appropriate Classification Technique on the given Dataset
CSL701.3	Analyze the results obtained by applying appropriate Ensemble Technique on the given Dataset
CSL701.4	Apply appropriate Unsupervised Technique on the given Dataset
CSL701.5	Analyze the results obtained by applying Dimensionality Reduction on the given dataset
CSL701.6	Build a Machine Learning Application
<b>CSL702</b>	<b>Big Data Analytics Lab</b>
CSL702.1	Use Sqoop tool in Hadoop ecosystem for big data analytics.
CSL702.2	Implement Map Reduce algorithm on structured and unstructured data
CSL702.3	Perform NoSQL commands on Cassandra, Hadoop HBase and MongoDB
CSL702.4	Implement filtering, counting distinct element and counting ones in window algorithms on data stream.
CSL702.5	Implement data visualization techniques on social network graphs using R
CSL702.6	Built real life application on big data analytics
<b>CSDL7011</b>	<b>Machine Vision Lab</b>
CSDL7011.1	Perform transformation and interpolation for image, video pre-processing
CSDL7011.2	Implement edge detection and depth estimation algorithms using canny
CSDL7011.3	Implement Object segmentation using the Watershed and GrabCut algorithms
CSDL7011.4	Perform face detection algorithms on image/video

CSDL7011.5	Implement Object detection techniques using OpenCV
CSDL7011.6	Implement Bag-of-word(BOW) algorithm to create object detector
<b>CSDL7013</b>	<b>Natural Language Processing Lab</b>
CSDL7013.1	Apply text processing techniques on given input
CSDL7013.2	Apply word level analysis techniques on the given data
CSDL7013.3	Apply Syntax Analysis techniques on the given data
CSDL7013.4	Apply Semantic Analysis techniques on the given data
CSDL7013.5	Apply Discourse Analysis techniques on the given data
CSDL7013.6	Design NLP based application
<b>CSDL7021</b>	<b>Augmented and Virtual Reality Lab</b>
CSDL7021.1	Setup VR development environment like Unity and Visual Studio
CSDL7021.2	Examine working of VR assistants like Google Cardboard, Google Daydream, Samsung gear VR and HTC Vive
CSDL7021.3	Apply the concepts to develop scene in VR environment Unity
CSDL7021.4	Apply the concept of color, material and texture to objects in a scene created in Unity
CSDL7021.5	Apply Rigid body component, material and Box collider to Game Objects
CSDL7021.6	Demonstrate use of Augmented Face Features
<b>CSDL7022</b>	<b>Block Chain Lab</b>
CSDL7022.1	Create Cryptographic merkle root to provide integrity
CSDL7022.2	Create digital signature to perform authentication
CSDL7022.3	Design Smart Contract using Solidity.
CSDL7022.4	Implement ethereum blockchain using Geth
CSDL7022.5	Implement ethereum blockchain using Ganache and Truffle
CSDL7022.6	Use the tool to demonstrate the concept of blockchain in real world application.
<b>CSP701</b>	<b>Major Project 1</b>
CSP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP701.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP701.3	Analyze and compare the results with the standard results.
CSP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP701.5	Write and present their work effectively with ethical values.
CSP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>CSC801</b>	<b>Distributed Computing</b>
CSC801.1	apply the concepts of distributed systems and its types
CSC801.2	illustrate the middleware technologies that support RPC, RMI and object-based middleware
CSC801.3	analyze the techniques used for clock synchronization, mutual exclusion and deadlock
CSC801.4	use the concepts of resource and process management for designing systems
CSC801.5	use the concepts of consistency, replication management and fault tolerance for designing systems
CSC801.6	use the knowledge of distributed file systems to perform file management tasks
<b>CSDC8012</b>	<b>Digital Forensic</b>
CSDC8012.1	Explain the various phases of Digital Forensics and methodology to handle the security incident
CSDC8012.2	Use the process of collection, analysis and recovery of the digital evidence
CSDC8012.3	Apply the knowledge of various tools to analyze malwares and images of hard disk/RAM
CSDC8012.4	Investigate Windows and UNIX systems
CSDC8012.5	Analyze digital evidence in Mobile Devices
CSDC8012.6	Investigate Web Browser, Email and generate report
<b>CSDC8013</b>	<b>Applied Data Science</b>
CSDC8013.1	Understand the concepts of data science
CSDC8013.2	Apply data explorations techniques on the given data
CSDC8013.3	Apply data visualization techniques and validation techniques on the given data
CSDC8013.4	Apply anomaly detection techniques on the given data and deal with the outliers to make the data appropriate for an ML algorithm
CSDC8013.5	Analyze the performance of a model and apply time series forecasting methods
CSDC8013.6	Apply data science techniques on real world applications
<b>CSDC8022</b>	<b>High Performance Computing</b>
CSDC8022.1	Understand parallel and pipeline processing approaches
CSDC8022.2	Design a parallel algorithm to solve computational problems and identify issues in parallel programming.
CSDC8022.3	Analyze the performance of parallel computing systems for clusters in terms of execution time, total parallel overhead, speedup.
CSDC8022.4	Develop efficient and high-performance parallel algorithms using OpenMP and message passing paradigm
CSDC8022.5	Develop high-performance parallel programming using OpenCL and CUDA framework
CSDC8022.6	Perform the range of activities associated with High Performance Computing in Cloud Computing
<b>ILO8021</b>	<b>Project Management</b>
ILO8021.1	Identify appropriate projects from various options and mention their selection criteria.
ILO8021.2	Prepare Project Charter for the selected project
ILO8021.3	Prepare Work Break Down Structure for a project and also prepare a schedule using GANTT chart, CPM, PERT



ILO8021.4	Identify opportunities and threats to decide risk response strategy of a project.
ILO8021.5	Apply Earned Value Management techniques to determine & predict status of the project and implement project termination process.
ILO8021.6	Identify reasons of project termination
<b>ILO8025</b>	<b>Professional Ethics and CSR</b>
ILO8025.1	Understand rights and duties of business.
ILO8025.2	Analyze and explore duties of business and professional ethics in the marketplace.
ILO8025.3	Analyze and Demonstrate professional ethics of consumer protection and job discrimination.
ILO8025.4	Describe and analyze different aspects of corporate social responsibility
ILO8025.5	Analyze interrelatedness of enterprises and corporate social responsibility.
ILO8025.6	Understand legal aspects of corporate social responsibility.
<b>ILO8029</b>	<b>Environmental Management</b>
ILO8029.1	Make use of knowledge of Environment Management for sustainable development
ILO8029.2	Identify the Environmental Concerns for the specific hazard
ILO8029.3	Apply the Concept of Ecology to know the interdependence between ecosystem and living organisms
ILO8029.4	Apply the concept of Corporate Env Responsibility for Environmental Quality Management
ILO8029.5	Categorize the ISO-14000 standards and understand the procedure of EMS Certification
ILO8029.6	Utilize the knowledge of Environmental legislations for sustainable development
<b>CSL801</b>	<b>Distributed Computing Lab</b>
CSL801.1	implement message-oriented Communication or RPC/RMI based client-server programs.
CSL801.2	implement techniques for clock synchronization
CSL801.3	implement techniques for election algorithms
CSL801.4	implement mutual exclusion and deadlock handling techniques
CSL801.5	implement techniques of resource and process management
CSL801.6	implement distributed file systems
<b>CSDL8012</b>	<b>Digital Forensic Lab</b>
CSDL8012.1	Use various forensics tools to acquire, duplicate and analyze data and recover deleted data
CSDL8012.2	Evaluate penetration testing using forensics tools
CSDL8012.3	Use various forensics tools and use them to acquire and analyze live and static data
CSDL8012.4	Use various forensics tools to extract emails evidence
CSDL8012.5	Use various forensics tools to extract Web Browsers related evidence
CSDL8012.6	Discuss real time crime forensics
<b>CSDL8013</b>	<b>Applied Data Science Lab</b>
CSDL8013.1	Apply Data Explorations techniques on the given data
CSDL8013.2	Apply Data Preparation techniques on the given data
CSDL8013.3	Apply Data Visualization techniques and Validation techniques on the given data
CSDL8013.4	Detect and Deal with Anomalies in the data and imbalance in the data
CSDL8013.5	Implement Time Series forecasting on the given dataset
CSDL8013.6	Develop a Data Science Application
<b>CSDL8022</b>	<b>High Performance Computing Lab</b>
CSDL8022.1	Perform Linux based commands on remote machine
CSDL8022.2	Compare the performance of sequential algorithms with parallel algorithm in terms of execution time, speedup and throughput.
CSDL8022.3	Implement parallel program using OpenMP library and analyze its performance
CSDL8022.4	Implement parallel program using MPI platform and analyze its performance
CSDL8022.5	Implement parallel program using OpenCL framework and analyze its performance
CSDL8022.6	Implement parallel program using CUDA framework and analyze its performance
<b>CSP801</b>	<b>Major Project- 2</b>
CSP801.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP801.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP801.3	Analyze and compare the results with the standard results.
CSP801.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP801.5	Write and present their work effectively with ethical values.
CSP801.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.

*ojs*

HEAD

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**Vidyavardhini's college of Engineering & Technology Vasai(w)**  
**Department of Information Technology**  
**R - 2019 C Scheme**

<b>Program Outcomes</b>
<b>PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</b>
<b>PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.</b>
<b>PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.</b>
<b>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.</b>
<b>PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</b>
<b>PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.</b>
<b>PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</b>
<b>PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</b>
<b>PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</b>
<b>PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</b>
<b>PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</b>
<b>PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.</b>
<b>Program Specific Outcomes</b>

<b>At the end of the program engineering graduate will be able to:</b>	
<b>PSO1: Apply and implement IT solutions in allied fields of engineering to solve real world problems.</b>	
<b>PSO2: Identify social and industrial problems, provide creative solutions and become quality asset for society and industry.</b>	
<b>PSO3: Deploy secured solution using Information Technology practices and strategies.</b>	
<b>Course Outcomes</b>	
	<b>At the end of the semester student will be able to</b>
<b>FEC101</b>	<b>Engineering Mathematics-I</b>
FEC101.1	Apply the concepts of Complex Numbers to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Compute the partial differentiation of functions of two & three variables.
FEC101.4	Find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Solve the system of linear algebraic and transcendental equation numerically and also by using Scilab.
<b>FEC102</b>	<b>Engineering Physics-I</b>
FEC102.1	Analyze the motion of free particle using time independent & time dependent Schrodinger wave equation.
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction technique.
FEC102.3	Explore the concepts of semiconductor physics and apply them for applications like LED, photoconductor and photovoltaic cell.
FEC102.4	Employ the concept of interference in thin films in measurements.
FEC102.5	Examine the properties of superconductors and super capacitors and apply them for the applications in-hand.
FEC102.6	Explore the properties of engineering materials and their applications.
<b>FEC103</b>	<b>Engineering Chemistry-I</b>
FEC103.1	Analyze the quality of water and suggest methods of its treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.

FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same.
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyze the motion by plotting the .
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyze particles in motion using force and acceleration, work-energy and impulse momentum.
<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Analyze DC circuits and apply Superposition, Thevenin's, Nortons', Maximum Power Transfer theorems to determine their response.
FEC105.2	Analyze single phase AC circuit and determine their response.
FEC105.3	Analyze three phase circuits and determine voltage/current/power relationship in star and delta connections.
FEC105.4	Understand the construction and operation of single phase transformer and evaluate its equivalent circuit and efficiency.
FEC105.5	Compare single phase & three phase machines on the basis of working principle, constructional details and operation.
<b>FEL101</b>	<b>Engineering Physics-I Lab</b>
FEL101.1	Perform the experiments based on interference in thin films and analyze the results.
FEL101.2	Determine the crystal structure and study/draw miller indices.
FEL101.3	Determine energy band gap of semiconductor.
FEL101.4	Study Hall Effect in semiconductor devices.
FEL101.5	Design a solution for a real world problem using knowledge gained in this course.
<b>FEL102</b>	<b>Engineering Chemistry-I Lab</b>

FEL102.1	Analyze water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Identify nature of solution based on its pH value.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics Lab</b>
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force
FEL103.2	Verify the conditions of equilibrium and find the beam reactions.
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same.
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering Lab</b>
FEL104.1	Implement DC circuits and analyze their behavior using network theorems.
FEL104.2	Analyze frequency behavior of RLC circuit and calculate resonance frequency, Bandwidth and Q- factor.
FEL104.3	Determine relationship between voltage/current/power in three phase star/delta circuits.
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency.
FEL104.5	Illustrate the working of Single & Three Phase Induction Motor.
<b>FEL105</b>	<b>Basic Workshop practice-I</b>
FEL105.1	Use different fitting tools and perform the basic operations such as square, hexagonal and V male female joint.
FEL105.2	Develop the skill required for hardware maintenance, installation of operating system and system drivers.
FEL105.3	Identify the network components and perform basic networking and crimping.
FEL105.4	Develop the skill to use different plumbing tools and accesseroies for domestic water
<b>FEC201</b>	<b>Engineering Mathematics-II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S.to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area.



FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a
FEC201.6	Solve Differential equations & Definite integrals using Numerically and also by using
<b>FEC202</b>	<b>Engineering Physics-II</b>
FEC202.1	Examine the diffraction through single slit and its applications.
FEC202.2	Apply the foundation of laser and fiber optics in development of modern communication technology.
FEC202.3	Explore the fundamentals of Electrodynamics and its application in the field of engineering.
FEC202.4	Explore the fundamentals of special theory of relativity.
FEC202.5	Assimilate the scope of nanotechnology in modern developments and its role in emerging innovating applications.
FEC202.6	Select appropriate sensing technology for physical measurements in modern instrumentations.
<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines and Planes.
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids.
FEC204.3	Apply the basic principles of projections in converting 3D view to 2D drawing.
FEC204.4	Visualize an object from the given two views.
<b>FEC205</b>	<b>C programming</b>
FEC205.1	Write an algorithm to support Structure Programming approach.
FEC205.2	Use variables, derived data types and control structures to write c program.
FEC205.3	Decompose a problem into functions and synthesize a complete program.
FEC205.4	Use Array and String for solving complex computational problem.
FEC205.5	Use Structure-Union for solving complex computational problem.
FEC205.6	Use Pointers for solving complex computational problem.
<b>FEC206</b>	<b>Professional Communication and Ethics-I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication.
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages.
FEC206.4	Write/ Draft academic, business and technical letter/email.
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process.

FEC206.6	Demonstrate principles of ethics in professional environment.
<b>FEL201</b>	<b>Engineering Physics-II</b>
FEL201.1	Perform the experiments based on diffraction through slits using Laser source and analyze the results.
FEL201.2	Determine the number of lines on the grating surface using LASER Source.
FEL201.3	Perform the experiments using optical fibre and analyse its characteristics.
FEL201.4	Perform the experiments on various sensors and analyze the result.
FEL201.5	Implement a solution for a real world problem using knowledge gained in this course.
<b>FEL202</b>	<b>Engineering Chemistry-II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na,k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Determine saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves.
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids.
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object.
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views.
<b>FEL204</b>	<b>C programming</b>
FEL204.1	Translate given algorithms to a program.
FEL204.2	Use variables, derived data types and control structures to write c program.
FEL204.3	Write iterative as well as recursive programs.
FEL204.4	Represent data in Array and String and manipulate them through a program.
FEL204.5	Use Structure-Union for solving complex computational problem.
FEL204.6	Declare pointers and demonstrate call by reference concept.
<b>FEL205</b>	<b>Professional Communication and Ethics-I</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully.
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content.

FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully.
<b>FEL206</b>	<b>Basic Workshop Practice - II</b>
FEL206.1	Use different carpentry tools and perform the basic operations like joints and wood turning practise.
FEL206.2	Understand the safe practices to adopt in electrical workshop.
FEL206.3	Demonstrate the wiring practices for the connection of simple electrical load.
FEL206.4	Demonstrate the use of furnace and produce the simple forging job.
<b>ITC301</b>	<b>Engineering Mathematics-III</b>
ITC301.1	Apply the concept of Laplace transform to solve the real integrals in engineering
ITC301.2	Apply the concept of inverse Laplace transform of various functions in engineering problems.
ITC301.3	Expand the periodic functions by using Fourier series for real life problems and complex engineering problems.
ITC301.4	Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.
ITC301.5	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI.
ITC301.6	Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
<b>ITC302</b>	<b>Data Structures &amp; Analysis</b>
ITC302.1	Apply the concepts of stacks, queues and linked list in real life problem solving.
ITC302.2	Apply and analyze the concepts trees in real life problem solving.
ITC302.3	Illustrate and justify the concepts of graphs in real life problem solving.
ITC302.4	Examine the concepts of sorting, searching techniques in real life problem solving.
ITC302.5	Use the concepts of recursion, hashing in real life problem solving.
ITC302.6	Examine and justify different methods of stacks, queues, linked list, trees and graphs to various applications.
<b>ITC303</b>	<b>Database Management System</b>
ITC303.1	Identify the need of Database Management System and understand database
ITC303.2	Design ER/EER model for real life applications.

ITC303.3	Construct Relational Model from ER/EER Diagram.
ITC303.4	Write a query using SQL commands by Analyzing user requirement.
ITC303.5	Apply the concept of normalization to relational database design.
ITC303.6	Demonstrate the concept of transaction, concurrency and recovery.
<b>ITC304</b>	<b>Principles of Communication</b>
ITC304.1	Describe analog and digital communication systems.
ITC304.2	Differentiate types of noise and understand time/frequency domain representation using Fourier transform.
ITC304.3	Illustrate transmitter and receiver of AM, DSB, SSB and FM.
ITC304.4	Describe Sampling theorem and pulse modulation systems.
ITC304.5	Explain multiplexing and digital band pass modulation techniques.
ITC304.6	Understand electromagnetic radiation and propagation of waves.
<b>ITC305</b>	<b>Paradigms and Computer Programming Fundamentals</b>
ITC305.1	To compare different programming paradigms and core language design issues and choose appropriate paradigm for problem at hand.
ITC305.2	To apply OO Paradigm for a given problem.
ITC305.3	To construct solution based on functional programming using Haskell.
ITC305.4	To demonstrate solution using logic programming.
ITC305.5	To use concurrency in programming.
ITC305.6	To illustrate use of scripting languages for different applications.
<b>ITL301</b>	<b>Data Structures Lab</b>
ITL301.1	Use the basic concepts and principles of stacks, queues and linked lists.
ITL301.2	Understand the concepts and apply the methods in basic trees.
ITL301.3	Use and identify the methods in advanced trees.
ITL301.4	Understand the concepts and apply the methods in graphs.
ITL301.5	Apply the techniques of searching and sorting.
ITL301.6	Illustrate and examine the methods of linked lists, stacks, queues, trees and graphs to various real time problems.
<b>ITL302</b>	<b>SQL Lab</b>
ITL302.1	Construct the conceptual model for the defined real life application.
ITL302.2	Create and populate a RDBMS using SQL.
ITL302.3	Formulate and write SQL queries for efficient information retrieval.

ITL302.4	Apply view, triggers, and procedures to demonstrate specific event handling.
ITL302.5	Establish database connectivity using JDBC.
ITL302.6	Implement the concept of concurrent transactions.
<b>ITL303</b>	<b>Computer programming Paradigms Lab</b>
ITL303.1	Apply Object Oriented concepts in C++ and develop applications.
ITL303.2	Construct solution based on functional programming using Haskell.
ITL303.3	Construct solution based on logic programming using Prolog.
ITL303.4	Develop multithreaded programs in Java and C++.
ITL303.5	Implement exception handling or garbage collection in C++ or JAVA.
ITL303.6	To construct a solution to the same problem using multiple paradigms.
<b>ITL304</b>	<b>Java Lab (SBL)</b>
ITL304.1	Explain the fundamental concepts of Java Programming.
ITL304.2	Use the concepts of classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
ITL304.3	Demonstrate how to extend java classes and achieve reusability using Inheritance, Interface and Packages.
ITL304.4	Construct robust and faster programmed solutions to problems using concept of Multithreading, exceptions and file handling.
ITL304.5	Design and develop Graphical User Interface using Abstract Window Toolkit along with response to the events.
ITL304.6	Develop Graphical User Interface by exploring Swing and JavaFX framework based on MVC architecture.
<b>ITM301</b>	<b>Mini Project – 1 A for Front end /backend Application using JAVA</b>
ITM301.1	Explore beyond the curriculum to identify problem of society, industrial or research
ITM301.2	Investigate the problem thoroughly and propose appropriate solution to solve the
ITM301.3	Design and implement project using appropriate method.
ITM301.4	Develop interpersonal skills to work as member of a group or leader.
ITM301.5	Write and present their work effectively with ethical values.
ITM301.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITC401</b>	<b>Engineering Mathematics-IV</b>
ITC401.1	Apply matrix theory to find eigen values and eigen vectors and their applications.
ITC401.2	Evaluate contour Integrals and expand the analytic functions inside circle.



