



Engineering A Better Tomorrow

An Autonomous Institution

Bachelor of Engineering
in
AE,AS,CH,CV,EC,EC(ACT),EE, IIOT,ME,VLSI
Scheme and Syllabus
(2026 Scheme)

I Semester

MVJ College of Engineering, Bengaluru (Autonomous)
B.E. (ECE, IIOT, EC(ACT), VLSI, EEE, CV, AE, AS, ME,CH):
Scheme2026

Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)
(Applicable for 2026-27 admitted students)

Semester - I

Sl. No	Course	Course Code	CourseTitle	Teaching & Learning scheme				#TH/S	Examination				Credits	
				CI		LI	TW&SL		Duration in hours	CIE Marks	SEE Marks	Total Marks		
				L	T	P	SL							
1	ASC	MVJ26MATK11	Differential Calculus and Linear Algebra	56	0	0	64	120	03	50	50	100	04	
2	ASC	MVJ26CHEE12	Applied Chemistry for Emerging Electronics and Futuristic Devices	42	0	0	48	90	03	50	50	100	03	
		MVJ26CHEM12	Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems											
3	ESC	MVJ26AIAK13	Introduction to AI and Applications	42	0	0	48	90	03	50	50	100	03	
4	ESC	MVJ26ESC14	Essentials of Information Technology	42	0	0	48	90	03	50	50	100	03	
5	PLC	MVJ26PLCK15	Python Programming	42	0	0	48	90	03	50	50	100	03	
6	PLCL	MVJ26PLCKL16	Python -Programming Lab	0	0	28	2	30	02	50	50	100	01	
7	ASCL	MVJ26CHEEL17	Applied Chemistry Lab-Electrical	0	0	28	2	30	02	50	50	100	01	
		MVJ26CHEML17	Applied Chemistry Lab- Mechanical											
8	SDCL	MVJ26IDTKL18	Innovation and Design Thinking Lab (Project-based learning)	0	0	28	2	30	02	50	50	100	01	
9	NCMC	MVJ26ICOK19	Indian constitution and Engineering Ethics	14	0	0	16	30	--	100	--	100	PP	
10	AEC	MVJ26ENGK110	Communication Skills	0	0	28	2	30	02	50	50	100	01	
	TOTAL													20

B.E, Semester I, Common to all Engineering courses

Semester: I			
Differential Calculus & Linear Algebra			
Course Code:	MVJ26MATK11	Scheme	2026
Type of Course	ASC	Semester	I
Teaching Hours/Week (L:T:P)	4:0:0	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	56:0:0:64	SEE Marks:	50
Credits	4	Total:	100
Examination type (SEE)	Theory	SEE Duration:	3 hrs
Course Objectives:			
This course will give ability to:			
- Familiarize the importance of calculus associated with one variable and two variables for engineering. - Analyse engineering problems applying Ordinary Differential Equations. - Apply linear algebra techniques to solve systems of linear equations			
Syllabus			
Differential calculus of one variable and two variables with applications in engineering. Polar curves, angle between curves, pedal equations, curvature and radius of curvature. Taylor’s and Maclaurin’s series, indeterminate forms and L’Hospital’s rule. Partial differentiation, total derivatives, maxima and minima of functions of two variables and Jacobians. Ordinary Differential Equations of first and higher order, including exact, linear, Bernoulli, Clairaut and related equations. Linear algebra involving rank of matrices, consistency and solution of systems of linear equations, eigenvalues and eigenvectors and numerical methods for determining dominant eigenvalues.			
Course Plan			
Module I			
Differential Calculus			
Sl. No	Topics to be covered		Hours required
1	Polar curves, angle between the radius vector and the tangent.		12 Hrs
2	Angle between the polar curves.		
3	Pedal equations.		
4	Curvature and radius of curvature in Cartesian form.		
5	Curvature and radius of curvature in Polar form.		
6	Curvature and radius of curvature in Parametric form and Pedal form.		
Module II			

Power Series Expansions, Indeterminate Forms and Multivariable Calculus		
Sl. No	Topics to be covered	Hours required
1	Infinite series expansion of a function of a single variable using Taylor's and Maclaurin's series.	10Hrs
2	Indeterminate forms – L Hospital's rule(with limits $1^\infty, 0^0, \infty^0$).	
3	Partial differentiation, total derivative - differentiation of composite functions.	
4	Maxima and minima for a function of two variables.	
5	Jacobian of function of three variables.	
Module III		
Ordinary Differential Equations (ODE) of First Order		
Sl. No	Topics to be covered	Hours required
1	Exact differential equations.	12Hrs
2	Reducible to exact differential equations-Integrating factors (Type 2 and Type 3).	
3	Linear and Bernoulli's differential equations.	
4	Orthogonal trajectories in Cartesian and Polar form.	
5	Non-linear differential equations: Introduction to general and singular solutions, equations solvable for p $\left(p = \frac{dy}{dx}\right)$.	
6	Clairaut's equations.	
7	Differential equations reducible to Clairaut's equations.	
Module IV		
Ordinary Differential Equations (ODE) of Higher Order		
Sl. No	Topics to be covered	Hours required
1	Higher-order linear ODEs with constant coefficients.	10Hrs
2	Homogeneous and non-homogeneous differential equations.	
3	Method of variation of parameters to solve non linear differential equations.	
4	Cauchy's and Legendre's homogeneous differential equations.	
Module V		
Linear Algebra - I		
Sl. No	Topics to be covered	Hours required
1	Rank of a matrix using Echelon form.	12Hrs
2	Consistency of system of linear equations.	