ITC401.3	Apply Z-transforms and its inverse to solve engineering problems.
ITC401.4	Apply the concept of probability distribution to engineering problems and testing hypothesis of small samples using sampling theory.
ITC401.5	Apply the concept of Linear Programming to solve the optimization problems.
ITC401.6	Apply the Non-linear Programming techniques to solve the optimization problems.
<b>ITC402</b>	<b>Computer Network and Network Design</b>
ITC402.1	Explain the functionalities of different layers of the OSI & TCP/IP models and compare the models.
ITC402.2	Categorize the types of transmission media and explain data link layer.
ITC402.3	Analyze the network and select appropriate routing strategy.
ITC402.4	Describe the data transportation and session management issues and related.
ITC402.5	Implement compression strategies for the application in hand and establish client server model.
ITC402.6	Design a network by selecting appropriate IP addressing, Routing strategy, and application services.
<b>ITC403</b>	<b>Operating System</b>
ITC403.1	Describe functions and services of Operating System.
ITC403.2	Analyze performance of process scheduling algorithms.
ITC403.3	Apply process synchronization primitives and deadlock management.
ITC403.4	Analyze the memory allocation techniques and management functions of Operating
ITC403.5	Illustrate the services provided by Operating System for storage management.
ITC403.6	Explain the functions of various special-purpose Operating Systems.
<b>ITC404</b>	<b>Automata Theory</b>
ITC404.1	Design Regular languages, Expression and Grammars for automation of problem in
ITC404.2	Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
ITC404.3	Design Context Free languages and Grammars.
ITC404.4	Design different types of Push down Automata as Simple Parser.
ITC404.5	Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.
ITC404.6	Develop understanding of applications of various Automata.
<b>ITC405</b>	<b>Computer Organization and Architecture</b>

ITC405.1	Apply concepts of number system, combinational circuits and sequential circuits for application in hand.
ITC405.2	Describe basic organization of computer, the architecture of 8086 microprocessor and implement assembly language programming for 8086 microprocessors.
ITC405.3	Demonstrate control unit operations and conceptualize instruction level parallelism.
ITC405.4	Represent data in appropriate format and perform arithmetic operations.
ITC405.5	Categorize memory organization and explain the function of each element of a memory hierarchy.
ITC405.6	Examine different methods for computer I/O mechanism.
<b>ITL401</b>	<b>Network Lab</b>
ITL401.1	Executes basic networking commands and configure NS2.
ITL401.2	Simulate different topologies with different protocols.
ITL401.3	Implement socket programming using TCP and UDP for client server architecture.
ITL401.4	Analyze the traffic flow in the network using modern network analyzer tools.
ITL401.5	Design a network for an organization using concepts of addressing naming and routing.
<b>ITL402</b>	<b>Unix Lab</b>
ITL402.1	Understand the architecture of Unix OS, install Linux and execute general purpose commands.
ITL402.2	Execute file system management and user management commands and explore their options.
ITL402.3	Execute process management and memory management commands explore their
ITL402.4	Write shell scripts for basic applications.
ITL402.5	Write scripts to perform basic tasks using grep, sed commands and awk & Perl
<b>ITL403</b>	<b>Microprocessor Lab</b>
ITL403.1	Demonstrate various components and peripheral of computer system.
ITL403.2	Analyze and design combinational circuits.
ITL403.3	Write a program on a microprocessor using arithmetic & logical instruction set of
ITL403.4	Develop the assembly level programming using 8086 loop instruction set.
ITL403.5	Write programs based on string and procedure for 8086 microprocessor.
ITL403.6	Illustrate interfacing of peripheral devices with 8086 microprocessor.
<b>ITL404</b>	<b>Python Lab (SBL)</b>
ITL404.1	Implement various data structures like lists, sets, dictionary, tuples to represent real world data in python program.

ITL404.2	To identify class requirement and construct python objects for real world entities.
ITL404.3	To access database to perform CRUD operations.
ITL404.4	To handle and manipulate large data using Numpy and Pandas.
ITL404.5	To visualize data using matplotlib.
ITL404.6	To design solution to real world problem using python
<b>ITM401</b>	<b>Mini Project – 1 B for Python based automation projects</b>
ITM401.1	Explore beyond the curriculum to identify problem of society, industrial or research
ITM401.2	Investigate the problem thoroughly and propose appropriate solution to solve the
ITM401.3	Design and implement project using appropriate method.
ITM401.4	Develop interpersonal skills to work as member of a group or leader.
ITM401.5	Write and present their work effectively with ethical values.
ITM401.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITC 501</b>	<b>Internet Programming</b>
ITC 501.1	Select protocols or technologies required for various web applications.
ITC 501.2	Apply JavaScript to add functionality to web pages.
ITC 501.3	Design front end application using basic React.
ITC 501.4	Design front end applications using functional components of React.
ITC 501.5	Design back-end applications using Node.js.
ITC 501.6	Construct web based Node.js applications using Express.
<b>ITC 502</b>	<b>Computer Network Security</b>
ITC 502.1	Develop understanding of computer security and network security and employ encryption techniques.
ITC 502.2	Apply basic cryptographic techniques using classical and block encryption methods.
ITC 502.3	Illustrate the system security malicious software.
ITC 502.4	Choose security protocols applicable as different layer for secured data communication.
ITC 502.5	Demonstrate network management security and illustrate the need for NAC.
ITC 502.6	Describe the function of an IDS and firewall for the system security.
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<b>ITC 503</b>	<b>Entrepreneurship and E- business</b>
ITC 503.1	Relate the concept of entrepreneurship and its close relationship with enterprise and owner-management.
ITC 503.2	Discover the nature of business development in the context of existing organizations and of new business start-ups.
ITC 503.3	Comprehended important factors for starting a new venture and business development.
ITC 503.4	Identify issues and decisions involved in financing and resourcing a business start-up.
ITC 503.5	Distinguish various E-business Models.

ITC 503.6	Compare various E-business Strategies.
<b>ITC 504</b>	<b>Software Engineering</b>
ITC 504.1	Apply basic knowledge in software engineering.
ITC 504.2	Identify requirements, analyze and prepare models.
ITC 504.3	Plan, schedule and track the progress of the projects.
ITC 504.4	Design & develop the software solutions for the growth of society.
ITC 504.5	To demonstrate and evaluate real time projects with respect to software engineering principles.
ITC 504.6	Apply testing and assure quality in software solution.
<b>ITDO5012</b>	<b>Advance Data Management Technologies</b>
ITDO5012.1	Measure query costs and design alternate efficient paths for query
ITDO5012.2	Apply sophisticated access protocols to control access to the database
ITDO5012.3	Implement Distributed databases.
ITDO5012.4	Organize strategic data in an enterprise and build a data Warehouse.
ITDO5012.5	Analyse data using OLAP operations so as to take strategic decisions.
ITDO5012.6	Design modern applications using NoSQL databases.
<b>ITDO5014</b>	<b>Advanced Data structure and Analysis</b>
ITDO5014.1	Demonstrate fundamentals of analysis of algorithms and to calculate complexity.
ITDO5014.2	Perform operations on advanced data structure.
ITDO5014.3	Apply divide and conquer approach and greedy programming technique to solve the problems.
ITDO5014.4	Apply the dynamic programming technique to solve the problems.
ITDO5014.5	Apply pattern matching algorithm for a given application.
ITDO5014.6	Illustrate concepts of Optimization, Approximation and Parallel computing algorithms.
<b>ITL501</b>	<b>IP Lab</b>
ITL501.1	Identify and apply the appropriate HTML tags to develop a webpage.
ITL501.2	Identify and apply the appropriate CSS tags to format data on webpage.
ITL501.3	Construct responsive websites using Bootstrap.
ITL501.4	Use JavaScript to develop interactive web pages.
ITL501.5	Construct front end applications using React.
ITL501.6	Construct back end applications using Node.js/Express.
<b>ITL502</b>	<b>Security Lab</b>
ITL502.1	Illustrate symmetric cryptography by implementing classical ciphers.
ITL502.2	Implement key management, distribution and user authentication.
ITL502.3	Employ different network reconnaissance tools to gather information about networks to identify vulnerabilities in network.

ITL502.4	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
ITL502.5	Use open-source tools to scan the network for vulnerabilities and simulate attacks.
ITL502.6	Implement the network security system using open source tools.
<b>ITL503</b>	<b>DevOPs Lab</b>
ITL503.1	To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements.
ITL503.2	To obtain complete knowledge of the version control system to effectively track changes augmented with Git and GitHub.
ITL503.3	To understand the importance of Jenkins to Build and deploy Software Applications on server environment.
ITL503.4	Understand the importance of Selenium and Jenkins to test Software Applications.
ITL503.5	To understand concept of containerization and analyze the Containerization of OS images and deployment of applications over Docker.
ITL503.6	To Synthesize software configuration and provisioning using Ansible.
<b>ITL504</b>	<b>Advance DevOPs Lab</b>
ITL504.1	To deploy compute and storage solutions on AWS.
ITL504.2	To deploy applications using kubernetes.
ITL504.3	To create infrastructure using code.
ITL504.4	To apply code pipeline for application development.
ITL504.5	To securely deploy apps.
ITL504.6	To develop serverless applications using Lambda.
<b>ITL505</b>	<b>Professional Communication &amp; Ethics-II (PCE-II)</b>
ITL505.1	Write effective business/ technical documents.
ITL505.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry.
ITL505.3	Apply various techniques to be successful in group discussions, technical presentation and meetings.
ITL505.4	Deliver successful professional presentations.
ITL505.5	Develop creative thinking and interpersonal skills.
ITL505.6	Apply codes of ethical conduct & organizational behaviour.
<b>ITM506</b>	<b>Mini Project – 2 A Web Based Business Model</b>
ITM506.1	Explore beyond the curriculum to identify problem of society, industrial or research
ITM506.2	Investigate the problem thoroughly and propose appropriate solution to solve the
ITM506.3	Design and implement project using appropriate method.
ITM506.4	Develop interpersonal skills to work as member of a group or leader.



ITM506.5	Write and present their work effectively with ethical values.
ITM506.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITC601</b>	<b>Data Mining &amp; Business Intelligence</b>
ITC601.1	Demonstrate the concepts of data warehouse and design star schema, snowflake schema for a given problem.
ITC601.2	Apply the techniques of data exploration and preprocessing techniques to prepare the data for application of data mining algorithms.
ITC601.3	Implement the data mining algorithm of classification on large data sets and apply metrics to measure the performance of various data mining algorithms.
ITC601.4	Implement the data mining algorithm of clustering on large data sets and apply metrics to measure the performance of various data mining algorithms.
ITC601.5	Implement the data mining algorithm of frequent pattern mining on large data sets and apply metrics to measure the performance of various data mining algorithms.
ITC601.6	Apply BI to make strategic decisions.
<b>ITC602</b>	<b>Web X.0</b>
ITC602.1	To analyze website usage.
ITC602.2	Apply TypeScript to add functionality to web pages.
ITC602.3	Design front end application using basic Angular.
ITC602.4	Design database solutions using MongoDB.
ITC602.5	Design back-end applications using Flask.
ITC602.6	Construct RIA using Ajax.
<b>ITC603</b>	<b>Wireless Technology</b>
ITC603.1	Summarize the basic concepts of Wireless Network and Wireless Generations.
ITC603.2	Evaluate the various Wide Area Wireless Technologies.
ITC603.3	Analyze IEEE standards used for implementation of WLAN and WMAN
ITC603.4	Appraise the importance of WPAN, WSN and Ad-hoc Networks.
ITC603.5	Categorize various Wireless Network Security Standards.
ITC603.6	Recognize the design considerations for deploying the Wireless Network Infrastructure.
<b>ITC604</b>	<b>Artificial Intelligence and Data Science-1</b>
ITC604.1	Identify the building blocks of AI as presented in terms of intelligent agents.
ITC604.2	Apply an appropriate problem-solving method and knowledge-representation scheme.
ITC604.3	Formalize the problem as a state space/graph as well as evaluate and select the appropriate search method.
ITC604.4	Solve real world problems with data science and tackle them from a statistical

ITC604.5	Select and apply appropriately from a wider range of exploratory and inferential methods for analysing data and evaluate and interpret the results contextually.
ITC604.6	Apply different machine learning methods for real world problems.
<b>ITDO6012</b>	<b>Image Processing</b>
ITDO6012.1	Understand basics of monochrome images and apply them for image processing applications.
ITDO6012.2	Select among various spatial domain filtering techniques and apply them for image enhancement.
ITDO6012.3	Transform the image and use it for representation, enhancement and/or compression.
ITDO6012.4	Exploit redundancy in the images and use it for image compression.
ITDO6012.5	Find the region of interest using various techniques and represent it for image processing applications.
ITDO6012.6	Choose structuring element and apply morphological operations to extract required information from image.
<b>ITDO6014</b>	<b>Ethical Hacking and Forensic</b>
ITDO6014.1	Illustrate the concept of ethical hacking.
ITDO6014.2	Recognize the need of digital forensics and examine the concept of digital evidence and incident response.
ITDO6014.3	Relate the knowledge of computer forensics using different tools and techniques.
ITDO6014.4	Detect the network attacks and analyze the evidence.
ITDO6014.5	Relate the knowledge of mobile forensics using different tools and techniques.
ITDO6014.6	Illustrate the method to generate legal evidence and supporting investigation reports.
<b>ITL601</b>	<b>BI Lab</b>
ITL601.1	Design Star Schema and Snowflake Schema for the given problem.
ITL601.2	Perform data pre-processing and data exploration on the given data set.
ITL601.3	Implement and evaluate classification algorithms on the given data set.
ITL601.4	Implement and evaluate clustering algorithms on the given data set.
ITL601.5	Implement and evaluate frequent pattern mining algorithms on the given data set.
ITL601.6	Acquire hands-on experience in using conventional data mining software, build a BI application and evaluate its strength and limitations.
<b>ITL602</b>	<b>Web Lab</b>
ITL602.1	To apply analysis tools on websites.
ITL602.2	Apply TypeScript to add functionality to web pages.
ITL602.3	Design front end application using basic Angular.

ITL602.4	Design database solutions using MongoDB.
ITL602.5	Design back-end applications using Flask.
ITL602.6	Construct RIA using Ajax.
<b>ITL603</b>	<b>Sensor Lab</b>
ITL603.1	Summarize various wireless communication technologies based on the range of communication, cost, propagation delay, power, and throughput.
ITL603.2	Conduct a literature survey of sensors used in real world wireless applications.
ITL603.3	Demonstrate the simulation of WSN using the Network Simulators (Contiki/ Tinker CAD/ Cup carbon etc.).
ITL603.4	Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.
ITL603.5	Prepare a report and present the findings of the study conducted in the preferred
ITL603.6	Demonstrate the ability to work in teams and manage the conduct of the research study.
<b>ITL604</b>	<b>MAD &amp; PWA Lab</b>
ITL604.1	Describe functions and services of Operating System.
ITL604.2	Analyze performance of process scheduling algorithms.
ITL604.3	Apply process synchronization primitives and deadlock management.
ITL604.4	Analyze the memory allocation techniques and management functions of Operating
ITL604.5	Illustrate the services provided by Operating System for storage management.
ITL604.6	Explain the functions of various special-purpose Operating Systems.
<b>ITL605</b>	<b>DS using Python Lab (SBL)</b>
ITL605.1	Apply pre-processing techniques to prepare data for data science applications.
ITL605.2	Analyze the data using different statistical techniques and visualize the outcome using different types of plots.
ITL605.3	Analyze and apply the supervised machine learning techniques like Classification, Regression or Support Vector Machine on data for building the models of data and solve the problems.
ITL605.4	Apply the different unsupervised machine learning algorithms like Clustering, Decision Trees, Random Forests or Association to solve the problems.
ITL605.5	Build an application that performs exploratory data analysis using Apache Spark.
ITL605.6	Develop a data science application that can have data acquisition, processing, visualization and statistical analysis methods with supported machine learning technique to solve the real-world problem.
<b>ITM601</b>	<b>Mini Project – 2 B Based on ML</b>
ITM601.1	Explore beyond the curriculum to identify problem of society, industrial or research

ITM601.2	Investigate the problem thoroughly and propose appropriate solution to solve the
ITM601.3	Design and implement project using appropriate method.
ITM601.4	Develop interpersonal skills to work as member of a group or leader.
ITM601.5	Write and present their work effectively with ethical values.
ITM601.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITC701</b>	<b>AI and DS –II</b>
ITC701.1	Apply reasoning to handle uncertainty in AI models.
ITC701.2	Analyse the process of building a Cognitive application.
ITC701.3	Design fuzzy controller system using fuzzy membership functions.
ITC701.4	Study deep learning models and evaluate response of the network.
ITC701.5	Evaluate performance of advanced ML classification algorithms.
ITC701.6	Analyze current trends in Data Science.
<b>ITC702</b>	<b>Internet of Everything</b>
ITC702.1	Describe the Characteristics and Conceptual Framework of IoT.
ITC702.2	Differentiate between the levels of the IoT architectures.
ITC702.3	Analyse the communication requirements of the system and select an appropriate IoT access technology.
ITC702.4	Illustrate various edge to cloud protocol for IoT.
ITC702.5	Apply appropriate analytics and data visualization technique of IoT data.
ITC702.6	Formulate a solution to solve a real-world problem using IoT concepts.
<b>ITDO7013</b>	<b>Infrastructure Security</b>
ITDO7013.1	Identify vulnerabilities, attacks and understand protection mechanisms
ITDO7013.2	Interpret software vulnerabilities and attacks on databases and operating systems.
ITDO7013.3	Explain the need for security protocols in the context of wireless communication.
ITDO7013.4	Discuss various security solutions for cloud infrastructure.
ITDO7013.5	Describe different attacks on Open Web Applications and Webservices.
ITDO7013.6	Implement appropriate security policies to protect infrastructure components.
<b>ITDO7014</b>	<b>Software Testing and QA</b>
ITDO7014.1	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs for quality improvement.
ITDO7014.2	Analyze and apply different software testing methodologies and techniques for general environments.
ITDO7014.3	Manage the testing process and testing metrics.
ITDO7014.4	Automate test processes to improve quality and get familiar with quality assurance models.
ITDO7014.5	Apply the software testing techniques in specialized environment.
ITDO7014.6	Use practical knowledge of a variety of ways to test software and quality attributes.
<b>ITDO7021</b>	<b>MANET</b>

ITDO7021.1	Understand the fundamentals of Mobile ad-hoc Networks
ITDO7021.2	Understand and be able to use advanced concept of MAC layer protocols more effective
ITDO7021.3	Analyse different routing technologies for designing a routing protocol
ITDO7021.4	Understand the concepts of Transport layer and security features of Ad-hoc network.
ITDO7021.5	Create the awareness of QoS and Energy Management in Ad hoc network.
ITDO7021.6	Demonstrate the ability of wireless sensor network.
<b>ITIO7013</b>	<b>Management Information System</b>
ITIO7013.1	Identify the impact of information systems on an organization.
ITIO7013.2	Use tools and technologies to access database information for improving business performance and decision making.
ITIO7013.3	Identify the threats to information systems and apply security controls for IS.
ITIO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce.
ITIO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ITIO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management.
<b>ITL701</b>	<b>Data Science Lab</b>
ITL701.1	Implement reasoning to handle uncertainty.
ITL701.2	Build a cognitive application by exploring various use cases of Cognitive Computing.
ITL701.3	Design a fuzzy controller system using fuzzy tool.
ITL701.4	Develop real life applications using deep learning concepts.
ITL701.5	Evaluate performance of applications built using classification algorithms.
ITL701.6	Build an application based on current trends in Data Science.
<b>ITL702</b>	<b>IOE Lab</b>
ITL702.1	Explore beyond the curriculum to identify the real world problem which can be solved using concepts of IoT.
ITL702.2	Investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
ITL702.3	Choose appropriate modern tools and plan/implement the proposed solution with effective utilization of the resources.
ITL702.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
ITL702.5	Write and present the findings of the study effectively with ethical values.
ITL702.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITL703</b>	<b>Secure Application Development</b>
ITL703.1	Summarize laws, standards and guidelines of cyber security.
ITL703.2	Infer the OWASP methodologies and standards.
ITL703.3	Identify main vulnerabilities inherent in applications.
ITL703.4	Demonstrate Data Validation and Authentication for application.



ITL703.5	Demonstrate Security at Session Layer Management.
ITL703.6	Apply secure coding for cryptography.
<b>ITL704</b>	<b>Recent Open Source Project Lab</b>
ITL704.1	Understand and apply the basic concepts of Open Source Software.
ITL704.2	Identify the difference between the GPL (General Public License) and Contribute to Open Source.
ITL704.3	Apply and evaluate your knowledge for the Contribute to Open Source in different Operating System.
ITL704.4	Apply and evaluate your knowledge for the Contribute to Open Source in different Technologies.
ITL704.5	Apply and evaluate your knowledge for the Contribute to Open Source in different Network Management.
ITL704.6	Apply and evaluate your knowledge for the Contribute to Open Source in different Applications and Services.
<b>ITP701</b>	<b>Major Project I</b>
ITP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs.
ITP701.2	Investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
ITP701.3	Choose appropriate modern tools and plan/implement the proposed solution with effective utilization of the resources available.
ITP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
ITP701.5	Write and present their work effectively with ethical values.
ITP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITC801</b>	<b>Blockchain and DLT</b>
ITC801.1	Analyze the security concept of Blockchain and Distributed Ledger Technology.
ITC801.2	Implement cryptocurrencies in bitcoin.
ITC801.3	Implement smart contracts in Ethereum.
ITC801.4	Install and configure hyperledger fabric.
ITC801.5	Utilize different cryptocurrencies.
ITC801.6	Apply blockchain concepts for various applications.
<b>ITL801</b>	<b>Blockchain Lab</b>
ITL801.1	To develop Local blockchain.
ITL801.2	To design and develop cryptocurrency.
ITL801.3	To publish smart contract.
ITL801.4	To implement permissioned blockchain.
ITL801.5	To apply blockchain for solving problem.
ITL801.6	To create token.

<b>ITL802</b>	<b>Cloud Computing</b>
ITL802.1	Create virtual machines using open source technology.
ITL802.2	Compare cloud computing services SaaS/PaaS/IaaS for a given application.
ITL802.3	Design and develop real world web applications and deploy them on commercial clouds
ITL802.4	Deploy cloud services to address security issues .
ITL802.5	Identify commercially available cloud services and recommend the appropriate one for the given application.
ITL802.6	Implement the concept of containerization.
<b>ITP801</b>	<b>Major Project-II</b>
ITP801.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
ITP801.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
ITP801.3	Analyze and compare the results with the standard results.
ITP801.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
ITP801.5	Write and present their work effectively with ethical values.
ITP801.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>ITDO8011</b>	<b>Big Data Analytics</b>
ITDO8011.1	Identify issues and challenges in Big data analytics.
ITDO8011.2	Identify Hadoop components and suitable NoSQL systems to handle big data.
ITDO8011.3	Apply MapReduce techniques to solve real world problems.
ITDO8011.4	Apply filtering techniques, counting distinct element and counting ones in window algorithms on data stream.
ITDO8011.5	Apply several newer algorithms for clustering, classifying and finding associations in Big Data.
ITDO8011.6	Analyze case study of Big data applications.
<b>ITDO8021</b>	<b>User Interface Design</b>
ITDO8021.1	Identify and criticize bad features of interface designs and to predict good features of interface designs.
ITDO8021.2	Predict good features of interface design.
ITDO8021.3	Illustrate and analyze user needs and formulate user design specifications.
ITDO8021.4	Interpret and evaluate the data collected during the process.
ITDO8021.5	Evaluate designs based on theoretical frameworks and methodological approaches.
ITDO8021.6	Apply better techniques to improve the user interaction design interfaces.
<b>ITDO8024</b>	<b>Cloud computing and Services</b>
ITDO8024.1	Analyze basics concepts of cloud computing service models, deployment models and its architecture.

ITDO8024.2	Compare virtualization & cloud computing and develop virtual machines
ITDO8024.3	Analyze different cloud computing services.
ITDO8024.4	Analyze various services provided by Amazon Web Services cloud platform.
ITDO8024.5	Analyze the functionality of Cloud using Openstack cloud platform & Serverless
ITDO8024.6	Analyze the security and privacy issues in cloud computing and how to use them.
<b>ITIO8011</b>	<b>Project Management</b>
ITIO8011.1	Identify appropriate projects from various options and need of project management.
ITIO8011.2	Apply selection criteria and select an appropriate project from different options.
ITIO8011.3	Develop Work Breakdown Structure to prepare the schedule for the project.
ITIO8011.4	Identify and predict the opportunities and threats and to decide various strategic approaches to deal with projects.
ITIO8011.5	Evaluate project performance using Earned value Technique.
ITIO8011.6	Prepare a final report considering analysis, Success and failures for the project.
<b>ITIO8015</b>	<b>Professional Ethics and Corporate Social Responsibility (CSR)</b>
ITIO8015.1	Understand rights and duties of business.
ITIO8015.2	Analyze and explore duties of business and professional ethics in the marketplace.
ITIO8015.3	Analyze and Demonstrate professional ethics of consumer protection and job discrimination
ITIO8015.4	Describe and analyze different aspects of corporate social responsibility
ITIO8015.5	Analyze interrelatedness of enterprises and corporate social responsibility.
ITIO8015.6	Understand legal aspects of corporate social responsibility.



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# Vidyavardhini's College of Engineering & Technology

## Department of Civil Engineering

### Program Outcomes

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

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

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

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

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

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

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

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

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



Vidyavardhini's College of Engineering & Technology

Department of Civil Engineering

**PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

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

### Program Specific Outcomes

The Graduates will be able to :

**PSO1.** Employ various approaches, ideologies, codes of practice, and soft tools for computing and designing real-world problems related to Civil Engineering

**PSO2.** Demonstrate technical aspects, teamwork, managerial, and professional skills necessary for efficient solution





<b>FEC101</b>	<b>Engineering Mathematics I</b>
FEC101.1	Apply the concepts of Complex Numbers, to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Compute the partial differentiation of functions of two & three variables.
FEC101.4	Find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations .
FEC101.6	Apply the concept of Numerical Methods to solve system of linear algebraic equations , transcendental equation.
<b>FEC102</b>	<b>Engineering Physics I</b>
FEC102.1	Describe the concepts of quantum mechanics and its applications of Schrodinger's equation to study the simple physical system.
FEC102.2	Explain the basic principles and methodologies of crystal structures for their application in crystallography using X-ray diffraction technique.
FEC102.3	Understand the concepts of semiconductor physics and applications of semiconductors in electronic devices.
FEC102.4	Apply the concepts of interference in thin films for various measurements.
FEC102.5	Discuss the properties of Superconductors and Supercapacitors to apply them in the novel applications.
FEC102.6	Compare the properties of engineering materials for their current and futuristic applications.



<b>FEC103</b>	<b>Engineering Chemistry I</b>
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule. thermodynamics
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse-momentum principles



<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Apply various network theorems to determine the circuit response / behavior
FEC105.2	Evaluate and analyze 1- $\Phi$ circuits.
FEC105.3	Evaluate and analyze 3- $\Phi$ AC circuits
FEC105.4	Understand the constructional features and operation of 1- $\Phi$ transformer
FEC105.5	Illustrate the working principle of 3- $\Phi$ machine.
FEC105.6	Illustrate the working principle of 1- $\Phi$ machines.
<b>FEL101</b>	<b>Engineering Physics I</b>
FEL101.1	Determine the value of Planck's constant (h) and understand its application in quantum mechanics.
FEL101.2	Determine different crystal structures and draw miller indices to verify the theory learned in crystallography
FEL101.3	Perform the experiments on various semiconductor devices and analyze their characteristics.
FEL101.4	Perform the experiments based on interference in thin films and analyze the results.
FEL101.5	Perform the experiments based on the superconductor and supercapacitors.
FEL101.6	Apply the knowledge and concept of physics in designing and developing mini-projects.



<b>FEL102</b>	<b>Engineering Chemistry I</b>
FEL102.1	Analyze water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of different solutions using PH meter.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics</b>
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering</b>
FEL104.1	Interpret and analyse the behaviour of DC circuits using network theorems
FEL104.2	Perform and infer experiment on single phase AC circuits.
FEL104.3	Demonstrate experiment on three phase AC circuits
FEL104.4	Illustrate the performance of single phase transformer and machines



<b>FEL105</b>	<b>Basic Workshop Practice I</b>
FEL105.1	Acquire the skill to identify and use of the various hand tools and measuring instruments.
FEL105.2	Model Various basic prototypes in the trade of fitting such as square, hexagonal and V Male Femalejoint
FEL105.3	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking and crimping.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
<b>FEC201</b>	<b>Engineering Mathematics II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients , variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S.to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area & Mass.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solids.
FEC201.6	Solve Differential equations & Definite integrals using Numerical Methods.
<b>FEC202</b>	<b>Engineering Physics II</b>
FEC202.1	Apply the knowledge of diffraction of light in various engineering applications.
FEC202.2	Apply the foundation of laser and fiber optics in development of modern communication systems.
FEC202.3	Understand the basics of electrodynamics, which are the prerequisites for satellite communications, and antenna theory.
FEC202.4	Explain the fundamentals of theory of relativity and its applications.
FEC202.5	Understand the broad outline of nanotechnology and their application to engineering.
FEC202.6	Interpret the basic sensing techniques for physical measurements in modern instrumentations.





<b>FEC203</b>	<b>Engineering Chemistry II</b>
FEC203.1	Identify types of corrosion & discuss corrosion control measures.
FEC203.2	Analyze the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Understand the principles of green chemistry & calculate Atom economy of chemical reaction.
<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines and Planes
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Apply the basic principles of projections in converting 3D view to 2D drawing.
FEC204.4	Visualize an object from the given two views.



<b>FEC205</b>	<b>C Programming</b>
FEC205.1	Write an algorithm to support Structure Programming approach.
FEC205.2	Use variables, derived data types and control structures to write c program
FEC205.3	Decompose a problem into functions and synthesize a complete program
FEC205.4	Use Array and String for solving complex computational problem
FEC205.5	Use Structure-Union for solving complex computational problem
FEC205.6	Use Pointers for solving complex computational problem
<b>FEC206</b>	<b>Professional Communication and Ethics- I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages
FEC206.4	Write/ Draft academic, business and technical letter/email
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical /Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment



<b>FEL201</b>	<b>Engineering Physics II</b>
FEL201.1	Perform the experiment based on the diffraction of light to measure the wavelength of light using a diffraction grating and determine the number of lines/cm on various types of grating by using laser beam.
FEL201.2	Perform the experiment using optical fiber to measure the numerical aperture of a given fiber.
FEL201.3	Perform the experiment to study the divergence of laser beam.
FEL201.4	Perform experiments on nanotechnology using open source simulation software like Avogadro to draw different carbon structures.
FEL201.5	Perform the experiments on physics of sensors to study the I-V characteristics of a Photodiode and measure the distance using an ultrasonic distance meter.
FEL201.6	Design and implement a mini-project related to physics.
<b>FEL202</b>	<b>Engineering Chemistry II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na, K & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views



<b>FEL204</b>	<b>C Programming</b>
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
<b>FEL205</b>	<b>Professional Communication and Ethics- I</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations run plagiarism check softwares and generate plagiarism report.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation
FEL205.6	Respond to moral dilemmas successfully
<b>FEL206</b>	<b>Basic Workshop Practice II</b>
FEL206.1	Use different carpentry tools and perform the basic operations like joints and wood turning practice.
FEL206.2	Demonstrate the use of furnace and produce the simple forging job.
FEL206.3	Demonstrate the safe wiring practices for the connection of simple electrical load/equipment.
FEL206.4	Demonstrate the skill to fabricate and assemble PCB.



<b>CEC301</b>	<b>Engineering Mathematics-III</b>
CEC301.1	Apply the concept of Laplace transform to solve the real integrals in engineering problems.
CEC301.2	Apply the concept of Inverse Laplace transform of various functions in engineering problems.
CEC301.3	Apply the concept of Fourier series to expand periodic functions.
CEC301.4	Find orthogonal trajectories and analytic function by using concepts of complex variable theory.
CEC301.5	Apply matrix theory to solve the system of linear equations and eigen values and eigen vectors and their applications.
CEC301.6	Solve Partial differential equations by applying numerical solution for one dimensional heat and wave equations.
<b>CEC302</b>	<b>Mechanics of Solids</b>
CEC302.1	To evaluate stress-strain behavior of elastic members and thin cylinders subjected to internal pressure.
CEC302.2	To analyse the determinate beams and frames for the internal forces (SF, BM, AF) to draw SFD, BMD, AFD.
CEC302.3	To calculate the moment of inertia for cross sections and analyze the material response under the action of flexure and shear.
CEC302.4	To predict and compute the angle of twist, shear stresses developed in torsion and also to evaluate direct and bending stresses in the axially and eccentrically loaded columns.
CEC302.5	To evaluate principal stresses with their directions using analytical and graphical methods.
CEC302.6	To evaluate slope and deflections for the beams supported and loaded in different ways.





<b>CEC303</b>	<b>Engineering Geology</b>
CEC303.1	Students will be able to explain the concepts of geology & its application for safe, stable & economical design of any civil engineering structure
CEC303.2	Students will be able to investigate & interpret the lithological characters of rock specimen and distinguish them.
CEC303.3	Students will be able to describe the structural elements of the rocks and implement the knowledge for collection and analysis of the geological data using maps
CEC303.4	Students will be able to compute RQD for rock masses & interpret geological conditions for dam & reservoir site
CEC303.5	Students will be able to compute rock mass rating for assessing tunnelling conditions & ground water potential
CEC303.6	Students will be able to interpret causes of geological hazards & their prevention
<b>CEC304</b>	<b>Architectural Planning &amp; Design of Buildings</b>
CEC304.1	Design Residential & Commercial building making use of the codes of practices, principle of planning.
CEC304.2	Sketch the components and services of building structure using code of practice.
CEC304.3	Sketch one and two-point perspective drawings for any object.
CEC304.4	Illustrate the concepts of town planning making use of master plan
CEC304.5	Prepare the report for green building certification process as per IGBC norms.
CEC304.6	



<b>CEC305</b>	<b>Fluid Mechanics- I</b>
CEC305.1	Identify of various properties of fluids and derive the laws when fluid is at rest and calculate Hydrostatic force and its location for a given geometry
CEC305.2	Compute force of buoyancy on a partially or fully submerged body and Analyze the stability of a floating body
CEC305.3	Classify velocity potential function and stream function and solve for velocity and Acceleration of a fluid at a given location in a fluid flow
CEC305.4	Derive Euler's Equation of motion and construct Bernoulli's equation
CEC305.5	Calculate the flow through various devices like orifices, mouthpieces, notches and weirs
CEC305.6	Identify the compressible flow, propagation of pressure waves and stagnation properties
<b>CEL301</b>	<b>Mechanics of Solids</b>
CEL301.1	To evaluate the stress-strain behaviour of materials and assess the structural behaviour by the virtue of stresses developed and deformation of elastic members.
CEL301.2	To analyse the material response under the action of shear and the effect of flexure (bending).
CEL301.3	To determine the angle of twist and shear stress developed in torsion.
CEL301.4	To evaluate the slope and deflection of beams supported and loaded in different ways.



<b>CEL302</b>	<b>Engineering Geology</b>
CEL302.1	Identify various rock/ ore forming minerals on the basis of physical properties.
CEL302.2	Explain the characteristics of Igneous, Sedimentary and Metamorphic rocks and assess their suitability as construction material and foundation rock.
CEL302.3	Sketch & Interpret the geological map and assess the suitability of the site for Civil Engineering
CEL302.4	Solve the borehole problems and interpret it in order to understand subsurface Geology of the area.
CEL302.5	Calculate RQD and evaluate the rock masses for Civil Engineering Works
<b>CEL303</b>	<b>Architectural Planning &amp; Design of Buildings</b>
CEL303.1	Plan and sketch working drawing for residential building by implementing the principles of planning of buildings, Green building principles, byelaws, regulations and codes for planning.
CEL303.2	Plan and sketch working drawing for public building by implementing the principles of planning of buildings, Green building principles, byelaws, regulations and codes for planning
CEL303.3	Sketch structural details of any component of the building.
CEL303.4	Prepare perspective views for all types of buildings.
<b>CEL304</b>	<b>Fluid Mechanics- I</b>
CEL304.1	Examine the metacentric height of floating body and analyse its stability
CEL304.2	Verify the Bernoulli's equation
CEL304.3	Determine the Discharge Coefficient of Venturimeter, orificemeter, nozzlemeter, mouthpiece, weirs (Broad Crested weir and Ogee weir) and Notches (Rectangular and Triangular notch)



<b>CEL305</b>	<b>Skill Based Lab Course-I</b>
CEL305.1	To illustrate various Computer Aided Drawing and Drafting (CADD) tools available for civilengineering projects in the market.
CEL305.2	To sketch a Line plan and Developed Plan of a residential and a Public Building using CADD tools.
CEL305.3	To illustrate various commands, features, capabilities, and functions of a peculiar building information modeling (BIM) Software.
CEL305.4	To sketch and model a residential building of G+1 Building and also families required for the same.
<b>CEM301</b>	<b>Mini Project – 1 A</b>
CEM301.1	Identify problems based on societal /research needs and formulate a solution strategy.
CEM301.2	Apply Knowledge and skill to solve societal problems in a group.
CEM301.3	Develop interpersonal skills to work as member of a group or leader.
CEM301.4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CEM301.5	Analyse the impact of solutions in societal and environmental context for sustainable development.
CEM301.6	Use standard norms of engineering practices
<b>CEC401</b>	<b>Engineering Mathematics - IV</b>
CEC401.1	Apply the concepts of vector calculus to evaluation of line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence.
CEC401.2	Use the concepts of complex integration for evaluating integrals, computing residues & evaluate various contour integrals.
CEC401.3	Apply the concepts of correlation, regression and curve fitting to the engineering problems.
CEC401.4	Apply the concepts of probability and expectation , Variance for the analysis of data.
CEC401.5	Apply the concept of probability distribution to engineering problems & testing hypothesis of small samples using small sampling theory.
CEC401.6	Apply the concept of parametric and non-parametric tests for analyzing practical problems.



<b>CEC402</b>	<b>Structural Analysis</b>
CEC402.1	Calculate axial forces on co planar truss using methods of sections and methods of joints and also calculate radial shear, normal thrust and bending moment in 3-hinged parabolic arch.
CEC402.2	Apply the principle and draw ILD for axial forces in trusses, reactions, SF and BM in beams.
CEC402.3	Calculate rotation and displacement at a joint of frames and deflection at any joint of truss will able to compute static and kinematic indeterminacy of the structure.
CEC402.4	Apply flexibility method and make use of Clapeyron's theorem to analyse the indeterminate structures.
CEC402.5	Analyze the indeterminate structures such as beams & simple rigid jointed frames using direct stiffness method.
CEC402.6	Analyze the indeterminate structures using Moment Distribution as Stiffness method and make plastic analysis.
<b>CEC403</b>	<b>Surveying</b>
CEC403.1	Apply the principles of surveying and field procedures to conduct the various surveys related to Civil Engineering.
CEC403.2	Apply the principles of levelling & Contouring in profile levelling for road projects, tunneling, laying of sewer line etc.
CEC403.3	Demonstrate the concept of theodolite survey, its principles for various applications in civil engineering fields.
CEC403.4	Employ different methods of tacheometric surveying and apply knowledge of total station and other EDM on field.
CEC403.5	Implement the concepts of plane table surveying, computation of area and volume by using various surveying instruments on field
CEC403.6	Use the knowledge of setting out various types of curves by linear and angular methods for civil engineering projects





<b>CEC404</b>	<b>Building Materials &amp; Concrete Technology</b>
CEC404.1	To develop and implement the conceptual knowledge of building materials in the construction industry.
CEC404.2	Explain & interpret manufacturing process of basic construction materials & other natural materials
CEC404.3	To examine properties & constituents of concrete and their effects on concrete properties
CEC404.4	Determine the properties of fresh and hardened concrete & durability assessment for concrete
CEC404.5	To design concrete mixes in accordance to codal provisions
CEC404.6	To explore the new technology for manufacturing, testing and quality of concrete.
<b>CEC405</b>	<b>Fluid Mechanics-II</b>
CEC405.1	Students will be able to Analyze flow through pipes, various losses through pipes, pipe network and power transmission through nozzle
CEC405.2	Students will be able to interpret laminar flow through circular pipe, parallel plates (stationary and moving)
CEC405.3	Students will be able to examine rough and smooth boundaries for a turbulent flow through circular pipe
CEC405.4	Students will be able to make inferences on forces on submerged bodies due to formation of boundary layer.
CEC405.5	Students will be able to apply the moment of momentum principle to various applications.
CEC405.6	Students will be able to establish relations between prototype and model based on dimensional analysis
<b>CEL401</b>	<b>Structural Analysis</b>
CEL401.1	Calculate axial forces on coplanar truss using methods of sections and methods of joints and also calculate radial shear, normal thrust and bending moment in 3-hinged parabolic arch.
CEL401.2	Apply the principle and draw ILD for axial forces in trusses, reactions, SF and BM in beams.



CEL401.3	Calculate rotation and displacement at a joint of frames and deflection at any joint of truss will able to compute static and kinematic indeterminacy of the structure.
CEL401.4	Apply flexibility method and make use of Clapeyron's theorem to analyse the indeterminate structures.
CEL401.5	Analyze the indeterminate structures such as beams & simple rigid jointed frames using direct stiffness method.
CEL401.6	Analyze the indeterminate structures using Moment Distribution as Stiffness method and make plastic analysis.
<b>CEL402</b>	<b>Surveying</b>
CEL402.1	Determine the area of an irregular plot by Chain, theodolite & modern Surveying methods
CEL402.2	Calculate the bearings for positioning a particular point on surface of earth.
CEL402.3	Apply traversing knowledge for calculating area of survey and locating important points
CEL402.4	Apply Surveying knowledge for carrying out feasibility studies of any new project
<b>CEL403</b>	<b>Building Materials &amp; Concrete Technology</b>
CEL403.1	determine physical and mechanical properties of materials used in the manufacturing of concrete like cement and aggregates.
CEL403.2	test the physical attributes and mechanical strength of burnt clay bricks used in the construction of structures
CEL403.3	determine the various properties of fresh and hardened concrete with and without the addition of admixtures.
CEL403.4	study the different basic non-destructive tests conducted in the laboratory or on site to determine the durability and strength of existing concrete structures.
CEL403.5	utilize the knowledge of mix design in the manufacturing of concrete, in the laboratory.
CEL403.6	understand the practical scenario of the commonly used building materials in terms of their availability, cost and significance through market surveys.



<b>CEL404</b>	<b>Fluid Mechanics-II</b>
CEL404.1	Verify the Reynold's experiment & Assess the flow pattern and velocity distribution in pipe flow
CEL404.2	Estimate the viscosity of fluid
CEL404.3	Calculate the losses in pipes (major & minor)
CEL404.4	learn the water hammer phenomenon through demonstration
CEL404.5	learn the wind tunnel testing through demonstration
<b>CEL405</b>	<b>Skill Based Lab Course-II</b>
CEL405.1	To prepare plans, elevation, and 3D views with the help of output of Total Station
CEL405.2	To compute height of a structure, area of a plot, demarcating boundaries using the output of TotalStation.
CEL405.3	To compute the point, line and area features using Global Navigation Satellite System.
CEL405.4	To plot various existing features in a geographic area on a GIS platform.
<b>CEL404</b>	<b>Fluid Mechanics-II</b>
CEL404.1	Verify the Reynold's experiment & Assess the flow pattern and velocity distribution in pipe flow
CEL404.2	Estimate the viscosity of fluid
CEL404.3	Calculate the losses in pipes (major & minor)
CEL404.4	learn the water hammer phenomenon through demonstration
CEL404.5	learn the wind tunnel testing through demonstration



<b>CEL405</b>	<b>Skill Based Lab Course-II</b>
CEL405.1	To prepare plans, elevation, and 3D views with the help of output of Total Station
CEL405.2	To compute height of a structure, area of a plot, demarcating boundaries using the output of TotalStation.
CEL405.3	To compute the point, line and area features using Global Navigation Satellite System.
CEL405.4	To plot various existing features in a geographic area on a GIS platform.
<b>CEM401</b>	<b>Mini Project – 1 B</b>
CEM401.1	Identify problems based on societal /research needs and formulate a solution strategy.
CEM401.2	Apply Knowledge and skill to solve societal problems in a group.
CEM401.3	Develop interpersonal skills to work as member of a group or leader.
CEM401.4	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CEM401.5	Analyse the impact of solutions in societal and environmental context for sustainable development.
CEM401.6	Use standard norms of engineering practices



<b>CEC501</b>	<b>Theory of Reinforced Concrete Structures</b>
CEC501.1	Evaluate the design parameters of a beam for given condition by using WSM
CEC501.2	Evaluate the design parameters of a beam for given condition by using LSM.
CEC501.3	Evaluate the design parameters of a Slab for given condition by using LSM.
CEC501.4	Evaluate the design parameters of Column for given condition by using LSM.
CEC501.5	Evaluate the design parameters of a L & T beam, shear and torsional reinforcement for given condition by using LSM.
CEC501.6	Evaluate the design parameters of a footing for given condition by using LSM.
<b>CEC502</b>	<b>Applied Hydraulics</b>
CEC502.1	Examine the dynamic force exerted by jet of water on stationary, moving, hinged and series of plates.
CEC502.2	Distinguish between different types of hydraulic turbine, characteristics curves and its application under different circumstances.
CEC502.3	Analyze centrifugal pump by incorporating velocity triangles diagrams
CEC502.4	Identify the hydraulic behavior for the uniform channel flow and design the most economical section of the channels.
CEC502.5	Calculate the hydraulic jump, surges, uniform and gradually varying flow for non-uniform flow.
CEC502.6	Demonstrate the working mechanism of hydraulic machines.





<b>CEC503</b>	<b>Geotechnical Engineering-I</b>
CEC503.1	Solve numericals by making use of fundamental definition and relationships.
CEC503.2	Understand clay minerology and calculate plasticity characteristics of soil using given data.
CEC503.3	Classify soil type & group using Indian soil classification system.
CEC503.4	Calculate permeability & seepage of soil using laboratory and field data.
CEC503.5	Calculate total and effective stress of a soil sample.
CEC503.6	Understand soil exploration process & calculate compactive characteristics of a soil sample.
<b>CEC504</b>	<b>Transportation Engineering</b>
CEC504.1	To summarise Roadways, Railways, Airways and Waterways Transportation Modes.
CEC504.2	To understand the planning of highway and calculate the geometric parameters essential for highway construction.
CEC504.3	To calculate elements of Traffic Engineering for efficient planning and control.
CEC504.4	To calculate design parameters for Rigid and flexible pavements using IRC codes.
CEC504.5	To provide soil stabilization and drainage system for pavement construction.
CEC504.6	To calculate the deflection characteristics and to identify failure in rigid and flexible pavement.
<b>CEDLO5012</b>	<b>Building Services &amp; Repairs</b>
CEDLO5012.1	Use the knowledge of utility services in making a building safe and comfortable
CEDLO5012.2	Choose appropriate fire safety and Plumbing systems for building construction projects.
CEDLO5012.3	Apply the knowledge of electrical services for effective planning of electrical system in buildings.
CEDLO5012.4	Examine the cause of deterioration of damaged structure by assessing its structural health.
CEDLO5012.5	Choose the suitable material and technique for repairing the concrete structures.
CEDLO5012.6	Employ corrosion protection method to improve the life of RCC structure.