3	Solving system of linear equations using Gauss elimination method and Gauss Seidel method.	
4	Eigen values and Eigen vectors of a matrix.	
5	Rayleigh Power Method to determine the dominant eigen value of a matrix.	

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021.
2. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. G.B. Gururajachar, "Calculus and Linear Algebra", Academic Excellent Series Publications, Ed., 2018-2019.

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics", McGraw-Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, 3rd Ed., 2016.
3. David C Lay, Linear Algebra and its Applications, "Pearson Publishers", 4th Ed., 2018.
4. Gilbert Strang, "Linear Algebra and its Applications", Cengage Publications, 4th Ed., 2022.

Other References:

1. NPTEL course : Geometry of Curves and Surfaces by Prof. Abhijit Pal, IIT Kanpur.
<https://nptel.ac.in/courses/111104765>
2. NPTEL course : Engineering Mathematics – I, By Prof. Jitendra Kumar, IIT Kharagpur.
<https://nptel.ac.in/courses/111105121>
3. NPTEL course : Differential Equations for Engineers, by Prof. Srinivasa Rao Manam, IIT Madras.
<https://nptel.ac.in/courses/111106100>
4. NPTEL course: Linear Algebra is a foundational subject in Mathematics, by PROF. Pranav Haridas, Kerala School of Mathematics.
<https://nptel.ac.in/courses/111106135>

Course Outcomes:

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

- CO1:** Apply foundational concepts of calculus and differential equations to analyse geometric properties of curves, solve first and higher-order ordinary differential equations and model physical phenomena in science and engineering.
- CO2:** Apply the principles of linear algebra to solve systems of linear equations, determine eigenvalues and eigen vectors and analyse real-world problems such as traffic flow.
- CO3:** Demonstrate the applications of electrical engineering and allied engineering science using

modern ICT tools.

CO-PO Mapping:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11
CO1	3	3									2
CO2	3	3									2
CO3	3	3									2

High-3: Medium-2: Low-1

Evaluation Method:

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. (A).
- Alternative Assessment Tools (AAT) should be a project / Quiz / Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted (B).
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C).

Final CIE Marks will be calculated as $(A + B + C) / 2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)
		3	AAT (Quiz, Project)
		4	Semester End Examination

Semester: I			
Applied Chemistry for Emerging Electronics and Futuristic Devices			
Course Code:	MVJ26CHEE12	Scheme	2026
Type of Course	ASC	Semester	I
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks:	50
Credits	3	Total:	100
Examination type (SEE)	Theory	SEE Duration:	3 hrs
Course Objectives: This course will give ability to: - Acquire core principles of electrochemical energy systems, energy storage, semiconductors, and advanced materials. - Understand corrosion, corrosion control, e-waste management, polymers, nanomaterials, and smart materials for engineering applications. - Analyze functional polymers, semiconductor materials, quantum dots, and composites used in electronic, optoelectronic, flexible, and wearable technologies. - Apply materials science principles to energy conversion, photovoltaics, sensors, and emerging IoT-enabled smart systems. - Develop awareness of sustainable materials, energy technologies, and smart-device applications for modern engineering.			
Syllabus			
Nernst equation, Galvanic cell and single electrode potential, Reference electrodes, Ion selective electrodes, Concentration cells, Energy Storage Devices, Lithium-ion battery and supercapacitors. Corrosion, Differential metal corrosion, Differential aeration corrosion, Factors affecting corrosion, Corrosion control methods, Corrosion Penetration Rate (CPR), E-Waste Management. Molecular weight of polymers, Polyvinylidene Fluoride (PVDF), Polydimethylsiloxane (PDMS), Conducting polymers, Applications of conducting polymers, Stretchable and Wearable Electronics, Lithography, Polymer Composites. Nanomaterials Band gap and classification of nanomaterials, Synthesis of nanomaterials, Quantum Dot Materials, Inorganic Quantum Dot Materials (IQDMs), Organic/Carbon-based Quantum Dot Materials. Semiconductor Materials and Organic Photovoltaics (OPVs), Poly(3-hexylthiophene-2,5-diyl) (P3HT) and [6,6]-Phenyl-C61-butyric acid methyl ester (PCBM), Electronic Device Applications, Energy Conversion Devices.			
Course Plan			
Module I			
Electrochemical Energy Systems			
Sl. No	Topics to be covered	Hours required	
1	Electrochemical Energy Systems: Introduction to electrode systems, electrochemical cells, oxidation-reduction reactions and electrode-electrolyte interface.	9hrs	

2	Nernst equation: derivation, significance and applications.	
3	Types of electrodes: Metal-metal ion, gas and redox electrodes. Galvanic cell and single electrode potential: Concept and numerical problems.	
4	Reference electrodes: Standard Hydrogen Electrode (SHE) overview, calomel electrode construction, working, and applications.	
5	Ion selective electrode: Definition, construction, working of glass electrode, determination of pH using glass electrode.	
6	Concentration cells: Electrode concentration cells, electrolyte concentration cells and numerical problems.	
7	Energy Storage Devices: Batteries and fuel cell - working principle. Construction, working, and applications of H ₂ -O ₂ fuel cell	
8	Lithium-ion battery and supercapacitors: Working principle and construction.Advantages and applications of Lithium-ion battery and supercapacitorsin electric vehicles (EVs), Internet of Things (IoT) and wearable devices.	
Module II		
Corrosion and E-Waste Management		
Sl. No	Topics to be covered	Hours required
1	Corrosion: Introduction, electrochemical theory of corrosion, anodic and cathodic reactions, and mechanism of corrosion.	8hrs
2	Types of corrosion: Differential metal corrosion and differential aeration corrosion.	
3	Differential metal corrosion: Galvanic series, examples, and prevention. Differential aeration corrosion: Oxygen concentration cell, waterline corrosion, pitting corrosion, examples, and prevention.	
4	Factors affecting corrosion: Primaryfactors.Nature of metal (position in galvanic series, purity of metal, nature of oxide film, relative anodic and cathodic areas).	
5	Secondary factors.Nature of environment (temperature, humidity, pH of medium and oxygen concentration).	
6	Corrosion control methods: Sacrificial anode method, impressed current method, galvanization, anodization and cathodic protection.	
7	Corrosion Penetration Rate (CPR): Definition, importance, determination of CPR by weight loss method and numerical problems.	
8	E-Waste Management: Introduction, sources of e-waste, environmental and health impacts of e-waste, recovery of gold from e-waste by bioleaching and advantages of bioleaching.	
Module III		
Functional Polymers and Smart Materials		
Sl. No	Topics to be covered	Hours required
1	Introduction to polymers: Classification of polymers, basic polymer structures, molecular architecture (linear, branched and cross-linked polymers), and structure-property relationships governing mechanical, thermal and electrical properties.	9 hrs
2	Molecular weight of polymers: Number average molecular weight (M _n), weight average molecular weight (M _w), polydispersity index (PDI) and numerical problems.	
3	Polyvinylidene Fluoride (PVDF): Synthesis, properties and applications in E-nose devices.	
4	Polydimethylsiloxane (PDMS): Synthesis, properties and applications in	

	e-skin (electronic skin) and RFID devices.	
5	Conducting polymers: Synthesis and conduction mechanism of polyacetylene.	
6	Applications of conducting polymers: Sensors, batteries and electronic devices.	8 hrs
7	Stretchable and Wearable Electronics: Introduction and material properties required for stretchable and wearable electronic devices. Lithography: Principles of lithography and micro-patterned copper deposition.	
8	Polymer Composites: Introduction, synthesis and properties of epoxy resin-magnetite (Fe ₃ O ₄) composite and Kevlar Fiber Reinforced Polymer (KFRP), and their applications in smart electronic devices.	
Module IV		
Nanomaterials and Quantum Dots		
Sl. No	Topics to be covered	Hours required
1	Introduction to nanomaterials: Definition, significance and size-dependent properties of nanomaterials including surface area, catalytic, optical and electrical properties.	8hrs
2	Band gap and classification of nanomaterials: Energy band concept and classification of nanomaterials.	
3	Synthesis of nanomaterials: Sol-gel method, Chemical Vapor Deposition (CVD) and Physical Vapor Deposition (PVD)/sputtering techniques.	
4	Quantum Dot Materials: Introduction, types, quantum confinement effect, optical and electronic properties of quantum dots (QDs).	
5	Inorganic Quantum Dot Materials (IQDMs): Synthesis and properties of silicon quantum dots (Si QDs) and their applications in optoelectronic devices.	
6	Organic/Carbon-based Quantum Dot Materials: Synthesis and properties of graphene quantum dots (GQDs) and their applications in emerging electronics, flexible and wearable electronic devices.	
Module V		
Semiconductor Materials and Photovoltaics		
Sl. No	Topics to be covered	Hours required
1	Introduction to semiconductors: organic and inorganic semiconductors, n-type and p-type semiconductors, charge carriers, andstructure-property relationship of semiconductor materials.	8hrs
2	Energy band structure, band gap concept, and material characteristics influencing semiconductor properties.	
3	Organic Photovoltaics (OPVs): Construction and working principle of OPV devices.	
4	Poly(3-hexylthiophene-2,5-diyl) (P3HT) and [6,6]-Phenyl-C61-butyric acid methyl ester (PCBM): P3HT as donor material, PCBM as acceptor material, charge transfer mechanism, and their applications in organic photovoltaic devices.	
5	Electronic Device Applications: Optoelectronic devices, flexible electronics and wearable electronic device applications.	
6	Energy Conversion Devices: Introduction, construction and working principle of solar photovoltaic (PV) cells and Microelectromechanical Systems (MEMS)-based energy harvesters, and their applications.	
Textbooks:		
1. Suba Ramesh, Vairam, Ananda Murthy, “ Engineering Chemistry ”,2011, Wiley India		