<b>CEDLO5017</b>	<b>Advanced Concrete Technology</b>
CEDLO5017.1	To determine the effect of various ingredients of concrete, and summarise the properties of fresh concrete and rheological models.
CEDLO5017.2	To examine the various testing methods on concrete
CEDLO5017.3	To apply and understand the concept of durability, cracking of concrete and concreting under extreme conditions
CEDLO5017.4	To design the concrete mix for field application by different methods
CEDLO5017.5	To apply the various properties of special concrete to different site conditions
CEDLO5017.6	To determine the quality of concrete and understand the acceptance criteria
<b>CEL501</b>	<b>Theory of Reinforced Concrete Structures</b>
CEL501.1	Evaluate the design parameters of a beam for given condition by using WSM
CEL501.2	Evaluate the design parameters of a beam for given condition by using LSM.
CEL501.3	Evaluate the design parameters of a Slab for given condition by using LSM.
CEL501.4	Evaluate the design parameters of Column for given condition by using LSM.
CEL501.5	Evaluate the design parameters of a L & T beam, shear and torsional reinforcement for given condition by using LSM.
CEL501.6	Evaluate the design parameters of a footing for given condition by using LSM.



<b>CEL502</b>	<b>Applied Hydraulics</b>
CEL502.1	Calculate the rate of flow ,Chezy's constant and hydraulic jump through open channel flow
CEL502.2	Evaluate the Gradually varied flow (G.V.F) and Rapid varied flow (R.V.F) in open channel flow
CEL502.3	Evaluate the efficiencies and working of various pumps, turbines and hydraulic machines
CEL502.4	Apply impulse momentum principle to calculate the impact of jet on flat, inclined and curved vanes
<b>CEL503</b>	<b>Geotechnical Engineering-I</b>
CEL503.1	Determine Index properties of soil in accordance with IS 2720.
CEL503.2	Determine Plasticity properties of soil in accordance with IS 2720.
CEL503.3	Demonstrate soil classification using grain size distribution.
CEL503.4	Determine compaction characteristics of soil in accordance to IS 2720.
<b>CEL504</b>	<b>Transportation Engineering</b>
CEL504.1	To determine Penetration grade and Viscosity grade of bitumen.
CEL504.2	To determine the Softening point and Ductility value of bitumen.
CEL504.3	To determine Impact, Abrasion and Crushing value of aggregate.
CEL504.4	To determine the flakiness and elongation of the aggregates.
CEL504.5	To determine the Classified volume study and plot speed profile at mid-block section.



# Vidyavardhini's College of Engineering & Technology

## Department of Civil Engineering

<b>CEL505</b>	<b>Professional Communication and Ethics</b>
CEL505.1	Write effective business/ technical documents.
CEL505.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
CEL505.3	Apply various techniques to be successful in group discussions, technical presentation and meetings
CEL505.4	Deliver successful professional presentations
CEL505.5	Develop creative thinking and interpersonal skills
CEL505.6	Apply codes of ethical conduct & organizational behaviour
<b>CEM501</b>	<b>Mini Project –2 A</b>
CEM501.1	Identify problems based on societal /research needs and formulate a solution strategy.
CEM501.2	Apply fundamentals to develop solutions to solve societal problems in a group
CEM501.3	Analyze the specific need, formulate the problem and deduce the interdisciplinary approaches, software-based solutions and computer applications.
CEM501.4	Develop systematic flow chart, evaluate inter disciplinary practices, devices, available software, estimate and recommend possible solutions.
CEM501.5	Draw the proper inferences from available results through theoretical/ experimental/ simulations and assemble physical systems
CEM501.6	Create devises or design a computer program or develop computer application



<b>CEC601</b>	<b>Design &amp; Drawing of Steel Structures</b>
CEC601.1	Apply the knowledge of Limit State Design philosophy as applied to steel structures using IS 800 codeclause
CEC601.2	Students will be able to design bolted and welded connections
CEC601.3	Students will be able to design design members subjected to axial tension
CEC601.4	Students will be able to design compression members, Built-up columns and column bases based oncodal provisions.
CEC601.5	Students will be able to design members subjected to flexure based on codal provision
CEC601.6	Students will be able to design the various parts of a Roof truss by determining loads using relevantcodal provisions
<b>CEC602</b>	<b>Water Resources Engineering</b>
CEC602.1	Calculate the crop water requirement and classify various types of irrigation methods
CEC602.2	Calculate the flood discharge and run-off by different methods for the planning and management ofwater resource projects
CEC602.3	Apply knowledge of ground water, well hydraulics and estimate safe yield capacity
CEC602.4	Analyze and design of gravity and earthen dams with spillway for sustainable development
CEC602.5	Compare and analyze the irrigation channel using Lacey's and Kennedy's theory
CEC602.6	Classify various canal structures and suggest remedial measures for water logging
<b>CEC603</b>	<b>Geotechnical Engineering-II</b>
CEC603.1	Calculate consolidation characteristics and settlement for a given soil mass.
CEC603.2	Calculate shear strength for a given soil mass.
CEC603.3	Calculate factor of safety of a slope subjected to given field conditions.
CEC603.4	Calculate lateral earth pressure and other parameters for designing retaining walls.
CEC603.5	Calculate load bearing capacity of shallow foundation using analytical and field methods.
CEC603.6	Calculate load bearing capacity of pile foundation using analytical and field methods.





<b>CEC604</b>	<b>Environmental Engineering</b>
CEC604.1	Understand the importance of a proper water supply system and identify the characteristics of water.
CEC604.2	Apply the necessary knowledge for the design and operation of various units of water treatment plant
CEC604.3	Prepare the building water supply and drainage system and calculate annual rainwater harvesting potential.
CEC604.4	Identify the different components of sewerage system and calculate the BOD value by using the knowledge of characteristics of sewage
CEC604.5	Apply the necessary knowledge for the design and operation of various units of sewage treatment plant
CEC604.6	Apply the basic concepts of Air pollution, noise pollution and solid waste calculate the sound level to control its adversity on ambient environment.
<b>CEDLO6013</b>	<b>Construction Equipment &amp; Techniques</b>
CEDLO6013.1	Demonstrate the knowledge of working and application of standard construction equipment's.
CEDLO6013.2	Select correct method and construction equipment for underground & underwater tunnelling
CEDLO6013.3	Compare and use the appropriate conventional and modern methods of formwork based on productivity, reuse, value, ease of erection and dismantling, flexibility offered and overall cost.
CEDLO6013.4	Apply the knowledge of pipeline insertion system in locating underground utilities.
CEDLO6013.5	Implement the knowledge construction techniques for proper working of power generating structures.
CEDLO6013.6	Schedule the techniques involved and the equipments required thereof for construction of various transporting facilities.



<b>CEDLO6014</b>	<b>Urban Infrastructure Planning</b>
CEDLO6014.1	Envisage and plan the various elements required for infrastructure development of a city.
CEDLO6014.2	Evaluate technical, social and economic feasibility of transportation projects within cities.
CEDLO6014.3	Demonstrate modern tool usage for urban management and governance.
CEDLO6014.4	Envisage and plan environmentally safe and disaster resilient infrastructure.
<b>CEL601</b>	<b>Design &amp; Drawing of Steel Structures</b>
CEL601.1	Calculate dead, live and wind loads on the structure.
CEL601.2	Analyze the structure by analytical/graphical method
CEL601.3	Use steel table for selecting appropriate section
CEL601.4	Design the members for various load combinations
CEL601.5	Design the bolted and welded connection
CEL601.6	Read and Prepare the detailed fabrication drawing and design report
<b>CEL602</b>	<b>Water Resources Engineering</b>
CEL602.1	Calculate the crop water requirement and classify various types of irrigation methods
CEL602.2	Calculate the flood discharge and run-off by different methods for the planning and management of water resource projects
CEL602.3	Apply knowledge of ground water, well hydraulics and estimate safe yield capacity
CEL602.4	Analyze and design of gravity and earthen dams with spillway for sustainable development
CEL602.5	Compare and analyze the irrigation channel using Lacey's and Kennedy's theory
CEL602.6	Classify various canal structures and suggest remedial measures for water logging



<b>CEL603</b>	<b>Geotechnical Engineering-II</b>
CEL603.1	Determine consolidation parameters such as coefficient of compressibility, coefficient of volume change, coefficient of consolidation using oedometer.
CEL603.2	Determine cohesion and angle of shearing resistance for given soil using laboratory methods.
CEL603.3	Determine the CBR value of soil for pavement design using CBR machine.
CEL603.4	Calculate stress distribution in soils due to vertically applied load.
<b>CEL604</b>	<b>Environmental Engineering</b>
CEL604.1	Analyse the characteristics of water sample and solid waste
CEL604.2	Analyse the characteristics of sewage sample
CEL604.3	Compare the BOD and COD of sewage sample
CEL604.4	Inspect the levels of noise and interpret the results and also determine the air quality
<b>CEL605</b>	<b>Skill Based Lab Course-III</b>
CEL605.1	To analyze RCC framed structure using E-Tabs.
CEL605.2	To analyze Steel Structure using E-Tabs.
CEL605.3	To prepare spreadsheet for Concrete Mix Design using MS-Excel.
CEL605.4	To prepare spreadsheet for RCC structural member design using MS-Excel.



<b>CEM601</b>	<b>Mini Project – 2 B</b>
CEM601.1	Identify problems based on societal /research needs and formulate a solution strategy.
CEM601.2	Apply fundamentals to develop solutions to solve societal problems in a group
CEM601.3	Analyze the specific need, formulate the problem and deduce the interdisciplinary approaches, software-based solutions and computer applications.
CEM601.4	Develop systematic flow chart, evaluate inter disciplinary practices, devices, available software, estimate and recommend possible solutions.
CEM601.5	Draw the proper inferences from available results through theoretical/ experimental/ simulations and assemble physical systems
CEM601.6	Create devices or design a computer program or develop computer application
<b>CEC701</b>	<b>Design &amp; Drawing of Reinforced Concrete Structures</b>
CEC701.1	Design of dog legged and open well type staircase using limit state method.
CEC701.2	Design cantilever and counter fort type retaining wall using limit state method.
CEC701.3	Design components of building such as slab, column, beam, footing using relevant IS codes.
CEC701.4	Design water tank using working stress method.
CEC701.5	Calculate design forces by using seismic coefficient method
CEC701.6	Determination of Stresses in prestress concrete member



<b>CEC702</b>	<b>Quantity Survey, Estimation and Valuation</b>
CEC702.1	To prepare an approximate estimate by using Plinth Area Method.
CEC702.2	To prepare the detailed estimate of a construction project by using Long Wall-Short Wall and Centre Line method.
CEC702.3	To prepare the Rate Analysis for construction activities as per Indian Standard (IS 1200-1964) and DSR.
CEC702.4	To prepare Bar Bending Schedule of structural members as per Indian Standard (IS 1200-1964).
CEC702.5	To compute volume of earthwork for roads and canals by using different methods.
CEC702.6	To analyze the valuation of any Land and Building using different methods.
<b>CEDLO7011</b>	<b>Pre-stressed Concrete</b>
CEDLO7011.1	To relate the advantages of Prestressed Concrete to Reinforced concrete and illustrate the prestressing systems used.
CEDLO7011.2	To calculate the resultant stresses in Prestressed and Post-tensioned concrete members using the Stress concept, P-line Concept, and Load balancing Method.
CEDLO7011.3	To calculate the losses in Prestressing Steel used in Prestressed and Post-tensioned Concrete members.
CEDLO7011.4	To calculate short-term and long-term deflection in Prestressed Concrete Beams.
CEDLO7011.5	To calculate the Shear and Flexural Reinforcement required in Prestressed and Post Tensioned Beams.
CEDLO7011.6	To calculate Safe Cable Zone and Effective Prestressing Force.





<b>CEDLO7013</b>	<b>Appraisal and Implementation of Infra Projects</b>
CEDLO7013.1	To classify projects and describe the stages of project formulation.
CEDLO7013.2	To prepare detailed project report of any construction project
CEDLO7013.3	To predict market demand of any construction project by using different methods.
CEDLO7013.4	To select construction project based financial and economic aspects of the entity.
CEDLO7013.5	To identify various sources of finance and select appropriate source for project implementation.
CEDLO7013.6	To select appropriate method for project implementation.
<b>CEDLO7021</b>	<b>Foundation Analysis and Design</b>
CEDLO7021.1	Estimate vertical stress condition in soils.
CEDLO7021.2	Calculate the safe allowable bearing capacity of shallow foundation under different soil conditions.
CEDLO7021.3	Calculate the load carrying capacity of pile foundation under different soil conditions
CEDLO7021.4	Calculate design parameters of floating and well foundation under different soil condition.
CEDLO7021.5	Calculate design parameters of Braced cuts & Sheet piles
CEDLO7021.6	Calculate design parameters of different components of machine foundation.
<b>CEDLO7022</b>	<b>Solid and Hazardous Waste Management</b>
CEDLO7022.1	Solve the numericals related to properties and composition of solid waste
CEDLO7022.2	Classify the segregation and transportation methods of solid waste
CEDLO7022.3	Compare the thermal, biological and chemical waste processing techniques
CEDLO7022.4	Utilize necessary knowledge and concepts of landfill for disposal.
CEDLO7022.5	Prepare the process of hazardous waste management using its safe handling and disposal methods
CEDLO7022.6	Prepare the waste management process required for assorted solid waste



<b>ILO7013</b>	<b>Management Information Systems</b>
ILO7013.1	Identify the impact of information systems on an organization
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making
ILO7013.3	Identify the threats to information systems and apply security controls for IS
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
<b>ILO7017</b>	<b>Disaster Management and Mitigation Measures</b>
ILO7017.1	Identify the effects of Disasters by understanding the scenario of disasters in India
ILO7017.2	Compare Manmade and Natural disasters and their extent and possible effects on the economy
ILO7017.3	Categorize the Government Policies, acts and administration based on the level of Disaster
ILO7017.4	Employ the knowledge of Institutional Framework for Disaster Management in India
ILO7017.5	Apply the knowledge of Financing and Relief Measures
ILO7017.6	Utilize the of Preventive and Mitigation Measures to act during the disasters



<b>CEL701</b>	<b>Design &amp; Drawing of Reinforced Concrete Structures</b>
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CEL701.3	Design components of building such as slab, column, beam, footing using relevant IS codes.
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<b>CEL702</b>	<b>Quantity Survey, Estimation and Valuation</b>
CEL702.1	To prepare an approximate estimate by using Plinth Area Method.
CEL702.2	To prepare the detailed estimate of a construction project by using Long Wall-Short Wall and CentreLine method.
CEL702.3	To prepare the Rate Analysis for construction activities as per Indian Standard (IS 1200-1964) and DSR.
CEL702.4	To prepare Bar Bending Schedule of structural members as per Indian Standard (IS 1200-1964).
CEL702.5	To compute volume of earthwork for roads and canals by using different methods.
CEL702.6	To analyze the valuation of any Land and Building using different methods.
<b>CEP701</b>	<b>Major Project - 1</b>
CEP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CEP701.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CEP701.3	Analyze and compare the results with the standard results.
CEP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CEP701.5	Write and present their work effectively with ethical values.
CEP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.



<b>CEC801</b>	<b>Construction Management</b>
CEC801.1	To understand and apply the principles and functions of Construction Management.
CEC801.2	To develop a Work Break Down Structure and Bar charts for the construction project.
CEC801.3	To identify schedule time required for completion of project by using CPM & PERT techniques.
CEC801.4	To Apply Resource allocation method for the construction project.
CEC801.5	To understand project monitoring process and optimize the Time-Cost trade-off.
CEC801.6	To understand and apply Safety Measures, Quality aspects of construction work and legislation(Labour).
<b>CEDLO8011</b>	<b>Bridge Engineering</b>
CEDLO8011.1	Choose the suitable type of bridge according to site condition
CEDLO8011.2	Analyse loads on decks slab and girders and design the Steel bridges, lattice girder bridge and balance cantilever bridges by IRC and IRS loading conditions
CEDLO8011.3	Analyse RCC slab bridge, trussed girders, Prestressed Concrete Bridges, Steel bridges, lattice girderbridge and balance cantilever bridges
CEDLO8011.4	To explain the various methods for the erection of the bridge girders.
CEDLO8011.5	Choose different foundations, Piers and Abutments based on their Suitability.
CEDLO8011.6	Choose different methods of erection for construction of bridge superstructure and repair techniques of existing bridges.



<b>CEDLO8015</b>	<b>Industrial Waste Treatment</b>
CEDLO8015.1	to interpret various quality standards, characteristics, toxicity of industrial wastewater, effects on stream and also calculate the BOD of wastewater.
CEDLO8015.2	to illustrate quality standards of stream and effluent and also calculate Oxygen deficit using Streeter-Phelps Equation.
CEDLO8015.3	to illustrate techniques of waste minimization and methods to treat Industrial Wastewater.
CEDLO8015.4	to illustrate techniques of waste minimization and treatment of Industrial wastewater.
CEDLO8015.5	to interpret the manufacturing process of industries and the treatment of wastewater.
CEDLO8015.6	to illustrate the framework for the remediation of industrial wastewater through environmental impact assessment, environmental audit, and common effluent treatment plant.
<b>CEDLO8021</b>	<b>Repairs, Rehabilitation and Retrofitting of Structures</b>
CEDLO8021.1	Understand the need of repairs and use its concept in R.C.C Structures
CEDLO8021.2	Examine the cause of deterioration of damaged structures by assessing its structural health
CEDLO8021.3	Choose the correct material and technique for repairing the concrete structures
CEDLO8021.4	Examine the structure and suggest suitable rehabilitation & retrofitting methods
CEDLO8021.5	Apply the knowledge to repair steel structures
CEDLO8021.6	Examine the structures damaged by earthquake and suggest repair and maintenance method





<b>CEDLO8023</b>	<b>Transportation System Engineering</b>
CEDLO8023.1	To illustrate various elements of the transportation system in the country, NUTP, and the Environmental Impact of a transportation project.
CEDLO8023.2	To calculate the dimensions of the Runway, Taxiway, and Aprons and illustrate the parameters of Airport planning.
CEDLO8023.3	To illustrate Aircraft movement control aids and aspects of planning for Helicopters
CEDLO8023.4	To calculate geometric parameters of a Railway System and explain the aspects of Modern Train.
CEDLO8023.5	To illustrate different components of Water Transport.
CEDLO8023.6	To calculate hydrological parameters of a bridge and explain the elements of it.
<b>ILO8011</b>	<b>Project Management</b>
ILO8011.1	Apply selection criteria and select an appropriate project from different options
ILO8011.2	Write work break down structure for a project and develop a schedule based on it
ILO8011.3	Identify opportunities and threats to the project and decide an approach to deal with them strategically
ILO8011.4	Use Earned value technique and determine & predict status of the project
ILO8011.5	Capture lessons learned during project phases and document them for future reference



<b>ILO8019</b>	<b>Environmental Management</b>
ILO8019.1	Apply the knowledge of Environment Management and sustainable development
ILO8019.2	Identify Global Environmental Concerns and Hazards.
ILO8019.3	Employ the Concept of Ecology and interdependence between ecosystem and living organisms
ILO8019.4	Utilize the knowledge of Scope of Environment Management and Corporate Env Responsibility
ILO8019.5	Present the process of EMS Certification and ISO-14000
ILO8019.6	Interpret Environment related legislations and acts
<b>CEL801</b>	<b>Construction Management</b>
CEL801.1	To understand and apply the principles and functions of Construction Management.
CEL801.2	To develop a Work Break Down Structure and Bar charts for the construction project.
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# Vidyavardhini's College of Engineering & Technology

## Department of Civil Engineering

<b>CEP802 Major Project - 2</b>	
CEP802.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CEP802.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CEP802.3	Analyze and compare the results with the standard results.
CEP802.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CEP802.5	Write and present their work effectively with ethical values.
CEP802.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.

*A. S. Raskhe*

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**VidyaVardhini's college of Engineering & Technology Vasai(w)**  
**Department of Artificial Intelligence and Data Science**  
**Course Outcomes for R-2019 Syllabus**

Program Outcomes	
<b>PO1. Engineering knowledge:</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2. Problem analysis:</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3. Design/development of solutions:</b>	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4. Conduct investigations of complex problems:</b>	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5. Modern tool usage:</b>	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO6. The engineer and society:</b>	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO7. Environment and sustainability:</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8. Ethics:</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9. Individual and teamwork:</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10. Communication:</b>	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11. Project management and finance:</b>	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12. Life-long learning:</b>	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes	
<b>PSO1:</b>	Analyze the currents trends in the field of Artificial Intelligence and Data Science and convey their findings by presenting/ publishing at national/ international forums..
<b>PSO2:</b>	Design and develop Artificial Intelligence and Data Science based solutions and applications for the problems in the different domains catering to industry and society.
Course Outcomes	
	<b>At the end of the semester student will able to</b>
<b>FEC101</b>	<b>Applied Mathematics I</b>
FEC101.1	Apply the concepts of Complex Numbers, to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Apply Compute the partial differentiation of functions of two & three variables.
FEC101.4	Apply find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Apply the concept of Numerical Methods to solve system of linear algebraic equations, transcendental equation.
<b>FEC102</b>	<b>Applied Physics I</b>
FEC102.1	Know the fundamentals of quantum mechanics and its applications.
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Bragg's diffractometer
FEC102.3	Apply concepts of semiconductor physics to understand principle and working of LED, photoconductor and photovoltaic cell.
FEC102.4	Use concept of interference in thin films in measurements.
FEC102.5	Discuss properties of superconductors and super capacitor.
FEC102.6	Know the principles of engineering materials.
<b>FEC103</b>	<b>Applied Chemistry I</b>
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles

<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Analyze DC circuits and apply Superposition, Thevenin's Norton's, Maximum power transfer theorems to determine their response.
FEC105.2	Analyse 1- $\Phi$ AC circuits and determine their response.
FEC105.3	Analyse 3- $\Phi$ circuits and determine voltage-current relationship in star and delta connection.
FEC105.4	Perform oc/sc test on 1- $\Phi$ Transformer and evaluate/determine its equivalent circuit and efficiency.
FEC105.5	Understand the working principle, constructional details and operation of 1- $\Phi$ & 3- $\Phi$ Machines.
<b>FEL101</b>	<b>Engineering Physics-I Lab</b>
FEL101.1	Draw Miller indices for a given unit cell.
FEL101.2	Calculate energy band gap of semiconductor for a given semiconductor material.
FEL101.3	Calculate Hall coefficient of material and carrier concentration of a given material.
FEL101.4	Calculate radius of curvature of a lens using Newton's ring set up.
FEL101.5	Calculate thickness of paper using Wedge shape film.
<b>FEL102</b>	<b>Engineering Chemistry-I Lab</b>
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of different solutions using PH meter.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics Lab</b>
FEL103.1	Verify the law of polygon, Varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering</b>
FEL104.1	Implement DC circuits and analyze their behavior using network theorem
FEL104.2	Implement RLC circuit and calculate resonance frequency, Bandwidth and Q-factor
FEL104.3	Determine relationship between line/phase voltage/current in three phase star/delta circuit
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency
FEL104.5	Identify the components of a D.C. Machine
FEL104.6	
<b>FEL105</b>	<b>Basic Workshop Practice I</b>
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail lap joint.
FEL105.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL105.3	Perform various basic House Wiring techniques while taking care of electrical safety.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
<b>FEC201</b>	<b>Applied Mathematics II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S. to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area & Mass.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solid.
FEC201.6	Solve Differential equations & Definite integrals using Numerical Methods.
<b>FEC202</b>	<b>Applied Physics II</b>
FEC202.1	Calculate wavelength of light using diffraction grating and resolving power of grating.
FEC202.2	Apply the principles of Laser and fibre optics in modern communication technology.
FEC202.3	Relate the fundamentals of electrodynamics for satellite communication, antenna theory.
FEC202.4	Know the fundamentals of relativity.
FEC202.5	Select Tools for characterisation of nanomaterials and method to synthesize nanomaterial
FEC202.6	Classify sensors based on their sensing technique.
<b>FEC203</b>	<b>Applied Chemistry II</b>
FEC203.1	Identify types of corrosion & discuss corrosion control measures.
FEC203.2	Analyse the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Understand the principles of green chemistry &
<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Visualize the given 3D object and draw Orthographic projections
FEC204.4	Draw Isometric view from the given orthographic projections
FEC204.5	Draw Orthographic and Isometric Projection using AutoCad



<b>FEC205</b>	<b>C programming</b>
FEC205.1	Identify the terminologies in operating system used for computer programming and illustrate the algorithms to support Structure
FEC205.2	Use Variables, derived data types and control structures to write C program.
FEC205.3	Implement solutions to the problem using strings and functions.
FEC205.4	Decompose a problem into functions and synthesize a complete program.
FEC205.5	Structure-Union and Files for solving complex Computational problem.
FEC205.6	Use Pointers for solving complex Computational problem.
<b>FEC206</b>	<b>Professional Communication and Ethics- I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages.
FEC206.4	Write/ Draft academic, business and technical letter/email.
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
<b>FEL201</b>	<b>Engineering Physics-II Lab</b>
FEL201.1	Calculate wavelength of given colour using diffraction grating
FEL201.2	Calculate number of lines on the grating using Laser source
FEL201.3	Calculate numerical aperture of an optical fibre
FEL201.4	Determine I-V characteristics of photodiode
FEL201.5	Calculate volume of room using ultrasonic distance meter.
<b>FEL202</b>	<b>Engineering Chemistry-II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na,K & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics Lab</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
<b>FEL204</b>	<b>C programming Lab</b>
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
<b>FEL205</b>	<b>Professional Communication and Ethics- I Lab</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully
<b>FEL201</b>	<b>Basic Workshop Practice II</b>
FEL201.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail lap joint.
FEL201.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL201.4	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking
<b>CSC301</b>	<b>Engineering Mathematics-III</b>
CSC301.1	Apply the concept of Laplace transform and its application to solve the real integrals in engineering problems.
CSC301.2	Apply the concept of inverse Laplace transform of various functions and its application in engineering problems.
CSC301.3	Expand the periodic function by using the fourier series for real life problems and complex engineering problems.
CSC301.4	Apply complex variable theory,application of harmonic conjugate to get orthogonal trajectories and analytic functions.
CSC301.5	Apply the concept of correlation and Regression to the engineering problems .
CSC301.6	Apply the concept of probability and expectation for getting the spread of the data and distribution of probabilities.
<b>CSC302</b>	<b>Discrete Structures and Graph Theory</b>
CSC302.1	Apply logical reasoning methods for problem solving .
CSC302.2	Apply set notations ,functions and relations for problem solving.
CSC302.3	Analyze posets and Lattice using relations .

CSC302.4	Solve problems using counting techniques .
CSC302.5	Use of groups and codes in Encoding-Decoding
CSC302.6	Use graphical terminologies to identify connected and isomorphic graphs.
<b>CSC303</b>	<b>Data Structure</b>
CSC303.1	Identify the Linear and Non Linear Data Structures for a given problem
CSC303.2	Apply insertion, deletion operations on stacks and queue data structures.
CSC303.3	Apply insertion and deletion operations on Linked Lists
CSC303.4	Apply insertion,deletion and searching operations on AVL, B Tree, B+ Tree, Expression Tree, Huffman Encoding
CSC303.5	Examine Graph Traversal algorithms to determine shortest path and connectivity between nodes
CSC303.6	Select appropriate searching technique and hashing function for a database application
<b>CSC304</b>	<b>Digital Logic &amp; Computer Organization and Architecture</b>
CSC304.1	Convert one number system to another and realize logic circuits using basic/universal gates.
CSC304.2	Apply the arithmetic algorithms to solve ALU operations.
CSC304.3	Analyze the truth table of digital components and identify the elements, their functions in processor architecture.
CSC304.4	Compare a hardwired / microprogrammed control unit.
CSC304.5	Classify parameters of cache and implement memory mapping techniques.
CSC304.6	Compare serial/parallel processing and ISA, PCI, USB buses.
<b>CSC305</b>	<b>Computer Graphics</b>
CSC305.1	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSC305.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSC305.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSC305.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSC305.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSC305.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
<b>CSL301</b>	<b>Data Structures Lab</b>
CSL301.1	Implement Linear Data Structure and handle insertion, deletion, traversal operations using array.
CSL301.2	Apply stack operations to convert and evaluate expression
CSL301.3	Implement linear, circular or priority queues using arrays
CSL301.4	Implement Singly, Circular or Doubly Linked list
CSL301.5	Implement Abstract data type using Linked list
CSL301.6	Implement Graph Traversal Techniques: BFS and DFS.
<b>CSL302</b>	<b>Digital Logic &amp; Computer Organization and Architecture Lab</b>
CSL302.1	Verify the truth table of logic, universal gates, and realize logic circuits using hardware.
CSL302.2	Implement combinational circuits design using hardware.
CSL302.3	Implement sequential & code conversion circuits design using hardware.
CSL302.4	Write Booth's, Restoring, and Non-Restoring algorithms for arithmetic operations using C-Programming language.
CSL302.5	Implement ripple carry adder, carry look ahead adder, ALU design using virtual lab.
CSL302.6	Implement CPU, memory and Cache memory designs using a virtual lab.
<b>CSL303</b>	<b>Computer Graphics Lab</b>
CSL303.1	Represent points in two/three-dimension graphical coordinate systems and compare raster scan & random scan displays.
CSL303.2	Apply scan conversions algorithms to draw point, line, circle, ellipse and compare flood fill, boundary fill algorithms.
CSL303.3	Apply 2-D geometric transformations on graphical objects and analyze composite transformation.
CSL303.4	Apply line and polygon clipping algorithms on 2D graphical objects.
CSL303.5	Apply 3D geometric transformations on graphical objects and construct the curves.
CSL303.6	Classify visible surface detection techniques and compare conventional/traditional and computer-based animation techniques.
<b>CSL304</b>	<b>Skill based Lab Course: Object Oriented Programming with Java</b>
CSL304.1	Apply programming constructs of decision making and looping for solving arithmetic problems.
CSL304.2	Apply the concept of packages, classes and objects for solving given problem.
CSL304.3	Use strings, arrays and vectors for solving given problem.
CSL304.4	Implement the concept of inheritance and interfaces.
CSL304.5	Implement the concept of exception handling and multithreading.
CSL304.6	Develop GUI based application.
<b>CSM301</b>	<b>Mini Project A</b>
CSM301.1	Identify societal, industrial needs and formulate problem statements followed by requirement analysis.
CSM301.2	Investigate the problem through appropriate literature Surveys.
CSM301.3	Design and develop solution using modern tools for the given problem.
CSM301.4	Work as an individual , contribute as a team member with effective management skills and ethical values.
CSM301.5	Develop effective communication/ technical writing skills through project presentation, Group discussion and report writing activities.
CSM301.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC401</b>	<b>Engineering Mathematics-IV</b>
CSC401.1	Apply the concept of eigenvalues and eigenvectors in engineering problems.
CSC401.2	Apply the concepts of Complex Integration for evaluating integrals,computing residues & evaluate various contour integrals.

CSC401.3	Apply the concept of Z-transformation and inverse in engineering problems.
CSC401.4	Apply the concept of probability distribution and sampling theory to engineering problems
CSC401.5	Apply the concept of Linear Programming Problems to optimization
CSC401.6	Solve Non-Linear Programming Problems for Optimization of engineering problems.
<b>CSC402</b>	<b>Analysis of Algorithms</b>
CSC402.1	Calculate the Space and Time Complexity of algorithms
CSC402.2	Apply Divide and Conquer approach to solve problems and analyze its complexity
CSC402.3	Apply Greedy Methods to solve problems on Single source shortest path and Minimum spanning tree, and analyze its complexity
CSC402.4	Apply Dynamic Programming Approaches to solve problems on Single source and All pair shortest path
CSC402.5	Apply backtracking, and branch & bound strategies to solve problems on decision and optimization
CSC402.6	Apply String Matching techniques for finding the occurrences of patterns in a text
<b>CSC403</b>	<b>Database Management System</b>
CSC403.1	Identify characteristics of database management system.
CSC403.2	Design ER/EER diagram for given case study.
CSC403.3	Construct relational model and apply relational algebra queries for a given problem.
CSC403.4	Apply SQL queries for a given schema.
CSC403.5	Apply normalization techniques to relational database design.
CSC403.6	Use transaction, concurrency and recovery techniques to analyze conflicts in multiple transactions.
<b>CSC404</b>	<b>Operating System</b>
CSC404.1	Identify the objectives, functions and structure of the operating system.
CSC404.2	Analyze performance of Process Scheduling algorithms based on CPU utilization and throughput.
CSC404.3	Use process synchronization techniques for deadlock detection, prevention, recovery.
CSC404.4	Analyze performance of memory allocation based on space complexity and page replacement policies based on time complexity.
CSC404.5	Use concepts of file management to access, share and manipulate file systems.
CSC404.6	Evaluate performance of disk scheduling algorithms using concepts of I/O management.
<b>CSC405</b>	<b>Microprocessor</b>
CSC405.1	Identify the components and their functions in Intel 8086 microprocessors.
CSC405.2	Write assembly, mixed language programs using instruction set of 8086 and analyze updated values of control flag after execution of assembly language
CSC405.3	Design 8086 microprocessor-based system for the given specifications using memory and peripheral chips.
CSC405.4	Identify the components and their functions in Intel 80386DX processor.
CSC405.5	Identify the components and their functions in the Pentium processors.
CSC405.6	Compare 8086, 80386, Pentium I, II, III and Identify the components, their functions for Pentium 4: Net burst microarchitecture.
<b>CSL401</b>	<b>Analysis of Algorithms Lab</b>
CSL401.1	Implement and Analyze Time Complexity of Insertion and Selection sort algorithms
CSL401.2	Implement Divide and Conquer approaches to solve problems and analyze its complexity
CSL401.3	Implement Greedy Algorithms for Single source shortest path, Fractional Knapsack, Minimum cost spanning trees
CSL401.4	Implement Dynamic Programming algorithms for Single source shortest path, All pairs Shortest path, 0/1 Knapsack Problem, Travelling Salesperson Problem
CSL401.5	Implement Backtracking, and Branch and Bound algorithms for Nqueen Problem, Sum of Subset Problem, Travelling Salesperson Problem, 15 puzzle problem
CSL401.6	Implement String Matching Techniques
<b>CSL402</b>	<b>Database Management system Lab</b>
CSL402.1	Design ER and EER diagram for the real life problem with software tool.
CSL402.2	Construct database tables with different DDL and DML statements and apply integrity constraints
CSL402.3	Apply SQL queries ,triggers for given Schema
CSL402.4	Apply procedure and functions for given schema
CSL402.5	Use transaction and concurrency control techniques to analyze conflicts in multiple transactions.
CSL402.6	Construct database tables and JDBC/ ODBC connectivity for given application
<b>CSL403</b>	<b>Operating System Lab</b>
CSL403.1	Use the Linux commands to write Shell scripting program using system calls.
CSL403.2	Analyze the performance of process scheduling algorithms based on CPU utilization and throughput.
CSL403.3	Write a program for deadlock detection and avoidance algorithm using C programming language.
CSL403.4	Analyze the performance of memory management techniques based on space complexity.
CSL403.5	Analyze the performance of virtual memory management algorithms based on time complexity.
CSL403.6	Write a program for file management and I/O management techniques using C programming language.
<b>CSL404</b>	<b>Microprocessor Lab</b>
CSL404.1	Write assembly language programs to perform basic arithmetic operations on 8-bit/16-bit data.
CSL404.2	Write assembly language programs for 16-bit addition, subtraction, multiplication, and division (menu based)
CSL404.3	Write assembly language programs based on string instructions.
CSL404.4	Write assembly language program using procedure.
CSL404.5	Write assembly language programs using macros.
CSL404.6	Write a mixed language program.

<b>CSL405</b>	<b>Skill Base Lab Course: Python Programming</b>
CSL405.1	Apply concepts of Input / Output, control statements and object oriented programming in python for performing arithmetic operations
CSL405.2	Use features of files, directories and regular expression in python for file manipulation
CSL405.3	Implement linked list, stacks, queues and dequeues data structures
CSL405.4	Develop Graphical User Interface, perform database operations and create web applications with Django web framework
CSL405.5	Implement multi-threading in python
CSL405.6	Use NumPy and Pandas packages for matrix manipulation and data analysis
<b>CSM401</b>	<b>Mini Project B</b>
CSM401.1	Identify societal, industrial needs and formulate problem statements followed by requirement analysis.
CSM401.2	Investigate the problem through appropriate literature Surveys.
CSM401.3	Design and develop solution using modern tools for the given problem.
CSM401.4	Work as an individual , contribute as a team member with effective management skills and ethical values.
CSM401.5	Develop effective communication/ technical writing skills through project presentation, Group discussion and report writing activities.
CSM401.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC501</b>	<b>Computer Networks</b>
CSC501.1	Apply the concepts of data communication and appropriate topologies for end-to-end communication.
CSC501.2	Apply communication mechanisms like services, framing, error detection, error correction, multiple access control for flow control.
CSC501.3	Apply Subnetting, Network Address Translation and routing algorithms for shortest paths.
CSC501.4	Apply sliding window technique for TCP flow control and SMTP, HTTP, Telnet for sending emails.
CSC501.5	Apply Cisco Service oriented network model and classic three-layer hierarchical model for Enterprise Network Design.
CSC501.6	Apply Software Defined Network approach and methodology to manage dynamic and programmatically efficient network.
<b>CSC502</b>	<b>Web Computing</b>
CSC502.1	Identify different protocols or technologies required for various web application
CSC502.2	Apply Javascript to add functionality to web pages.
CSC502.3	Develop front end application using React
CSC502.4	Develop back end application using node.js
CSC502.5	Construct web based Node.js applications using Express
CSC502.6	Develop back end application using functional components of react
<b>CSC503</b>	<b>Artificial Intelligence</b>
CSC503.1	Identify PEAS descriptors and TASK Environment of an rational agent.
CSC503.2	compare and contrast among different types of intelligent agent and the types of environment they encounter .
CSC503.3	Apply informed and uninformed search techniques to solve given problem.
CSC503.4	Apply the concept of knowledge and reasoning to intelligent agent using PROLOG programming.
CSC503.5	Apply Bayes' rule and reasoning for Bayesian Belief network.
CSC503.6	Identify the various components of expert system for real world AI problems
<b>CSC504</b>	<b>Data warehousing and mining</b>
CSC504.1	Design a data warehouse for a given application and perform OLAP operations to take business decisions.
CSC504.2	Apply pre-processing techniques for a given data set to perform data cleaning, data transformation, data reduction, and data discretization
CSC504.3	Apply decision tree induction and Bayesian classification on a given data set for prediction
CSC504.4	Apply Partition and Hierarchical Clustering algorithms on a given data set to form the clusters
CSC504.5	Apply association mining techniques to identify interesting patterns
CSC504.6	Apply web mining algorithms on a given data for deriving complex information
<b>CSDL5011</b>	<b>Statistics In AI&amp;DS</b>
CSDLO5011.1	Apply principles of descriptive statistics for solving the problems of Exploratory Data Analysis.
CSDLO5011.2	Apply the descriptive statistic principles for understanding Data and Sampling Distributions
CSDLO5011.3	Apply the principles of inferential statistics for solving and performing Statistical Experiments and Significance Testing
CSDLO5011.4	Apply all descriptive statistical as well as inferential statistical principles for Summarizing Data
CSDLO5011.5	Apply the parametric and non-parametric test principles to solve the Analysis of Variance.
CSDL5011	Statistics In AI&DS
<b>CSDL5013</b>	<b>Internet of Things</b>
CSDLO5013.1	Describe the Characteristics and Conceptual Framework of IoT
CSDLO5013.2	Differentiate between the levels of the IoT architectures
CSDLO5013.3	Analyze the IoT access technologies
CSDLO5013.4	Illustrate various edge to cloud protocol for IoT
CSDLO5013.5	Apply IoT analytics and data visualization
CSDLO5013.6	Analyze and evaluate IoT applications
<b>CSL501</b>	<b>Web Computing and Network Lab</b>
CSL501.1	Identify and apply the appropriate HTML tags to develop a webpage
CSL501.2	Identify and apply the appropriate CSS tags to format data on webpage
CSL501.3	Build responsive websites using Bootstrap
CSL501.4	Apply JavaScript to develop interactive web pages.
CSL501.5	Build front end applications using React and back end using Node.js/express
CSL501.6	Use simulator for Cisco packet tracer/GNS3
<b>CSL502</b>	<b>Artificial Intelligence Lab</b>
CSL502.1	Identify PEAS descriptors and TASK Environment of an Intelligent agent.
CSL502.2	Apply Uninformed searching algorithms for problem solving
CSL502.3	Apply Informed searching algorithms for problem solving
CSL502.4	Implement simple programs using PROLOG.
CSL502.5	Represent natural language description as statements in Logic and apply inference rules to it.

CSL502.6	Case study of successful AI System.
CSL503	Data Warehouse & Mining Lab
CSL503.1	Apply dimensional modeling concepts to construct data warehouses.
CSL503.2	Analyze data using OLAP operations so as to make strategic decisions.
CSL503.3	Apply pre processing techniques to organize and prepare the data needed for data mining.
CSL503.4	Implement data mining methods like classification and clustering to solve real world problems.
CSL503.5	Implement the data mining method like Frequent Pattern mining on large data sets.
CSL503.6	Implement Web Mining algorithms to solve real world problems.
CSL504	Business Communication and Ethics 2
CSL504.1	Write effective business/ technical documents.
CSL504.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
CSL504.3	Apply various techniques to be successful in group discussions, technical presentation and meetings.
CSL504.4	Deliver successful professional presentations.
CSL504.5	Develop creative thinking and interpersonal skills.
CSL504.6	Apply codes of ethical conduct & organizational behaviour.
CSM501	Mini Project 2A
CSM501.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM501.2	Investigate the problem through appropriate literature surveys.
CSM501.3	Design and develop solution using modern tools for the given problem
CSM501.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM501.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM501.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC601	Data Analytics and Visualization
CSC601.1	Understand basics of data analytics.
CSC601.2	Apply various regression models on a given data set and perform prediction.
CSC601.3	Analyze various time series model
CSC601.4	Analyze text data for insights
CSC601.5	Apply different analytics and visualization techniques using R programming.
CSC601.6	Apply different analytics and visualization techniques using Python
CSC602	Cryptography and System Security
CSC602.1	Identify information security goals using classical encryption techniques
CSC602.2	Apply Different encryption and decryption techniques to solve problems related to confidentiality and authentication
CSC602.3	Apply Cryptographic hash function and message digest algorithms to check data integrity
CSC602.4	Apply Different digital Signature algorithms to achieve authentication
CSC602.5	Apply security mechanism on operating system and database system
CSC602.6	Apply security basics for different attacks on network
CSC603	Software Engineering and Project Management
CSC603.1	Understand the fundamentals of Software Engineering
CSC603.2	Apply estimation techniques for software development
CSC603.3	Apply design principles to design a model
CSC603.4	Apply RMMM plan for risk management
CSC603.5	Apply various testing techniques for testing the developed product
CSC603.6	Apply the project management concepts to develop the n/w diagram and schedule the project
CSC604	Machine Learning
CSC604.1	Identify a Machine Learning Technique for the given problem and understand its performance metrics.
CSC604.2	Apply System of Linear equations, Length of vector and the concept of Symmetric Positive Definite Matrices on the given data to understand mathematical modeling of Machine Learning Models.
CSC604.3	Apply the different methods of Linear model for Regression and Classification.
CSC604.4	Apply Hebbian Learning Rule and Expectation-Maximization algorithm for clustering.
CSC604.5	Apply concept of Neural Network to design simple network and understand Perceptron Learning Rule and Logistic Regression for classification.
CSC604.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
CSDL6011	High Performance Computing
CSDLO6011.1	Understand the fundamentals of parallel Computing.
CSDLO6011.2	Design a parallel algorithm for searching problem and compare it with sequential algorithm.
CSDLO6011.3	Design a parallel algorithm to solve computational problem and identify issues in parallel programming.
CSDLO6011.4	Analyze the performance of parallel computing system for clusters in terms of execution time, total parallel overhead, and speed up
CSDLO6011.5	Create HPC programming paradigm for parallel applications
CSDLO6011.6	Develop high performance parallel programming using open CL.
CSDL6013	Image & Video Processing
CSDLO6013.1	To understand the fundamentals of digital image processing.
CSDLO6013.2	To apply image enhancement techniques to recognize their impact on images.
CSDLO6013.3	To apply image segmentation techniques to recognize their impact on images.
CSDLO6013.4	To understand the fundamentals of image transformation.
CSDLO6013.5	To apply image compression techniques to identify their impact on images.