ISBN: 9788126519880

2. B. S. Jai Prakash, R. Venugopal, Shivakumaraiah, 2010 "**Chemistry for Engineering Students**".

Reference Books:

1. K. K. Rajeshwar, "**Electrochemical Energy System**" Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
2. M.G. Fontana, R.W. Staettle, "**Advances in corrosion science and technology**", Springer publications, 2012, ISBN: 9781461590620.
3. Jain & Jain, "**Engineering Chemistry**" Publisher: Dhanpat Rai Publishing Company, ISBN: 978-9353161181.
4. Harvey, James A "**Smart materials**" Handbook of materials selection, 2002, John Wiley & Sons Canada, Limited, ISBN: 9780471359241.

Other References:(NPTEL/SWAYAM)

1. NPTEL course: Advances in corrosion Engineering, by K. A Natarajan, IISc, Bangalore <https://nptel.ac.in/courses/113108051>
2. NPTEL course: Polymers: concepts, properties, uses and sustainability, by Abhijit P Deshpande, IIT Madras. <https://nptel.ac.in/courses/105106205>

Course Outcomes:

The student will be able to:

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

- CO1:** Understand electrochemical principles, electrode potentials, Nernst equation, concentration cells, and energy storage devices.
- CO2:** Analyze corrosion mechanisms, influencing factors, corrosion control, CPR, and e-waste management.
- CO3:** Explain functional polymers, conducting polymers, smart materials, and composites for electronic and wearable applications.
- CO4:** Explain nanomaterials and quantum dots, their synthesis, properties, quantum confinement, and device applications.
- CO5:** Understand semiconductors and photovoltaics, and apply them to PV, MEMS, optoelectronic, flexible, and wearable devices.

CO-PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PS O1	PS O2
CO1	3	2			2							3	2
CO2	3	3		2								3	3
CO3	3	2	2		2							3	2
CO4	3		2				3					3	
CO5			3				3				2		

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(A)**.
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B)**.
- Two Assignments for 10marks each and the sum of both the assignments will be taken for 20 Marks **(C)**.

Final CIE Marks will be calculated as $(A+B+ C)/2$ for 50 marks.

Semester End Examination (SEE) for Theory:

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (X).

The Final mark for the course is the sum of CIE and SEE marks, scaled to 100.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination

Semester: I			
Applied Chemistry for Advanced Metal Protection and Sustainable Energy Systems			
Course Code:	MVJ26CHEM12	Scheme	2026
Type of Course	ASC	Semester	I
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks:	50
Credits	3	Total:	100
Examination type (SEE)	Theory	SEE Duration:	3 hrs
Course Objectives: This course will give ability to: • Acquire core chemical principles relevant to manufacturing, energy, and materials industries. • Understand corrosion, fuels, materials, polymers, and sensors used in automotive, aerospace, energy, EV, and process industries. • Apply analytical and experimental techniques to solve industry-relevant engineering problems. • Develop awareness of industrial safety, sustainability, and smart monitoring practices.			
Syllabus			
Corrosion, types of corrosion, corrosion control, Corrosion penetration rate, electroplating and electroless plating. Calorific value of fuels, Knocking of(IC)engines, green fuels. Synthesis of nanomaterials. Energy storage devices- introduction, working principle and applications. Synthesis properties and applications of polymers-PVC,PMMA,butyl rubber. Synthesis properties and applications of Carbon fiber and Kevlar. synthesis, properties and applications of polylactic acid (PLA) resin. Lubricants, industrial coolants, and sensors.			
Course Plan			
Module I			
Corrosion Science and Coating Technologies			
Sl. No	Topics to be covered	Hours required	
1	Corrosion: Introduction, electrochemical theory of corrosion	9 hrs	
2	Types of corrosion: Differential metal corrosion in automobile bodies & pipelines. Differential aeration corrosion in marine and offshore structures. Factors affecting corrosion.		
3	Corrosion control: Cathodic protection- sacrificial anode method and impressed current method.		
4	Corrosion penetration rate (CPR): Introduction and numerical problems.		
5	Coating Technologies: Introduction, technological importance, electroplating- electroplating of chromium- hard and decorative coating.		
6	Electro-less plating- electroless plating of Nickel, difference between electroplating and electroless plating.		