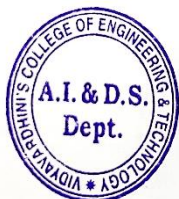


CSDLO6013.6	To understand the fundamentals of video processing.
CSL601	Data Analytics and Visualization Lab
CSL601.1	Explore various data analytics Libraries in R and Python.
CSL601.2	Implement various Regression techniques for prediction.
CSL601.3	Build various time series models on a given data set.
CSL601.4	Design Text Analytics Application on a given data set.
CSL601.5	Implement visualization techniques to given data sets using R.
CSL601.6	Implement visualization techniques to given data sets using Python.
CSL602	Cryptography and System Security Lab
CSL602.1	Apply the knowledge of symmetric cryptography to implement simple ciphers
CSL602.2	Analyze and implement public key algorithms like RSA and EL Gammal
CSL602.3	Analyze and evaluate performance of hashing algorithms
CSL602.4	Explore the different network reconnaissance tools to gather information about networks
CSL602.5	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network
CSL602.6	Apply and set up firewalls and intrusion detection system using open source technologies and email security
CSL603	Software Engineering and Project Management Lab
CSL603.1	Understood the fundamentals of DevOps engineering and be fully proficient with DevOps concepts
CSL603.2	Implement Git & Git Hub to achieve Version Control
CSL603.3	Implement selenium and Jenkins to test software applications
CSL603.4	Implement to build and deploy software applications
CSL603.5	Implement Docker to containerize images and deploy applications
CSL603.6	Implement Puppet to synthesize software configuration and provisioning
CSL604	Machine Learning Lab
CSC604.1	Identify different libraries used for Data processing like Numpy , Pandas and Matplotlib.
CSC604.2	Apply System of Linear equations, Length of vector and the concept of Symmetric Positive Definite Matrices on the given data to understand mathematical modeling of Machine Learning Models.
CSC604.3	Apply the different methods of Linear model for Regression and Classification.
CSC604.4	Apply Hebbian Learning Rule and Expectation-Maximization algorithm for clustering.
CSC604.5	Apply concept of Neural Network to design simple network and understand Perceptron Learning Rule and Logistic Regression for classification.
CSC604.6	Use Dimensionality Reduction techniques for dealing with data with large number of attributes
CSL605	Skill Based Lab Course: Cloud Computing
CSL605.1	Create virtual machines using open source technology.
CSL605.2	Compare cloud computing services SaaS/PaaS/IaaS for a given application
CSL605.3	Design and develop real world web applications and deploy them on commercial clouds.
CSL605.4	Deploy cloud services to address security issues .
CSL605.5	Identify commercially available cloud services and recommend the appropriate one for the given application.
CSL605.6	Implement the concept of containerization.
CSM501	Mini Project 2B
CSM501.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM501.2	Investigate the problem through appropriate literature surveys.
CSM501.3	Design and develop solution using modern tools for the given problem
CSM501.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM501.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM501.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
CSC701	Deep Learning
CSC701.1	Understand the fundamental concepts in neural network and deep learning
CSC701.2	Compare and Contrast among activation functions, loss functions, optimizers and regularization for choosing the appropriate method for the given application
CSC701.3	Compare and Contrast among different types of Autoencoders for choosing the appropriate method for the given application
CSC701.4	Apply the concepts of Convolution Neural Network on the given data
CSC701.5	Compare and Contrast among different types of Recurrent Neural Network for choosing the appropriate method for the given application
CSC701.6	Apply appropriate deep learning techniques for the given application
CSC702	Big Data Analytics
CSC702.1	Identify issues and challenges in Big data analytics.
CSC702.2	Apply Hadoop and MapReduce techniques to solve real world problems.
CSC702.3	Identify suitable NoSQL systems to handle big data.

CSC702.4	Apply filtering techniques, counting distinct element and counting ones in window algorithms on data stream.
CSC702.5	Analyze case study of Big data applications
CSC702.6	Apply statistical computing techniques and graphics for analyzing big data using R programming language.
CSDO7011	Natural Language Processing
CSDC7013.1	Demonstrate understanding of Natural Language Processing Fundamentals
CSDC7013.2	Apply Tokenization, Stemming, Regular Expression, Finite State Machine and N-gram techniques for performing Word Level Analysis
CSDC7013.3	Apply Part of Speech Tagging techniques on the given data and parse the data for performing Syntactic Analysis
CSDC7013.4	Demonstrate understanding of lexeme relations and apply appropriate technique for performing Word Sense Disambiguation
CSDC7013.5	Apply the concepts like Referring Expressions, Referents, Coreference and Coreference Resolution for performing discourse analysis
CSDC7013.6	Apply Natural Language Processing Techniques for Designing NLP Applications
CSDO7012	AI for Healthcare
CSDO7012.1	Explain the role of AI and ML for handling Healthcare data.
CSDO7012.2	Apply Advanced AI algorithms and computational techniques for Healthcare Problems.
CSDO7012.3	Use evaluation metrics for evaluating healthcare systems
CSDO7012.4	Develop NLP applications for healthcare using various NLP Techniques.
CSDO7012.5	Understand ways to monitor health care data
CSDO7012.6	Apply AI and ML algorithms for building Healthcare Applications
CSDO7021	User Experience Design with VR
CSDO7021.1	Understand the fundamental concepts of user experience design.
CSDO7021.2	Apply the requirement gathering techniques and visual design principles for understanding the user's needs.
CSDO7021.3	Create interactive and functional prototype for usability.
CSDO7021.4	Apply usability testing to improve the user interface design
CSDO7021.5	Apply various sensory I/P and O/P system for user engagement in Virtual Reality system
CSDO7021.6	Build various VR systems using DECIDE framework
CSDO7022	Blockchain Technologies
CSDO7022.1	Understand the basic concept of Blockchain and Distributed Ledger Technology.
CSDO7022.2	Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions.
CSDO7022.3	Understand the concept of Ethereum and Smart Contracts using different development frameworks.
CSDO7022.4	Understand the concept of Hyperledger Fabric, different development tools and frameworks.
CSDO7022.5	Interpret the knowledge of Cryptocurrencies and Crypto assets.
CSDO7022.6	Apply the Blockchain principles to various areas of application.
ILO7013	Management Information System
ILO7013.1	Identify the impact of information systems on an organization
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making
ILO7013.3	Identify the threats to information systems and apply security controls for IS
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
ILO7016	Cyber Security and Laws
ILO7016.1	Illustrate the concept of cybercrime, cyber-frauds, cybercriminal types with their motives with respect to cybercrime.
ILO7016.2	Analyze and discriminate cyberattack types with tools used for attacks.
ILO7016.3	Identify the security challenges presented by mobile devices and infer measures for protecting the same.
ILO7016.4	Discover and apply different aspects of cyber law and Information Security Standards compliance.
ILO7016.5	Discover and understand different aspects of cyber laws.
ILO7016.6	Distinguish different aspects of cyber crime and Indian IT Act.
CSL701	Deep Learning Lab
CSL701.1	Implement Multilayer Perceptron to solve the given problem
CSL701.2	Design a deep neural network by choosing appropriate training, optimization and regularization techniques to solve the given problem
CSL701.3	Design an appropriate Autoencoder architecture to solve the given problem
CSL701.4	Design an appropriate Convolution Neural Network architecture to solve the given problem
CSL701.5	Design an appropriate Recurrent Neural Network architecture to solve the given problem
CSL701.6	Build a Deep Learning Application
CSL702	Big Data Analytics Lab
CSL702.1	Use Sqoop tool in Hadoop ecosystem for big data analytics.
CSL702.2	Implement Map Reduce algorithm on structured and unstructured data
CSL702.3	Perform NoSQL commands on Cassandra, Hadoop HBase and MongoDB
CSL702.4	Implement filtering, counting distinct element and counting ones in window algorithms on data stream.
CSL702.5	Implement data visualization techniques on social network graphs using R
CSL702.6	Built real life application on big data analytics
CSDOL7011	Natural Language Processing Lab
CSDOL7011.1	Understanding of current NLP implementations and applications.
CSDOL7011.2	Using Word Level Analysis implementations with Tokenization, Lemmatization etc.
CSDOL7011.3	Using Syntax Analysis for Parts of Speech and Parts of Speech Tagging.
CSDOL7011.4	Using Semantic Analysis for implementation of corpus.
CSDOL7011.5	Implementation of core NLP concepts for modern applications.
CSDOL7011.6	Implementation of Mini-Project through a full fledged application.

CSDOL7012	AI for Healthcare Lab
CSDOL7012.1	Understanding preprocessing in Health Care data
CSDOL7012.2	Apply EDA on health care data
CSDOL7012.3	Understand computational models of AI.
CSDOL7012.4	Analyze and justify the performance of specific models as applied to healthcare problems
CSDOL7012.5	Apply NLP in healthcare domain
CSDOL7012.6	Design and implement AI based healthcare applications
CSDOL7021	User Experience Design with VR Lab
CSDO7021.1	Demonstrate the installation process of Unity and Visual Studio on computer
CSDO7021.2	Demonstrate the working of VR Controller
CSDO7021.3	Create VR scenes for 2D games in Unity
CSDO7021.4	Create User interface for virtual world in Unity
CSDO7021.5	Create 3D game in Unity
CSDO7021.6	Create virtual environment for application in Unity
CSDL7022	Block Chain Lab
CSDL7022.1	Create Cryptographic merkle root to provide integrity
CSDL7022.2	Create digital signature to perform authentication
CSDL7022.3	Design Smart Contract using Solidity.
CSDL7022.4	Implement ethereum blockchain using Geth
CSDL7022.5	Implement ethereum blockchain using Ganache and Truffle
CSDL7022.6	Use the tool to demonstrate the concept of blockchain in real world application.
CSP701	Major Project 1
CSP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP701.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP701.3	Analyze and compare the results with the standard results.
CSP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP701.5	Write and present their work effectively with ethical values.
CSP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
CSC801	Advanced Artificial Intelligence
CSC801.1	Analyze different Probabilistic models and choose the appropriate method for the given application
CSC801.2	Analyze the working and architecture for Generative Networks
CSC801.3	Interpret various components and various types of Autoencoders
CSC801.4	Apply the concepts of Transfer Learning on the given data
CSC801.5	Apply Ensemble Learning techniques to real-world problems
CSC801.6	Understand the nascent technologies in the field of artificial intelligence
CSDO8013	Reinforcement Learning
CSDOL8013.1	Understand different types of robots, specifications of Robots its characteristics and applications.
CSDOL8013.2	Apply the concepts of Direct and Inverse Kinematics to solve real world problems.
CSDOL8013.3	Identify actuators, sensors, and control of a robot for different applications
CSDOL8013.4	Applying the differential relationships of motion, velocities and dynamic analysis of force
CSDOL8013.5	Applying perspectives on AI and Robotics
CSDOL8013.6	Applying the fundamentals of robotics for automation
CSDO8022	Recommendation Systems
CSDO8022.1	Apply principles of Linear Algebra as a pre-requisite for the Recommendation Systems.
CSDO8022.2	Apply the approaches for performing collaborative filtering.
CSDO8022.3	Apply the approaches for performing content-based recommendation.
CSDO8022.4	Apply the approaches for performing knowledge based recommendation.
CSDO8022.5	Apply the approaches for performing ensemble based and hybrid recommendation system.
CSDO8022.6	Apply the approaches for meticulously evaluating recommendation systems.
ILO8021	Project Management
ILO8021.1	Identify appropriate projects from various options and mention their selection criteria.
ILO8021.2	Prepare Project Charter for the selected project
ILO8021.3	Prepare Work Break Down Structure for a project and also prepare a schedule using GANTT chart, CPM, PERT

ILO8021.4	Identify opportunities and threats to decide risk response strategy of a project.
ILO8021.5	Apply Earned Value Management techniques to determine & predict status of the project and implement project termination process.
ILO8021.6	Identify reasons of project termination
<b>ILO8025</b>	<b>Professional Ethics and CSR</b>
ILO8025.1	Understand rights and duties of business.
ILO8025.2	Analyze and explore duties of business and professional ethics in the marketplace.
ILO8025.3	Analyze and Demonstrate professional ethics of consumer protection and job discrimination.
ILO8025.4	Describe and analyze different aspects of corporate social responsibility
ILO8025.5	Analyze interrelatedness of enterprises and corporate social responsibility.
ILO8025.6	Understand legal aspects of corporate social responsibility.
<b>ILO8029</b>	<b>Environmental Management</b>
ILO8029.1	Make use of knowledge of Environment Management for sustainable development
ILO8029.2	Identify the Environmental Concerns for the specific hazard
ILO8029.3	Apply the Concept of Ecology to know the interdependence between ecosystem and living organisms
ILO8029.4	Apply the concept of Corporate Env Responsibility for Environmental Quality Management
ILO8029.5	Categorize the ISO-14000 standards and understand the procedure of EMS Certification
ILO8029.6	Utilize the knowledge of Environmental legislations for sustainable development
<b>CSL801</b>	<b>Advanced Artificial Intelligence Lab</b>
CSL801.1	Design and Implement a Probabilistic Model for predicting outcomes
CSL801.2	Design a GAN on to solve the given problem
CSL801.3	Design an appropriate Variational Autoencoder architecture to solve the given problem
CSL801.4	Apply the concept of Transfer Learning on the given dataset
CSL801.5	Apply Ensemble Learning techniques to real-world problems
CSL801.6	Build an Application by making use of Advanced AI concepts
<b>CSDOL8013</b>	<b>Reinforcement Learning Lab</b>
CSDOL8013.1	Apply the fundamentals of reinforcement learning and problem formulation using MDPs and Bandit problems
CSDOL8013.2	Apply different exploration strategies and their impact on online learning scenarios.
CSDOL8013.3	Apply dynamic programming algorithms for solving Markov Decision Processes.
CSDOL8013.4	Apply dynamic programming techniques to solve small-scale MDP problems
CSDOL8013.5	Implement and compare Monte Carlo methods and Temporal-Difference learning algorithms.
CSDOL8013.6	Apply real-world applications of reinforcement learning in domains such as autonomous driving or robotics
<b>CSDOL8022</b>	<b>Recommendation Systems Lab</b>
CSDOL8022.1	Understand mathematics and representation of data for recommendation systems
CSDOL8022.2	Design, implement and analyze Collaborative filtering based for recommendation systems.
CSDOL8022.3	Design, implement and analyze Content-based recommendation systems.
CSDOL8022.4	Design, implement and analyze Knowledge-based recommendation systems
CSDOL8022.5	Understanding feature engineering and pre-processing for recommendation systems.
CSDOL8022.6	To solve real world problems using recommendation systems.
<b>CSP801</b>	<b>Major Project- 2</b>
CSP801.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP801.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP801.3	Analyze and compare the results with the standard results.
CSP801.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP801.5	Write and present their work effectively with ethical values.
CSP801.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.



*J. Nagarkatti*  
Dr. Tatwadarshi P. N.







**Vidyavardhini's college of Engineering & Technology Vasai(w)**  
**Department of Computer Science and Engineering(Data Science)**  
**Course Outcomes for R-2019 Syllabus**

**Program Outcomes**

<b>PO1. Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2. Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3. Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4. Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5. Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO6. The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO7. Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8. Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9. Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10. Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11. Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12. Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Course Outcomes**

	<b>At the end of the semester student will able to</b>
<b>FEC101</b>	<b>Applied Mathematics I</b>
FEC101.1	Apply the concepts of Complex Numbers, to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Apply Compute the partial differentiation of functions of two & three variables.
FEC101.4	Apply find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Apply the concept of Numerical Methods to solve system of linear algebraic equations, transcendental equation.
<b>FEC102</b>	<b>Applied Physics I</b>
FEC102.1	Know the fundamentals of quantum mechanics and its applications.
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction techniques viz. Bragg's diffractometer
FEC102.3	Apply concepts of semiconductor physics to understand principle and working of LED, photoconductor and photovoltaic cell.
FEC102.4	Use concept of interference in thin films in measurements.
FEC102.5	Discuss properties of superconductors and super capacitor.
FEC102.6	Know the principles of engineering materials.
<b>FEC103</b>	<b>Applied Chemistry I</b>
FEC103.1	Analyze the quality of water and suggest methods of treatment.
FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
<b>FEC104</b>	<b>Engineering Mechanics</b>
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation.
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body.
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles

<b>FEC105</b>	<b>Basic Electrical Engineering</b>
FEC105.1	Analyze DC circuits and apply Superposition, Thevenin's, Norton's, Maximum power transfer theorems to determine their response.
FEC105.2	Analyse 1- $\Phi$ AC circuits and determine their response.
FEC105.3	Analyse 3- $\Phi$ circuits and determine voltage-current relationship in star and delta connection.
FEC105.4	Perform OC/SC test on 1- $\Phi$ Transformer and evaluate/determine its equivalent circuit and efficiency.
FEC105.5	Understand the working principle, constructional details and operation of 1- $\Phi$ & 3- $\Phi$ Machines.
<b>FEL101</b>	<b>Engineering Physics-I Lab</b>
FEL101.1	Draw Miller indices for a given unit cell.
FEL101.2	Calculate energy band gap of semiconductor for a given semiconductor material.
FEL101.3	Calculate Hall coefficient of material and carrier concentration of a given material.
FEL101.4	Calculate radius of curvature of a lens using Newton's ring set up.
FEL101.5	Calculate thickness of paper using Wedge shape film.
<b>FEL102</b>	<b>Engineering Chemistry-I Lab</b>
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Estimate PH of different solutions using PH meter.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
<b>FEL103</b>	<b>Engineering Mechanics Lab</b>
FEL103.1	Verify the law of polygon, Varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
<b>FEL104</b>	<b>Basic Electrical Engineering</b>
FEL104.1	Implement DC circuits and analyze their behavior using network theorem
FEL104.2	Implement RLC circuit and calculate resonance frequency, Bandwidth and Q-factor
FEL104.3	Determine relationship between line/phase voltage/ current in three phase star/delta circuit
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency
FEL104.5	Identify the components of a D.C. Machine
<b>FEL105</b>	<b>Basic Workshop Practice I</b>
FEL105.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetail lap joint.
FEL105.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL105.3	Perform various basic House Wiring techniques while taking care of electrical safety.
FEL105.4	Perform various basic domestic plumbing operations such as pipe cutting, threading, fitting etc.
<b>FEC201</b>	<b>Applied Mathematics II</b>
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S. to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area & Mass.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of solids.
FEC201.6	Solve Differential equations & Definite integrals using Numerical Methods.
<b>FEC202</b>	<b>Applied Physics II</b>
FEC202.1	Calculate wavelength of light using diffraction grating and resolving power of grating.
FEC202.2	Apply the principles of Laser and fibre optics in modern communication technology.
FEC202.3	Relate the fundamentals of electrodynamics for satellite communication, antenna theory.
FEC202.4	Know the fundamentals of relativity.
FEC202.5	Select Tools for characterisation of nanomaterials and method to synthesize nanomaterial
FEC202.6	Classify sensors based on their sensing technique.
<b>FEC203</b>	<b>Applied Chemistry II</b>
FEC203.1	Identify types of corrosion & discuss corrosion control measures.
FEC203.2	Analyse the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Understand the principles of green chemistry &
<b>FEC204</b>	<b>Engineering Graphics</b>
FEC204.1	Apply the basic principles of projections in Projection of Lines, Planes and Engineering Curves
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Visualize the given 3D object and draw Orthographic projections
FEC204.4	Draw Isometric view from the given orthographic projections
FEC204.5	Draw Orthographic and Isometric Projection using AutoCad

<b>FEC205</b>	<b>C programming</b>
FEC205.1	Identify the terminologies in operating system used for computer programming and illustrate the algorithms to support Structure
FEC205.2	Use Variables, derived data types and control structures to write C program.
FEC205.3	Implement solutions to the problem using strings and functions.
FEC205.4	Decompose a problem into functions and synthesize a complete program.
FEC205.5	Structure-Union and Files for solving complex Computational problem.
FEC205.6	Use Pointers for solving complex Computational problem.
<b>FEC206</b>	<b>Professional Communication and Ethics- I</b>
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages.
FEC206.4	Write/ Draft academic, business and technical letter/email.
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
<b>FEL201</b>	<b>Engineering Physics-II Lab</b>
FEL201.1	Calculate wavelength of given colour using diffraction grating
FEL201.2	Calculate number of lines on the grating using Laser source
FEL201.3	Calculate numerical aperture of an optical fibre
FEL201.4	Determine I-V characteristics of photodiode
FEL201.5	Calculate volume of room using ultrasonic distance meter.
<b>FEL202</b>	<b>Engineering Chemistry-II</b>
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na,k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Estimate saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.
<b>FEL203</b>	<b>Engineering Graphics Lab</b>
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
<b>FEL204</b>	<b>C programming Lab</b>
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
<b>FEL205</b>	<b>Professional Communication and Ethics- I Lab</b>
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully
<b>FEL201</b>	<b>Basic Workshop Practice II</b>
FEL201.1	Model different prototypes in the carpentry trade such as Cross cut lap joint, Tee lap joint, Dovetel lap joint.
FEL201.2	Model various basic prototypes in the trade of fitting such as Square, Hexagonal and V Male Female joint.
FEL201.3	Read various basic Layout drawing; make positive and negative film, and perform PCB etching and drilling, Tinning and soldering operations.
FEL201.4	Dismantle and Assemble a Personal Computer, perform Basic troubleshooting and maintenance, identify network components and perform Basic networking
<b>CSC301</b>	<b>Engineering Mathematics-III</b>
CSC301.1	Apply the concept of Laplace transform and its application to solve the real integrals in engineering problems.
CSC301.2	Apply the concept of inverse Laplace transform of various functions and its application in engineering problems.
CSC301.3	Expand the periodic function by using the Fourier series for real life problems and complex engineering problems.
CSC301.4	Apply complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions.
CSC301.5	Apply the concept of correlation and Regression to the engineering problems.
CSC301.6	Apply the concept of probability and expectation for getting the spread of the data and distribution of probabilities.
<b>CSC302</b>	<b>Discrete Structures and Graph Theory</b>
CSC302.1	Apply the concept of mathematical thinking and mathematical proofs in problem solving.
CSC302.2	Apply the concept of relations and functions to reason logically.
CSC302.3	Apply the concept of Posets and Lattice.