Module II		
Sustainable Green Fuels		
Sl. No	Topics to be covered	Hours required
1	Fuels: Introduction of fuels and calorific value,classification of calorific value (GCV and LCV)and relation between GCV and LCV.	9 hrs
2	Determination of calorific value using bomb calorimeter, numerical problems on GCV and LCV.	
3	Knocking in Internal Combustion (IC) Engines: Causes and mechanism of knocking, its effect on engine efficiency and emissions, and the significance of tetraethyl lead (TEL) and unleaded petrol in controlling engine performance and environmental impact of TEL.	
4	Anti-knocking agents: Definition and examples; octane and cetane ratings of fuels and their importance in petrol and diesel engine performance.	
5	Green Fuels: Principles of green energy. Introduction, power alcohol – properties, applications and its limitations.	
6	Biodiesel –Industrial synthesis by trans-esterification method, advantages and its applications.	
7	Production of green hydrogen by photocatalytic water splitting by TiO ₂ catalyst and its advantages.	
8	Hydrogen storage: Introduction; metal hydrides and ammonia as chemical hydrogen carriers, their advantages and limitations.	
Module III		
Materials for Energy Systems		
Sl. No	Topics to be covered	Hours required
1	Nanomaterials: Introduction; size-dependent properties influencing the industrial performance of nanomaterials, including surface area, catalytic activity, electrical conductivity, and thermal conductivity.	8hrs
2	Methods for the synthesis of nanomaterials - Sol-gel, Chemical Vapour Deposition (CVD), and solid-state methods.	
3	Graphene – synthesis by Hummer’s method,structure and it’s application.	
4	Energy storage devices: Batteries - Introduction, classification of batteries, characteristics-capacity, power density, cell balancing and cycle life.	
5	Li-ion battery: Construction, working principle, and applications.	
6	Fuel Cells: Solid Oxide Fuel Cells (SOFCs) - introduction, construction, working principle, and applications. Comparison between fuel cells and batteries.	
7	Photovoltaic cells (PV cells) - construction, working, advantages and limitations.	
Module IV		
Functional materials		
Sl.	Topics to be covered	Hours

No		required
1	Polymers: Introduction and types of polymers(addition and condensation)	8hrs
2	Structure-property relationship of polymers(Crystallinity, strength,elasticity and Chemical resistivity).	
3	Synthesis,Properties and applications of polyvinyl chloride (PVC), polymethyl methacrylate (PMMA),and butyl rubber.	
4	Glass transition temperature (Tg), flexibility of polymers and its significance	
5	Polymer Composites: Introduction, Kevlar fibre – Synthesis, properties and applications offiber-reinforced polymers (EpoxyFRPs).	
6	Carbon-fiber - Preparation, properties and applications.	
7	3D Printing materials: Introduction, synthesis, properties and applications of polylactic acid (PLA) resin.	
8	Number average and weight average molecular weight of polymers (numerical problems).	

Module V

Fluid Technology and Smart Sensors

Sl. No	Topics to be covered	Hours required
1	Lubricants: Introduction, classification, ideal properties and applications in machine tools and engines	8hrs
2	Lubricant testing; experimental determination of viscosity.	
3	Industrial Coolants: Introduction, types-water and oil-based coolants, properties and applications.	
4	Industrial effluents: Introduction, Determination of Chlorides in water	
5	Sensors: Introduction, potentiometric sensor (oxygen sensor)and amperometric sensor (glucose sensor) - principle and its application. Advantages and limitations.	

Textbooks:

1. Wiley Engineering Chemistry, 2nd ed., Wiley India Pvt. Ltd., New Delhi, 2013.
2. Chawla S., A Textbook of Engineering Chemistry, Dhanpat Rai & Co. (P) Ltd., New Delhi.
3. Gadag, R. V., and Shetty, N., A Textbook of Engineering Chemistry, 2nd ed., I. K. International Publishing House, New Delhi, 2016.

Reference Books:

1. Satyaprakash and Agrawal, M., Engineering Chemistry, Khanna Book Publishing, Delhi.
2. Ozin, G. A., and Arsenault, A. C., Nanotechnology: A Chemical Approach to Nanomaterials, RSC Publishing, Cambridge, 2005.
3. Fontana, M. G., and Greene, N. D., Corrosion Engineering, 3rd ed., McGraw-Hill Publications, New York, 1996.
4. Beard, K. W., Linden's Handbook of Batteries, 5th ed., McGraw-Hill Education, 2019.
5. Manasa, C., Vrushabendra, B., and Srikantamurthy, N., Applied Chemistry for Mechanical Engineering and Allied Branches, Astitva Prakashan, ISBN: 978-93-58380-

90-3.

6. National Research Council, Expanding the Vision of Sensor Materials, The National Academies Press, Washington, DC, 1995. <https://doi.org/10.17226/4782>
7. Mahesh, B. (Ed.) and Roopashree, B. (Ed.), Engineering Chemistry, Sunstar Publisher, Bengaluru, 2022. ISBN: 978-93-85155-70-3.
8. Gowariker, V. R., Viswanathan, N. V., Jayadev, S., and Sreedhar, Polymer Science, 4th ed., New Age International Publishers, 2021.
9. Jai Prakash, B. S., Venugopal, R., Sivakumaraiah, and Iyengar, P., Chemistry for Engineering Students, 5th ed., Subash Publications, 2014.
10. Skoog, D. A., Holler, F. J., and Crouch, S. R., Principles of Instrumental Analysis, 7th ed., Cengage Learning, 2020.

Other References:

1. NPTEL course: Advances in corrosion Engineering, by Prof. K.A Natarajan, IISc, Bangalore
<https://nptel.ac.in/courses/113108051>
2. NPTEL course: Polymers: concepts, properties, uses and sustainability, by Prof. Abhijit P Deshpande, IIT Madras. <https://nptel.ac.in/courses/105106205>

Course Outcomes:

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

- **CO 1** : Understand and explain the fundamental principles of applied chemistry related to corrosion, fuels, materials, polymers, sensors, and energy systems relevant to engineering applications.
- **CO 2** : Apply chemical concepts and calculations to analyze corrosion phenomena, fuel characteristics, lubrication behavior, material performance, and environmental parameters in industrial systems.
- **CO 3** : Analyze and evaluate corrosion mechanisms, corrosion control strategies, coating technologies, green fuels, nanomaterials, polymers, and energy systems with emphasis on sustainability and industrial relevance.
- **CO 4** : Select and justify appropriate materials, corrosion protection methods, green inhibitors, coatings, and energy solutions for advanced engineering and industrial applications.
- **CO 5** : Perform experimental synthesis, testing, and quantitative analysis using modern laboratory techniques, sensors, and instrumental methods to solve real-world engineering problems related to corrosion control, materials, fluids, and environmental analysis.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	-	-	1	-	-	-	-	-	-
CO2	3	3	1	-	2	-	-	-	-	-	-
CO3	3	2	2	2	2	-	2	-	-	-	-
CO4	2	2	3	-	2	1	3	-	-	-	-

CO5	2	2	-	3	3	-	2	-	1	1	-
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High-3: Medium-2: Low-1

EvaluationMethod

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(A).**
- Alternative Assessment Tools (AAT) are used to complete a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B).**
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks **(C).**

Final CIE Marks will be calculated as (A+B+ C)/2 for 50 marks.

Semester End Examination (SEE) for Theory:

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (X).

The Final mark for the course is the sum of CIE and SEE marks, scaled to 100.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester End Examination

Semester: I			
Introduction to AI and Applications			
Course Code	MVJ26AIK13	Scheme	2026
Type of Course	ESC	Semester	I
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks	50
Credits	3	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives:			
This course will give ability to:			
• Provide learners with a strong foundation in artificial intelligence concepts, techniques, and applications across various domains. • Develop skills in applying machine learning methods and prompt engineering for solving real-world problems using AI tools. • Expose students to recent advancements and trends in AI and ML, encouraging innovation, research, and practical implementation. • Learn the importance of natural language modelling.			
Syllabus			
Essentials of Artificial Intelligence, types of AI, machine intelligence, intelligent agents, search algorithms and knowledge representation; prompt engineering and prompting techniques; machine learning models including regression, classification, clustering, Naive Bayes, neural networks and Support Vector Machines; AI ethics, AI as a Service, expert systems, IoT and AIoT; Natural Language Processing, Indian language processing, N-gram models, Paninian framework and Karaka theory.			
Course Plan			
Module I			
Introduction to Artificial Intelligence			
Sr. No	Topics to be covered		Hours required
1	Introduction to Artificial Intelligence: How AI works, advantages and disadvantages, history of AI.		8- Hrs
2	Types of Artificial Intelligence: Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness.		
3	Key differences between Artificial Intelligence, Augmented Intelligence, Cognitive Computing, Machine Learning and Deep Learning.		
4	Machine Intelligence: Defining intelligence, components of intelligence, human vs machine intelligence, agent and environment.		
5	Search: Uninformed search algorithms; Informed search algorithms - Pure Heuristic Search, Best-First Search (Greedy Search).		
6	Knowledge Representation: Knowledge-based agent and types of knowledge.		
Module II			
Prompt Engineering			
Sr.	Topics to be covered		Hours

No		required
1	Introduction to Prompt Engineering: Evolution of prompt engineering, types of prompts, and how prompt engineering works.	8- Hrs
2	Role of prompt engineering in communication, advantages of prompt engineering, and the future of LLM communication.	
3	Prompt Engineering Techniques for ChatGPT: Instructions prompt technique; Zero, One and Few-Shot prompting; Self-Consistency prompt.	
4	Prompts for Creative Thinking: Unlocking imagination and innovation.	
5	Prompts for Effective Writing: Igniting the writing process with prompts.	
Module III		
Machine Learning		
Sr. No	Topics to be covered	Hours required
1	Techniques in AI and the Machine Learning model.	8- Hrs
2	Regression Analysis in Machine Learning.	
3	Classification Techniques and Naive Bayes Classification.	
4	Clustering Techniques.	
5	Neural Network and Support Vector Machine (SVM).	
Module IV		
Trends in AI		
Sr. No	Topics to be covered	Hours required
1	AI and Ethical Concerns.	8- Hrs
2	AI as a Service (AIaaS).	
3	Recent trends in AI.	
4	Expert System.	
5	Internet of Things (IoT) and Artificial Intelligence of Things (AIoT).	
Module V		
Natural Language Processing		
Sr. No	Topics to be covered	Hours required
1	Introduction to Natural Language Processing: Origins of NLP, language and knowledge, and the challenges of NLP.	10- Hrs
2	Language and Grammar; Processing Indian Languages; NLP Applications.	
3	Statistical Language Model: N-gram model (unigram, bigram).	
4	Paninian Framework.	
5	Karaka theory.	
Textbooks:		
1. Reema Thareja, "Artificial Intelligence: Beyond Classical AI", Pearson Education, 2023.		
2. Ajantha Devi Vairamani and Anand Nayyar, "Prompt Engineering: Empowering Communication", 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: https://doi.org/10.1201/9781032692319).		
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone - A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.		

4. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.

Reference Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4/e, Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, "Artificial Intelligence", McGraw Hill Education.
3. Tom Taulli, "Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond", Apress, Springer Nature.
4. Nilakshi Jain, "Artificial Intelligence: Making A System Intelligent", First Edition, Wiley.

Other References: (NPTEL/SWAYAM. Any Other) :

1. NPTEL Course: An Introduction to Artificial Intelligence, IIT Delhi - <https://nptel.ac.in/courses/106102220>
2. Elements of AI: <https://www.elementsofai.com/><https://www.elementsofai.com/>
3. Google Machine Learning Crash Course: <https://developers.google.com/machine-learning/crash-course>
4. Learn Prompting (Open-Source Guide): <https://learnprompting.org/><https://learnprompting.org/>
5. Google AI - Learn with Google AI: <https://ai.google/learn-ai-skills/><https://ai.google/learn-ai-skills/>
6. Coursera - Machine Learning by Andrew Ng (Stanford University): <https://www.coursera.org/learn/machine-learning><https://www.coursera.org/learn/machine-learning>
7. OpenAI Prompt Engineering Guide: <https://platform.openai.com/docs/guides/gpt-best-practices><https://platform.openai.com/docs/guides/gpt-best-practices>
8. Prompt Engineering for Developers - DeepLearning.AI + OpenAI: <https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/><https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/>
9. Ethics in AI - Google Responsible AI Practices: <https://ai.google/principles/#our-ai-principles-in-action><https://ai.google/principles/#our-ai-principles-in-action>

Course Outcomes:

The student will be able to:

CO1: Explain the concepts and types of artificial intelligence.

CO2: Illustrate basic machine learning methods for regression, classification and clustering.

CO3: Identify real-world applications across different disciplines.

CO4: Make use of prompt engineering techniques to interact with generative AI tools.

CO5: Outline recent trends in artificial intelligence and machine learning.

CO6: Outline the fundamental concept of NLP, grammar-based language model and statistical-based language model.

Sl. No	Activity on Creating Effective Prompts
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Note: To conduct the activity students can use any of the AI tools such as ChatGPT.

1	Basic Prompt writing: Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.
2	Zero-Shot Prompting: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.
3	One-Shot and Few-Shot Prompting: Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.
4	Chain-of-Thought Prompting: Current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.
5	Prompt Refinement: Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. Role-Based Prompting: Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses.
6	Creative Engineering Problem Prompts: Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like "limited resources" and "sustainability".
7	Ethical Prompt Design Discussion: Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.
8	Simulated Customer Support Chatbot: Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.
9	Multi-Language Prompting: Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.
10	Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a "Prompt Gallery." For each prompt type, match it with a real-world task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.
11	Choose a real engineering challenge or societal problem relevant to your field (e.g., "Reducing plastic waste in campus cafeterias" or "Optimizing solar panel placement on

	campus rooftops"). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI's (or peer's) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses.
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CO-PO Mapping :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	3	3	2	3			2			2	3	2
CO2	3	3	3	2	3			2			2	3	2
CO3	3	3	2	2	3			2			2	2	2
CO4	3	2	3	2	3			2			2	3	2
CO5	3	3	3	3	3			2			2	3	2
CO6	3	3	2	2	3			2			2	2	2

High-3: Medium-2: Low-1

Evaluation Method :

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. (A).
- Alternative Assessment Tools (AAT) should be a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted (B).
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C).
- Final CIE Marks will be calculated as $(A+B+C)/2$ for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

- Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.
- Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Project
3	Flipped Classes	3	Quiz / Seminar / Prompt Activities (SAAE)
4	Practice session/Demonstrations	4	Semester End Examination