CSC302.4	Apply basic counting principles and recurrence in problem solving.
CSC302.5	Apply Coding theory in problems solving with understanding of Algebraic Structure
CSC302.6	Apply concepts of graph theory in solving problems.
<b>CSC303</b>	<b>Data Structure</b>
CSC303.1	Understand the concepts of Linear and Non-Linear Data Structures
CSC303.2	Apply insertion, deletion and traversal operations on stacks and queue data structures
CSC303.3	Apply insertion and deletion operations on different types of Linked Lists
CSC303.4	Apply insertion, deletion and searching operations on Binary Search tree, AVL tree, and introduction to B Tree, B+ Tree, Huffman Encoding
CSC303.5	Use Graph Traversal algorithms to determine shortest path and connectivity between nodes
CSC303.6	Apply appropriate searching technique, hashing function and collision resolution techniques for a data sequence
<b>CSC304</b>	<b>Digital Logic &amp; Computer Organization and Architecture</b>
CSC304.1	Convert one number system to another and realize logic circuits using basic/universal gates.
CSC304.2	Apply the arithmetic algorithms to solve ALU operations.
CSC304.3	Analyze the truth table of digital components and identify the elements, their functions in processor architecture.
CSC304.4	Compare a hardwired / microprogrammed control unit.
CSC304.5	Classify parameters of cache and implement memory mapping techniques.
CSC304.6	Compare serial/parallel processing and ISA, PCI, USB buses.
<b>CSC305</b>	<b>Computer Graphics</b>
CSC305.1	Explain the basics of computer graphics, different graphics systems and applications of computer graphics
CSC305.2	Apply various algorithms for scan conversion and filling of basic graphic objects
CSC305.3	Apply 2-D geometric transformations on graphical objects.
CSC305.4	Apply line and polygon clipping algorithms on graphical objects.
CSC305.5	Apply 3D geometric transformations and construct the curves.
CSC305.6	Describe visible surface detection techniques and concepts of animation.
<b>CSL301</b>	<b>Data Structures Lab</b>
CSL301.1	Implement stack linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.2	Implement queue linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.3	Implement Linked list linear data structures & be able to handle operations like insertion, deletion, searching and traversing on them.
CSL301.4	Implement nonlinear data structures & be able to handle operations like insertion, deletion, searching and traversing on them
CSL301.5	Apply appropriate data structure on various evaluation problems
CSL301.6	Apply appropriate searching techniques for given problems.
<b>CSL302</b>	<b>Digital Logic &amp; Computer Organization and Architecture Lab</b>
CSL302.1	Verify the truth table of logic, universal gates, and realize logic circuits using hardware.
CSL302.2	Implement combinational circuits design using hardware.
CSL302.3	Implement sequential & code conversion circuits design using hardware.
CSL302.4	Write Booth's, Restoring, and Non-Restoring algorithms for arithmetic operations using Programming language.
CSL302.5	Implement ripple carry adder, carry look ahead adder, ALU design using virtual lab.
CSL302.6	Implement ALU, memory and Cache memory designs using virtual lab.
<b>CSL303</b>	<b>Computer Graphics Lab</b>
CSL303.1	Implement the basic scan conversion algorithms of output primitives
CSL303.2	Execute algorithms for filled area primitives
CSL303.3	Apply 2D Transformations: Translation, Scaling, Rotation, Reflection, Shear on a graphics object
CSL303.4	Implement algorithms for clipping line and polygon
CSL303.5	Implement curve generation methods.
CSL303.6	Develop an Animation/Graphical application based on learned concepts
<b>CSL304</b>	<b>Skill based Lab Course: Object Oriented Programming with Java</b>
CSL304.1	Apply fundamental programming constructs.
CSL304.2	Illustrate the concept of packages, classes and objects.
CSL304.3	Elaborate the concept of strings, arrays and vectors.
CSL304.4	Implement the concept of inheritance and interfaces.
CSL304.5	Implement the concept of exception handling and multithreading.
CSL304.6	Develop GUI based application.
<b>CSM301</b>	<b>Mini Project A</b>
CSM301.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM301.2	Investigate the problem through appropriate literature surveys.
CSM301.3	Design and develop solution using modern tools for the given problem
CSM301.4	Work as an individual; contribute as a team member with effective management skills and ethical values
CSM301.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM301.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC401</b>	<b>Engineering Mathematics-IV</b>
CSC401.1	Apply the concept of eigenvalues and eigenvectors in engineering problems.
CSC401.2	Apply the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
CSC401.3	Apply the concept of Z-transformation and inverse in engineering problems.
CSC401.4	Apply the concept of probability distribution and sampling theory to engineering problems
CSC401.5	Apply the concept of Linear Programming Problems to optimization

CSC401.6	Solve Non-Linear Programming Problems for Optimization of engineering problems.
<b>CSC402</b>	<b>Analysis of Algorithm</b>
CSC402.1	Determine the space and time complexity of algorithms
CSC402.2	Apply divide and conquer strategy to solve problems and calculate its complexity
CSC402.3	Apply greedy strategy to solve problems on single source shortest path and minimum spanning tree and calculate its complexity
CSC402.4	Apply dynamic programming to solve problems on single source and all pair shortest path
CSC402.5	Apply backtracking and branch and bound strategies to solve problems on decision and optimization
CSC402.6	Explain and apply string matching algorithms for finding occurrences of patterns in a text
<b>CSC403</b>	<b>Database Management System</b>
CSC403.1	Understand the need of database management system
CSC403.2	Draw ER and EER diagram for real life applications
CSC403.3	Construct relational model and write relational algebra queries.
CSC403.4	Formulate SQL queries
CSC403.5	Apply the concept of normalization to relational database design.
CSC403.6	Describe the concept of transaction, concurrency and recovery
<b>CSC404</b>	<b>Operating System</b>
CSC404.1	Understand the objectives, functions and structure of OS
CSC404.2	Analyze the concept of process management and evaluate performance of process scheduling algorithms.
CSC404.3	Understand and apply the concepts of synchronization and deadlocks
CSC404.4	Evaluate performance of Memory allocation and replacement policies
CSC404.5	Understand the concepts of file management.
CSC404.6	Apply concepts of I/O management and analyze techniques of disk scheduling.
<b>CSC405</b>	<b>Microprocessor</b>
CSC405.1	Describe the core concepts of 8086 microprocessor.
CSC405.2	Write assembly and mixed language programs using instruction set of 8086.
CSC405.3	Apply the concepts of memory and peripheral chips to interface 8086 based system.
CSC405.4	Describe the fundamentals of 80386DX processor.
CSC405.5	Illustrate the core concepts of Pentium Processor.
CSC405.6	Compare 8086 with advanced processors and understand the hyper-threading technology.
<b>CSL401</b>	<b>Analysis of Algorithm Lab</b>
CSL401.1	Implement and analyze time complexity of sorting algorithms
CSL401.2	Implement divide and conquer approaches to solve problems and analyze its complexity
CSL401.3	Implement greedy algorithms for solving dijkstras, minimum spanning tree and fractional knapsack
CSL401.4	Implement dynamic programming algorithm for all pair shortest path and 0/1 knapsack
CSL401.5	Implement backtracking and branch and bound for 15 puzzle , N queen and sum of subset problem
CSL401.6	Analyze the performance of string matching techniques
<b>CSL402</b>	<b>Database Management System Lab</b>
CSL402.1	Draw ER /EER diagram and convert to relational model for the real world application.
CSL402.2	Apply DDL and DML commands
CSL402.3	Apply DCL and TCL commands
CSL402.4	Write simple and complex queries
CSL402.5	Use PL / SQL Constructs
CSL402.6	Understand the concept of concurrent transactions execution and frontend-backend connectivity
<b>CSL403</b>	<b>Operating System Lab</b>
CSL403.1	Demonstrate basic Operating system Commands, Shell scripts, System Calls and API wrt Linux
CSL403.2	Implement various process scheduling algorithms and evaluate their performance.
CSL403.3	Implement and analyze concepts of synchronization and deadlocks.
CSL403.4	Implement various Memory Management techniques and evaluate their performance.
CSL403.5	Implement and analyze concepts of virtual memory.
CSL403.6	Demonstrate and analyze concepts of file management and I/O management techniques.
<b>CSL404</b>	<b>Microprocessor Lab</b>
CSL404.1	Write assembly language programs to perform basic arithmetic operations on 8-bit/16-bit data.
CSL404.2	Write assembly language programs using INT 10H and INT 21H.
CSL404.3	Write assembly language programs based on string instructions.
CSL404.4	Write assembly language programs using procedure and macro.
CSL404.5	Write a mixed language program.
CSL404.6	Write programs for 8086 interfacing with peripheral chips.
<b>CSL405</b>	<b>Skill Base Lab Course: Python Programming</b>
CSL405.1	Apply basic concepts of python to implement input, output, control statements and data types
CSL405.2	Implement file processing, text processing and directory management functions of python
CSL405.3	To develop program for data structure using built in functions in python
CSL405.4	Develop GUI based web applications. perform database operations and create web applications using Django
CSL405.5	Apply multithreading concepts using python
CSL405.6	Apply and use Numpy and Pandas

<b>CSM401</b>	<b>Mini Project 1-B</b>
CSM401.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM401.2	Investigate the problem through appropriate literature surveys.
CSM401.3	Design and develop solution using modern tools for the given problem
CSM401.4	Work as an individual; contribute as a team member with effective management skills and ethical values
CSM401.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM401.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC501</b>	<b>Computer Networks</b>
CSC501.1	Understand the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
CSC501.2	Apply different design issues like services, framing, flow and error control at data link layer.
CSC501.3	Design the network using IP addressing and subnetting / supernetting schemes.
CSC501.4	Analyze transport layer protocols and congestion control algorithms
CSC501.5	Describe HTTP, SMTP, Telnet, FTP, DHCP, DNS protocols in application layer
CSC501.6	Describe enterprise network design and software defined network
<b>CSC502</b>	<b>Web Computing</b>
CSC502.1	Understand the fundamental concepts related to web applications.
CSC502.2	Apply the JavaScript to add functionality to web pages.
CSC502.3	Apply the concepts of React for designing frontend application.
CSC502.4	Apply the concepts of Node for designing backend application.
CSC502.5	Apply the concepts of Express for designing an application with Node.
CSC502.6	Apply the concepts of advance React for designing frontend application.
<b>CSC503</b>	<b>Artificial Intelligence</b>
CSC503.1	Identify PEAS descriptors and TASK environment of a rational agent
CSC503.2	Compare and contrast among different types of intelligent agent and the types of environment they encounter
CSC503.3	Solve given problem using informed and uninformed search techniques
CSC503.4	Apply the concept of knowledge base & reasoning to any intelligent agent using FOPL, Prolog, resolution.
CSC503.5	Apply Bayes Rule and reasoning for bayesian belief network
CSC503.6	Identify the various components of expert system for real world AI problems
<b>CSC504</b>	<b>Data Warehousing &amp; Mining</b>
CSC504.1	Apply dimensional modelling concepts to construct data warehouse and perform OLAP operations.
CSC504.2	Apply pre-processing techniques and prepare the data needed for data mining.
CSC504.3	Apply the data mining technique like classification to solve real world problems.
CSC504.4	Apply data mining technique like clustering to solve real world problems.
CSC504.5	Apply data mining techniques like frequent pattern mining and association rule mining on large datasets.
CSC504.6	Understand the concepts related to Web Mining.
<b>CSDLO5 01X</b>	<b>Department Level Optional Course- 1</b>
<b>CSDLO5011</b>	<b>Statistics for Artificial Intelligence &amp; Data Science</b>
CSDLO5011.1	Apply principles of descriptive statistics for solving the problems of Exploratory Data Analysis.
CSDLO5011.2	Apply the descriptive statistic principles for understanding Data and Sampling Distributions
CSDLO5011.3	Apply the principles of inferential statistics for solving and performing Statistical Experiments and Significance Testing
CSDLO5011.4	Apply all descriptive statistical as well as inferential statistical principles for Summarizing Data
CSDLO5011.5	Apply the parametric and non-parametric test principles to solve the Analysis of Variance.
CSDLO5011.6	Apply parametric statistical principles to solve the Linear Least Squares method.
<b>CSDLO5012</b>	<b>Advanced Algorithms</b>
CSDLO5012.1	Analyze the classification of problems into various NP classes and their Computational Intractability
CSDLO5012.2	Describe, apply and analyze the complexity of Approximation Algorithms.
CSDLO5012.3	Describe, apply and analyze the complexity of Randomized Algorithms.
CSDLO5012.4	Describe, apply and analyze the complexity of Local Search Algorithms.
CSDLO5012.5	Design and Apply the concepts of String and Amortized Analysis
CSDLO5012.6	To Understand Combinatorial Analysis techniques
<b>CSDLO5013</b>	<b>Internet of Things</b>
CSDLO5013.1	Describe the Characteristics and Conceptual Framework of IoT
CSDLO5013.2	Differentiate between the levels of the IoT architectures
CSDLO5013.3	Analyze the IoT access technologies
CSDLO5013.4	Illustrate various edge to cloud protocol for IoT
CSDLO5013.5	Apply IoT analytics and data visualization
CSDLO5013.6	Analyze and evaluate IoT applications
<b>CSL501</b>	<b>Web Computing and Network Lab</b>
CSL501.1	Apply the concepts of HTML to develop web pages.
CSL501.2	Apply the concepts of CSS to format the developed web pages appropriately.
CSL501.3	Apply the concepts of Bootstrap for developing responsive layout.
CSL501.4	Apply the concepts of JavaScript to make the web pages interactive.
CSL501.5	Apply the concepts of React for developing the frontend and Node/Express for backend part of the application.
CSL501.6	Apply the concepts of Computer Networking and simulate the environment using Cisco Packet Tracer.
<b>CSL502</b>	<b>Artificial Intelligence Lab</b>
CSL502.1	Identify PEAS descriptors and TASK environment of an Artificial Intelligent agent
CSL502.2	Identify suitable agent architecture for rational agent



CSL502.3	Apply uninformed & informed searching strategy to design problem solving agent
CSL502.4	Implement simple programs using prolog
CSL502.5	Apply Bayes Rules, FOPL to derive inferences from an intelligent agent
CSL502.6	Construct bayesian belief network or design an expert system for an intelligent agent to derive inferences from it
<b>CSL503</b>	<b>Data Warehousing &amp; Mining Lab</b>
CSL503.1	Build a data warehouse using dimensional modeling concepts.
CSL503.2	Analyze data using OLAP operations so as to take strategic decisions.
CSL503.3	Organize and Prepare the data needed for data mining using pre preprocessing techniques.
CSL503.4	Implement the data mining methods like classification and clustering to solve real world problems.
CSL503.5	Implement the data mining method like Frequent Pattern mining on large data sets.
CSL503.6	Implement Web Mining algorithms.
<b>CSL504</b>	<b>Business Communication and Ethics-II</b>
CSL504.1	Write effective business/ technical documents.
CSL504.2	Relate and apply strategies for personal and professional skills to meet the demands of the industry
CSL504.3	Apply various techniques to be successful in group discussions, technical presentation and meetings.
CSL504.4	Deliver successful professional presentations.
CSL504.5	Develop creative thinking and interpersonal skills.
CSL504.6	Apply codes of ethical conduct & organizational behaviour.
<b>CSM501</b>	<b>Mini Project: 2 A</b>
CSM501.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM501.2	Investigate the problem through appropriate literature surveys.
CSM501.3	Design and develop solution using modern tools for the given problem
CSM501.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM501.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM501.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC601</b>	<b>Data Analytics and Visualization</b>
CSC601.1	Understand basics of data analytics.
CSC601.2	Apply various regression models on a given data set and perform prediction.
CSC601.3	Analyse various time series models
CSC601.4	Analyse text data for insights.
CSC601.5	Apply different analytics and visualization techniques using R programming.
CSC601.6	Apply different analytics and visualization techniques using Python
<b>CSC602</b>	<b>Cryptography and System Security</b>
CSC602.1	Identify information security goals using classical encryption techniques
CSC602.2	Apply different encryption & decryption techniques to solve problems related to confidentiality & authentication.
CSC602.3	Describe cryptographic hash functions and message digest algorithms to check data integrity.
CSC602.4	Apply different digital signature algorithm to achieve authentication
CSC602.5	Describe security mechanism in an operating system and database system
CSC602.6	Apply security basics for different attacks on networks
<b>CSC603</b>	<b>Software Engineering and Project Management</b>
CSC603.1	Understand the fundamentals of Software Engineering.
CSC603.2	Apply estimation techniques for software development.
CSC603.3	Describe the different design models.
CSC603.4	Describe the concept of risk and configuration management.
CSC603.5	Understand the different types of software testing and maintenance.
CSC603.6	Apply the project Management concepts to develop the network diagram and schedule the projects.
<b>CSC604</b>	<b>Machine Learning</b>
CSC604.1	Explain and illustrate the basic concepts of Machine Learning.
CSC604.2	Apply mathematical foundation concepts for Machine Learning models.
CSC604.3	Apply Least Square Method, Regression Techniques and SVM for Classification.
CSC604.4	Select suitable Machine learning models for a given problem.
CSC604.5	Build Neural Network based models.
CSC604.6	Apply Dimensionality Reduction techniques.
<b>CSDLO6 01X</b>	<b>Department Level Optional Course -2</b>
<b>CSDLO6011</b>	<b>High Performance Computing</b>
CSDLO6011.1	Understand the fundamentals of parallel Computing.
CSDLO6011.2	Design a parallel algorithm for searching problem and compare it with sequential algorithm.
CSDLO6011.3	Design a parallel algorithm to solve computational problem and identify issues in parallel programming.
CSDLO6011.4	Analyze the performance of parallel computing system for clusters in terms of execution time, total parallel overhead, and speed up
CSDLO6011.5	Create HPC programming paradigm for parallel applications
CSDLO6011.6	Develop high performance parallel programming using open CL.
<b>CSDLO6012</b>	<b>Distributed Computing</b>
CSDLO6012.1	Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
CSDLO6012.2	Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.
CSDLO6012.3	Analyze the various techniques used for clock synchronization and mutual exclusion
CSDLO6012.4	Demonstrate the concepts of Resource and Process management and synchronization algorithms

CSDLO6012.5	Demonstrate the concepts of Consistency and Replication Management
CSDLO6012.6	Apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale distributed applications
<b>CSDLO6013</b>	<b>Image &amp; Video processing</b>
CSDLO6013.1	To understand the fundamentals of digital image processing.
CSDLO6013.2	To apply image enhancement techniques to recognize their impact on images.
CSDLO6013.3	To apply image segmentation techniques to recognize their impact on images.
CSDLO6013.4	To understand the fundamentals of image transformation.
CSDLO6013.5	To apply image compression techniques to identify their impact on images.
CSDLO6013.6	To understand the fundamentals of video processing.
<b>CSL601</b>	<b>Data Analytics and Visualization Lab</b>
CSL601.1	Explore various data analytics Libraries in R and Python.
CSL601.2	Implement various Regression techniques for prediction.
CSL601.3	Build various time series models on a given data set.
CSL601.4	Design Text Analytics Application on a given data set.
CSL601.5	Implement visualization techniques to given data sets using R.
CSL601.6	Implement visualization techniques to given data sets using Python.
<b>CSL602</b>	<b>Cryptography &amp; System Security Lab</b>
CSL602.1	Apply the knowledge of symmetric cryptography to implement simple ciphers
CSL602.2	Analyze and implement public key algorithms like RSA and El Gamal
CSL602.3	Analyze and evaluate performance of hashing algorithms
CSL602.4	Explore the different network reconnaissance tools to gather information about networks
CSL602.5	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
CSL602.6	Apply and set up firewalls and intrusion detection systems using open source technologies and to explore email security.
<b>CSL603</b>	<b>Software Engineering and Project Management Lab</b>
CSL603.1	To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements
CSL603.2	To obtain complete knowledge of the —version control systeml to effectively track changes augmented with Git and GitHub
CSL603.3	Understand the importance of Selenium and Jenkins to test Software Applications
CSL603.4	To understand the importance of Jenkins to Build and deploy Software Applications on server environment
CSL603.5	To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Dockerk.
CSL603.6	To Synthesize software configuration and provisioning using Ansible.
<b>CSL604</b>	<b>Machine Learning Lab</b>
CSL604.1	Implement a Regression techniques for a given dataset.
CSL604.2	Apply Support Vector Machine for given problem.
CSL604.3	Implement various machine learning model.
CSL604.4	Apply suitable Machine learning models for a given problem.
CSL604.5	Implement Neural Network based models.
CSL604.6	Apply Dimensionality Reduction Techniques.
<b>CSL605</b>	<b>Skill base Lab Course: Cloud Computing</b>
CSL605.1	Implement different types of virtualization techniques.
CSL605.2	Analyze various cloud computing service models and implement them to solve the given problems.
CSL605.3	Design and develop real world web applications and deploy them on commercial cloud(s).
CSL605.4	Explain major security issues in the cloud and mechanisms to address them.
CSL605.5	Explore various commercially available cloud services and recommend the appropriate one for the given application.
CSL605.6	Implement the concept of containerization
<b>CSM601</b>	<b>Mini Project Lab: 2B</b>
CSM601.1	Identify societal, industrial needs and formulate problem statement followed by requirement analysis.
CSM601.2	Investigate the problem through appropriate literature surveys.
CSM601.3	Design and develop solution using modern tools for the given problem
CSM601.4	Work as an individual; contribute as a team member with effective management skills and ethical values.
CSM601.5	Develop effective communication / technical writing skills through project presentation, Group discussion and report writing activities.
CSM601.6	Demonstrate capabilities of self-learning, leading to lifelong learning.
<b>CSC701</b>	<b>Deep Learning</b>
CSC701.1	Understand basic knowledge of Neural Networks.
CSC701.2	Apply the knowledge of Neural Networks in training Deep Neural Networks.
CSC701.3	Apply knowledge of unsupervised learning concept in Autoencoder
CSC701.4	Apply knowledge of supervised learning concept in CNN .
CSC701.5	Apply knowledge of sequence learning concept in RNN
CSC701.6	Understand recent trends and applications of Deep Learning.
<b>CSC702</b>	<b>Big Data Analytics</b>
CSC702.1	Identify issues and challenges in Big data analytics.
CSC702.2	Apply Hadoop and MapReduce techniques to solve real world problems.
CSC702.3	Identify suitable NoSQL systems to handle big data.
CSC702.4	Apply filtering techniques, counting distinct element and counting ones in window algorithms on data stream.
CSC702.5	Analyze case study of Big data applications
CSC702.6	Apply statistical computing techniques and graphics for analyzing big data using R programming language.

<b>CSDO 701X</b>	<b>Department Level Optional Course-3</b>
<b>CSDO7011</b>	<b>Natural Language Processing</b>
CSDO7011.1	Demonstrate understanding of Natural Language Processing Fundamentals
CSDO7011.2	Apply Tokenization, Stemming, Regular Expression, Finite State Machine and N-gram techniques for performing Word Level Analysis
CSDO7011.3	Apply Part of Speech Tagging techniques on the given data and parse the data for performing Syntactic Analysis
CSDO7011.4	Demonstrate understanding of lexeme relations and apply appropriate technique for performing Word Sense Disambiguation
CSDO7011.5	Apply the concepts like Referring Expressions, Referents, Coreference and Coreference Resolution for performing discourse analysis
CSDO7011.6	Apply Natural Language Processing Techniques for Designing NLP Applications
<b>CSDO7012</b>	<b>AI for Healthcare</b>
CSDO7012.1	Explain the role of AI and ML for handling Healthcare data.
CSDO7012.2	Apply Advanced AI algorithms and computational techniques for Healthcare Problems.
CSDO7012.3	Use evaluation metrics for evaluating healthcare systems
CSDO7012.4	Develop NLP applications for healthcare using various NLP Techniques.
CSDO7012.5	Understand ways to monitor health care data
CSDO7012.6	Apply AI and ML algorithms for building Healthcare Applications
<b>CSDO7013</b>	<b>Neural Network &amp; Fuzzy System</b>
CSDO7013.1	Acquire basic knowledge of fuzzy set theory properties and relations.
CSDO7013.2	Implement Fuzzy operations towards Fuzzy-rule creations.
CSDO7013.3	Gain familiarity with the training and implementation of Associative Memory Network.
CSDO7013.4	Understand the architecture and basics components of Unsupervised learning networks.
CSDO7013.5	Analyze the significance and working of the Special Networks.
CSDO7013.6	Interpret Hybrid System to analyze the Principles of Soft computing in Neuro-Fuzzy applications.
<b>CSDO 702X</b>	<b>Department Level Optional Course-4</b>
<b>CSDO7021</b>	<b>User Experience Design with VR</b>
CSDO7021.1	Understand the fundamental concepts of user experience design.
CSDO7021.2	Apply the requirement gathering techniques and visual design principles for understanding the user's needs.
CSDO7021.3	Create interactive and functional prototype for usability.
CSDO7021.4	Apply usability testing to improve the user interface design
CSDO7021.5	Apply various sensory I/P and O/P system for user engagement in Virtual Reality system
CSDO7021.6	Build VR system for various scenarios
<b>CSDO7022</b>	<b>Blockchain Technologies</b>
CSDO7022.1	Understand the basic concept of Blockchain and Distributed Ledger Technology.
CSDO7022.2	Interpret the knowledge of the Bitcoin network, nodes, keys, wallets and transactions.
CSDO7022.3	Understand the concept of Ethereum and Smart Contracts using different development frameworks.
CSDO7022.4	Understand the concept of Hyperledger Fabric, different development tools and frameworks.
CSDO7022.5	Interpret the knowledge of Cryptocurrencies and Crypto assets.
CSDO7022.6	Apply the Blockchain principles to various areas of application.
<b>CSDO7023</b>	<b>Game Theory for Data Science</b>
CSDO7023.1	Analyze and Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
CSDO7023.2	Discuss the use of Nash Equilibrium for other problems. Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
CSDO7023.3	Identify some applications that need aspects of Bayesian Games. Implement a typical Virtual Business scenario using Game theory.
CSDO7023.4	Identify and discuss working principle of Non-Cooperative Games
CSDO7023.5	Discuss the Mechanism for Design Aggregating Preferences
CSDO7023.6	Identify and discuss working principle : Repeated Games
<b>ILO 701X</b>	<b>Institute Level Optional Course-1</b>
<b>ILO7011</b>	<b>Product Lifecycle Management</b>
ILO7011.1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
ILO7011.2	Illustrate various approaches and techniques for designing and developing products.
ILO7011.3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
ILO7011.4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
<b>ILO7012</b>	<b>Reliability Engineering</b>
ILO7012.1	Understand and apply the concept of Probability to engineering problems
ILO7012.2	Apply various reliability concepts to calculate different reliability parameters
ILO7012.3	Estimate the system reliability of simple and complex systems
ILO7012.4	Carry out a Failure Mode Effect and Criticality Analysis
<b>ILO7013</b>	<b>Management Information System</b>
ILO7013.1	Identify the impact of information systems on an organization.
ILO7013.2	Use tools and technologies to access database information for improving business performance and decision making.
ILO7013.3	Identify the threats to information systems and apply security controls for IS.
ILO7013.4	Identify use of social computing for business-shopping, Marketing, Operational and Analytical CRM, E-business and E-commerce.
ILO7013.5	Use technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
ILO7013.6	Identify the Transaction Processing, Functional Area Information and ERP system for enterprise-wide knowledge management
<b>ILO7014</b>	<b>Design of Experiments</b>
ILO7014.1	Plan data collection, to turn data into information and to make decisions that lead to appropriate action
ILO7014.2	Apply the methods taught to real life situations

ILO7014.3	Plan, analyze, and interpret the results of experiments
<b>ILO7015</b>	<b>Operation Research</b>
ILO7015.1	Solve the LP problems using simplex algorithm and Interpret the optimum solution of it
ILO7015.2	Perform sensitivity analysis on LPP problem and Solve specialized LPP problems like the transportation and assignment problems
ILO7015.3	Plan optimum network models like the shortest path, minimum spanning tree, and maximum flow problems.
ILO7015.4	Identify queuing model for single server and multi-server models, Poisson input, exponential service, constant rate service, finite, and infinite population.
ILO7015.5	Solve simulation problem using Monte Carlo Technique
ILO7015.6	: Identify Inventory models for Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,
<b>ILO7016</b>	<b>Cyber Security and Laws</b>
ILO7016.1	Understand the concept of cybercrime, cybercriminal types with their motives and legal issues with respect to cybercrime.
ILO7016.2	Identify cyberattacks and discover security challenges presented by mobile devices.
ILO7016.3	Identify tools and methods used in cyber line to perform cyberattack.
ILO7016.4	Apply different aspects of cyber law.
ILO7016.5	Interpret IT Act with respect to Cybercrime and Criminal justice.
ILO7016.6	Apply Information Security Standard compliances during software design and development.
<b>ILO7017</b>	<b>Disaster Management &amp; Mitigation Measures</b>
ILO7017.1	Identify the effects of Disasters by understanding the scenario of disasters in India
ILO7017.2	Compare Manmade and Natural disasters and their extent and possible effects on the economy
ILO7017.3	Categorize the Government Policies, acts and administration based on the level of Disaster
ILO7017.4	Employ the knowledge of Institutional Framework for Disaster Management in India
ILO7017.5	Apply the knowledge of Financing and Relief Measures
ILO7017.6	Utilize the of Preventive and Mitigation Measures to act during the disasters
<b>ILO7018</b>	<b>Energy Audit and Management</b>
ILO7018.1	To identify and describe present state of energy security and its importance.
ILO7018.2	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
ILO7018.3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
ILO7018.4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
ILO7018.5	To analyze the data collected during performance evaluation and recommend energy saving measures
<b>ILO7019</b>	<b>Development Engineering</b>
ILO7019.1	Demonstrate understanding of knowledge for Rural Development.
ILO7019.2	Prepare solutions for Management Issues.
ILO7019.3	Take up Initiatives and design Strategies to complete the task
ILO7019.4	Develop acumen for higher education and research.
ILO7019.5	Demonstrate the art of working in group of different nature
ILO7019.6	Develop confidence to take up rural project activities independently
<b>CSL701</b>	<b>Deep Learning Lab</b>
CSL701.1	Implement basic neural network models
CSL701.2	Design and train feedforward neural networks using various learning algorithms and optimize model performance
CSL701.3	Build and train deep learning models such as Autoencoders.
CSL701.4	Build and train deep learning models such as CNN.
CSL701.5	Build and train deep learning models such as RNN, LSTM
CSL701.6	Describe tools which uses DeepFake technology
<b>CSL702</b>	<b>Big Data Analytics Lab</b>
CSL702.1	Use Sqoop tool in Hadoop ecosystem for big data analytics.
CSL702.2	Implement Map Reduce algorithm on structured and unstructured data
CSL702.3	Perform NoSQL commands on Cassandra, Hadoop HBase and MongoDB
CSL702.4	Implement filtering, counting distinct element and counting ones in window algorithms on data stream.
CSL702.5	Implement data visualization techniques on social network graphs using R
CSL702.6	Built real life application on big data analytics
<b>CSDOL 701X</b>	<b>Department Level Optional Course-3 Lab</b>
<b>CSDOL7011</b>	<b>Natural Language Processing Lab</b>
CSDOL7011.1	Understanding of current NLP implementations and applications.
CSDOL7011.2	Using Word Level Analysis implementations with Tokenization, Lemmatization etc.
CSDOL7011.3	Using Syntax Analysis for Parts of Speech and Parts of Speech Tagging.
CSDOL7011.4	Using Semantic Analysis for implementation of corpus.
CSDOL7011.5	Implementation of core NLP concepts for modern applications.
CSDOL7011.6	Implementation of Mini-Project through a full fledged application.
<b>CSDOL7012</b>	<b>AI for Healthcare Lab</b>
CSDOL7012.1	Understanding preprocessing in Health Care data
CSDOL7012.2	Apply EDA on health care data
CSDOL7012.3	Understand computational models of AI.
CSDOL7012.4	Analyze and justify the performance of specific models as applied to healthcare problems.
CSDOL7012.5	Apply NLP in healthcare domain
CSDOL7012.6	Design and implement AI based healthcare applications
<b>CSDOL7013</b>	<b>Neural Network &amp; Fuzzy System Lab</b>


CSDOL7013.1	Implement Fuzzy operations and functions towards Fuzzy-rule creations.
CSDOL7013.2	Build and training Associative Memory Network.
CSDOL7013.3	Build Unsupervised learning based networks .
CSDOL7013.4	Design and implement architecture of Special Networks
CSDOL7013.5	Implement Neuro-Fuzzy hybrid computing applications
CSDOL7013.6	
<b>CSDOL 702X</b>	<b>Department Level Optional Course-4 Lab</b>
<b>CSDOL7021</b>	<b>User Experience Design with VR Lab</b>
CSDOL7021.1	Demonstrate the installation process of Unity and Visual Studio on computer
CSDOL7021.2	Demonstrate the working of VR Controller
CSDOL7021.3	Create VR scenes for 2D games in Unity
CSDOL7021.4	Create User interface for virtual world in Unity
CSDOL7021.5	Create 3D game in Unity
CSDOL7021.6	Create virtual environment for application in Unity
<b>CSDOL7022</b>	<b>Blockchain Technologies</b>
CSDOL7022.1	Apply the concept of blockchain using Truffle.
CSDOL7022.2	Apply the concept of Smart Contract and deploy on Ethereum test networks.
CSDOL7022.3	Apply the concept of Smart Contract and deploy using Remix IDE and Metamask.
CSDOL7022.4	Design and develop Cryptocurrency.
CSDOL7022.5	Write and deploy chain code in Hyperledger Fabric.
CSDOL7022.6	Develop and test a Full-fledged DApp using Ethereum/Hyperledger.
<b>CSDOL7023</b>	<b>Game Theory for Data Science</b>
CSDOL7023.1	Gain a solid understanding of fundamental game theory concepts
CSDOL7023.2	Develop the ability to apply game theory principles to real-world data science problems.
CSDOL7023.3	Analyze and identify Nash equilibria in various game scenarios
CSDOL7023.4	Comprehend the implications and applications of mixed strategies in game theory.
CSDOL7023.5	Acquire practical skills in utilizing game theory algorithms and computational tools.
CSDOL7023.6	Explore and appreciate the wide range of applications of game theory in data science.
<b>CSP701</b>	<b>Major Project1</b>
CSP701.1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP701.2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP701.3	Analyze and compare the results with the standard results.
CSP701.4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP701.5	Write and present their work effectively with ethical values.
CSP701.6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.
<b>CSC801</b>	<b>Advanced Artificial Intelligence</b>
CSC801.1	Acquire basic knowledge of Probabilistic Models.
CSC801.2	Analyze the working and architecture for Generative Networks.
CSC801.3	Interpret various components and various types of Autoencoders
CSC801.4	Understand various aspects of Transfer Learning
CSC801.5	Apply ensemble learning techniques to real-world problems and demonstrate improved predictive performance.
CSC801.6	Relate to the nascent technologies in the field of artificial intelligence
<b>CSDO 801X</b>	<b>Department Level Optional Course-5</b>
<b>CSDO8011</b>	<b>AI for financial &amp; Banking application</b>
CSDO8011.1	Gain knowledge of technology's influence on financial and banking enterprises.
CSDO8011.2	Understand the applications of blockchain in the financial sector.
CSDO8011.3	Recognize digital money transfer mechanisms and its role in digitization
CSDO8011.4	Evaluate the advantages of digitization and cloud services in banking.
CSDO8011.5	Analyze enterprise software solutions for financial operations.
CSDO8011.6	Explore the integration of AI in banking processes.
<b>CSDO8012</b>	<b>Quantum Computing</b>
CSDO8012.1	Understand basic concepts of quantum computing
CSDO8012.2	Illustrate building blocks of quantum computing through architecture and programming models.
CSDO8012.3	Appraise various mathematical models required for quantum computing
CSDO8012.4	Discuss various quantum hardware building principles
CSDO8012.5	Identify the various quantum algorithms
CSDO8012.6	Describe usage of tools for quantum computing
<b>CSDO8013</b>	<b>Reinforcement Learning</b>
CSDO8013.1	Understand different types of robots, specifications of Robots its characteristics and applications
CSDO8013.2	Understanding Direct – Inverse kinematics of robotic manipulator.
CSDO8013.3	Identify actuators, sensors, and control of a robot for different applications
CSDO8013.4	Developing the differential relationships of motion, velocities and dynamic analysis of force
CSDO8013.5	Developing perspectives on AI and Robotics
CSDO8013.6	Developing footprints of algorithms, programming associated with Robots and conceptualizing self-configuring Robots and use of Robots in different applications
<b>CSDO 802X</b>	<b>Department Level Optional Course -6</b>



<b>CSDO8021</b>	<b>Graph Data Science</b>
CSDO8021.1	Demonstrate a solid understanding of graph concepts and properties.
CSDO8021.2	Apply graph algorithms to solve puzzles and optimization problems
CSDO8021.3	Compare graph databases with relational and NoSQL databases.
CSDO8021.4	Model data using the labeled property graph model and avoid common pitfalls
CSDO8021.5	Build graph database applications with proper data modeling and testing
CSDO8021.6	Analyze and implement graph database solutions for real-world use cases, considering non-functional characteristics
<b>CSDO8022</b>	<b>Recommendation Systems</b>
CSDO8022.1	To have a broad understanding of the field of Recommendation Systems.
CSDO8022.2	In-depth Knowledge of the architecture and models for Collaborative Filtering
CSDO8022.3	Understanding the architecture and working of Content based recommendation systems.
CSDO8022.4	Understanding the architecture and basics of Knowledge based recommendation systems.
CSDO8022.5	Analyzing hybrid and ensembles recommendation systems
CSDO8022.6	Evaluation of recommendation systems by selecting right evaluation parameter.
<b>CSDO8023</b>	<b>social media Analytic</b>
CSDO8023.1	Understand the concept of Social media
CSDO8023.2	Understand the concept of social media Analytics and its significance.
CSDO8023.3	Learners will be able to analyze the effectiveness of social media
CSDO8023.4	Learners will be able to use different Social media analytics tools effectively and efficiently.
CSDO8023.5	Learners will be able to use different effective Visualization techniques to represent social media analytics.
CSDO8023.6	Acquire the fundamental perspectives and hands-on skills needed to work with social media data.
<b>ILO80X</b>	<b>Institute Level Optional Course-2</b>
<b>ILO8021</b>	<b>Project Management</b>
ILO8021.1	Apply selection criteria and select an appropriate project from different options
ILO8021.2	Write work break down structure for a project and develop a schedule based on it
ILO8021.3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
ILO8021.4	Use Earned value technique and determine & predict status of the project
ILO8021.5	Capture lessons learned during project phases and document them for future reference
<b>ILO8022</b>	<b>Finance Management</b>
ILO8022.1	Understand Indian finance system and corporate finance
ILO8022.2	Take investment, finance as well as dividend decisions
<b>ILO8023</b>	<b>Entrepreneurship Development and Management</b>
ILO8023.1	Understand the concept of business plan and ownerships
ILO8023.2	Interpret key regulations and legal aspects of entrepreneurship in India
ILO8023.3	Understand government policies for entrepreneurs
<b>ILO8024</b>	<b>Human Resource Management</b>
ILO8024.1	Understand the concepts, aspects, techniques and practices of the human resource management
ILO8024.2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.
ILO8024.3	Gain knowledge about the latest developments and trends inHRM
ILO8024.4	Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and intergroup environment emerging as future stable engineers and managers.
<b>ILO8025</b>	<b>Professional Ethics and CSR</b>
ILO8025.1	Understand rights and duties of business
ILO8025.2	Distinguish different aspects of corporate social responsibility
ILO8025.3	Demonstrate professional ethics
ILO8025.4	Understand legal aspects of corporate social responsibility
<b>ILO8026</b>	<b>Research Methodology</b>
ILO8026.1	Prepare a preliminary research design for projects in their subject matter areas
ILO8026.2	Accurately collect, analyze and report data
ILO8026.3	Present complex data or situations clearly
ILO8026.4	Review and analyze research findings
<b>ILO8027</b>	<b>IPR and Patenting</b>
ILO8027.1	understand Intellectual Property assets
ILO8027.2	assist individuals and organizations in capacity building
ILO8027.3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting
<b>ILO8028</b>	<b>Digital Business Management</b>
ILO8028.1	Identify drivers of digital business
ILO8028.2	Illustrate various approaches and techniques for E-business and management
ILO8028.3	Prepare E-business plan
<b>ILO8029</b>	<b>Environmental Management</b>
ILO8029.1	Make use of knowledge of Environment Management for sustainable development
ILO8029.2	Identify the Environmental Concerns for the specific hazard
ILO8029.3	Apply the Concept of Ecology to know the interdependence between ecosystem and living organisms
ILO8029.4	Apply the concept of Corporate Env Responsibility for Environmental Quality Management
ILO8029.5	Categorize the ISO-14000 standards and understand the procedure of EMS Certification



ILO8029.6	Utilize the knowledge of Environmental legislations for sustainable development
<b>CSL801</b>	<b>Advanced AI Lab</b>
CSL801 .1	Implement Fuzzy operations and functions towards Fuzzy-rule creations.
CSL801 .2	Build and training Associative Memory Network
CSL801 .3	Build Unsupervised learning based networks
CSL801 .4	Design and implement architecture of Special Networks
CSL801 .5	Implement Neuro-Fuzzy hybrid computing applications.
<b>CSDOL8011</b>	<b>AI for financial &amp; Banking application Lab</b>
CSDOL8011 .1	Proficiency in implementing secure and efficient digital money transfer systems
CSDOL8011 .2	Ability to assess investment performance using risk-adjusted measures
CSDOL8011 .3	Competence in identifying meaningful patterns and segments in financial data.
CSDOL8011 .4	Understanding of market sentiment and its impact on trading decisions.
CSDOL8011 .5	Practical skills in developing and evaluating trading algorithms.
CSDOL8011 .6	Knowledge of fraud detection methods for financial systems.
<b>CSDOL8012</b>	<b>Quantum Computing Lab</b>
CSDOL8012 .1	Implement basic quantum computing logic by building dice and random numbers using open source simulation tools
CSDOL8012 .2	Understand quantum logic gates using open source simulation tools.
CSDOL8012 .3	Implement quantum circuits using open source simulation tools
CSDOL8012 .4	Implement quantum algorithms using open source simulation tools.
<b>CSDOL8013</b>	<b>Reinforcement Learning Lab</b>
CSDOL8013.1	Gain a solid understanding of reinforcement learning concepts and problem formulation.
CSDOL8013.2	Evaluate and compare exploration strategies in online learning scenarios.
CSDOL8013.3	Solve Markov Decision Processes using dynamic programming algorithms
CSDOL8013.4	Apply dynamic programming techniques to solve small-scale MDP problems.
CSDOL8013.5	Implement and analyze Monte Carlo methods and Temporal-Difference learning algorithms
CSDOL8013.6	Explore practical applications of reinforcement learning in real-world domains
<b>CSDOL8021</b>	<b>Graph Data Science Lab</b>
CSDOL8021 .1	Comprehensive understanding of graph databases and their benefits
CSDOL8021 .2	Proficiency in creating data models for representing complex relationships
CSDOL8021 .3	Ability to write efficient queries and analyze graph data effectively
CSDOL8021 .4	Competence in administering and managing graph databases.
CSDOL8021 .5	Application of graph database techniques to solve real-world problems
CSDOL8021 .6	Understand developing graph database applications.
<b>CSDOL8022</b>	<b>Recommendation Systems Lab</b>
CSDOL8022 .1	Understand mathematics and representation of data for recommendation systems
CSDOL8022 .2	Design, implement and analyze Collaborative filtering based for recommendation systems.
CSDOL8022 .3	Design, implement and analyze Content-based recommendation systems.
CSDOL8022 .4	Design, implement and analyze Knowledge-based recommendation systems.
CSDOL8022 .5	Understanding feature engineering and pre-processing for recommendation systems
CSDOL8022 .6	To solve real world problems using recommendation system
<b>CSDOL8023</b>	<b>Social Media Analytics Lab</b>
CSDOL8023 .1	Understand characteristics and types of social media networks
CSDOL8023 .2	Use social media analytics tools for business
CSDOL8023 .3	Collect, monitor, store and track social media data
CSDOL8023 .4	Analyze and visualize social media data from multiple platforms
CSDOL8023 .5	Design and develop content and structure based social media analytics models.
CSDOL8023 .6	Design and implement social media analytics applications for business.
<b>CSP801</b>	<b>Major Project 2</b>
CSP801 .1	Explore beyond the curriculum to identify problem of society, industrial or research needs; investigate the problem through in-depth literature survey and propose appropriate solution to solve the problem.
CSP801 .2	Implement the methodology with modern tools and provide sustainable solution with effective utilization of the resources available.
CSP801 .3	Analyze and compare the results with the standard results.
CSP801 .4	Work as an individual and contribute as a team member with effective management skills to achieve a common objective.
CSP801 .5	Write and present their work effectively with ethical values.
CSP801 .6	Engage themselves in area of their interest applying the knowledge gained and explore new technical trends.

  
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