Semester:I			
Essentials of Information Technology			
Course Code	MVJ26ESC14	Scheme	2026
Type of Course	ESC	Semester	I
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks	50
Credits	3	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3
Course Objectives: This course will give ability to: ● To familiarize the students with different methods of information representation, processing, and manipulation in computing systems. ● To enable the students to understand and utilize Information Technology (IT) infrastructure for effective information exchange and communication. ● To provide the students with fundamental software engineering concepts required for website and application development. ● To equip the students with the skills to design and develop database queries for efficient insertion, retrieval, and updating of structured information.			
Syllabus			
Data representation and storage, main memory, binary representation, and the storage of integers and fractions; data manipulation and computer architecture, program execution, arithmetic and logic operations, device communication; Operating systems, evolution, process management, and coordination of machine activities; and algorithms, representation.Computer networks and the Internet, the World Wide Web, Internet protocols, and security; Cybersecurity and information ethics, information security, cyber hygiene, cybersecurity teams, ownership, ethical issues, and online content. Software engineering, software life cycle, methodologies, modularity, and development tools; database systems, with emphasis on database fundamentals and the relational model; HTML and website development, CSS, website design, storyboarding, and structure; and computer graphics.			
Course Plan			
Module I			
Sr. No	Topics to be covered		Hours required
1	Data Storage: Bits and Their Storage, Main Memory		8- Hrs
2	Mass Storage, Representing Information as Bit Patterns, Storing Integers, Storing Fractions.		
3	The Binary System		
4	Data Manipulation: Computer Architecture, Machine Language, Program		

	Execution,	
5	Arithmetic/Logic Instructions, Communicating with Other Devices	
Module II		
Sr. No	Topics to be covered	Hours required
1	Operating Systems: The History of Operating Systems, Operating System Architecture,	8- Hrs
2	Coordinating the Machine's Activities, Handling Competition Among Processes,	
3	Algorithms: The Concept of an Algorithm,	
4	Algorithm Representation, Algorithm Discovery.	
Module III		
Sr. No	Topics to be covered	Hours required
1	Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web,	10- Hrs
2	InternetProtocols, Security.	
3	Cybersecurity: Overview-What is Cybersecurity?, Brief History of Cybersecurity Events, The Basic Information Security Model,	
4	Cyber Hygiene, Teams in Cybersecurity.	
5	Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content.	
Module IV		
Sr. No	Topics to be covered	Hours required
1	Software Engineering: The Software Engineering Discipline, The Software Life Cycle,	8- Hrs
2	Software Engineering Methodologies, Modularity, Tools of the Trade.	
3	Database Systems: Database Fundamentals,	
4	The Relational Model.	
Module V		
Sr. No	Topics to be covered	Hours required

1	Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS)	8 - Hrs
2	WebsiteDesign and Storyboarding, Structure of a Website.	
3	Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics,	
4	Modeling, Rendering.	
Textbooks: 1. J. Glenn Brookshear and Dennis BryLOW, Computer Science:An Overview, 12 th edition Education Limited, 2017. 2. Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish, "Fundamentals of Information Technology" (2023). FUNDAMENTALS OF INFORMATION TECHNOLOGY: Textbook – English. 19.		
Other References: 1. NPTEL COURSE: Fundamentals of Information Technology By Prof. Aasim Zafar, Prof. Arman Rasool Faridi https://onlinecourses.swayam2.ac.in/e-learning/preview/ini25_cs01		
Course Outcomes: At the end of the course, the student will be able to: CO1: Illustrate different information representation and manipulation CO2: Make use of Information Technology (IT) infrastructure for information exchange. CO3: Apply basic software engineering concepts for Website and application development. CO4: Develop queries for quick insert, access and updating of structured information CO5: Identify role of cybersecurity and ethics issues in Information Technology (I'T).		

CO-PO Mapping:

CO/P O	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PSO1	PSO 2
CO1	3	2			2						1	2	
CO2	2	2			3				1	2	1	2	2
CO3	2	3	3	1	3				1				2
CO4	2	3	2	1	3						2		
CO5	1	2			2			3					

High-3: Medium-2: Low-1

Evaluation Method:**Continuous Internal Evaluation (CIE)::**

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. **(A)**.
- Alternative Assessment Tools (AAT) should be a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted **(B)**.
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks **(C)**.

Final CIE Marks will be calculated as $(A+B+C)/2$ for 50 marks.

Semester End Examination (SEE)::

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Assignments (OBA)/ Book Lab Project
3	Flipped Classes	3	Lab Test
4	Practice session/Demonstrations in Labs	4	Semester Examination End
5	Virtual Labs (if present)		

Semester: I			
Python Programming			
Course Code	MVJ26PLCK15	Scheme	2026
Type of Course	PLC	Semester	I
Teaching Hours/Week (L:T:P)	3:0:0	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	42:0:0:48	SEE Marks	50
Credits	3	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	3

Course Objectives:

This course will give ability to:

- Understand the primitive language constructs of python.
- Demonstrate the methods to manipulate primitive python data structures
- Apply the python standard libraries and file operations
- Illustrates the concepts of Object-Oriented Programming in python.

Syllabus

Problem-solving strategies, programming paradigms, OOP concepts, Python features, IDLE, variables, identifiers, and data types. input/output, operators, expressions, type conversion, comments, indentation, reserved words, decision control, branching, loops, break, continue, and pass. Functions, scope and lifetime, arguments, lambda and recursive functions, modules, importing techniques, standard library modules, and packages. Lists, tuples, sets, dictionaries, strings, their methods and operations, list comprehension, string formatting, and regular expressions. File handling, errors and exceptions, assertions, classes and objects, inheritance, polymorphism, operator overloading, and method overriding.

Course Plan

Module I

Introduction and Basics of Python Programming

Sr. No	Topics to be covered	Hours required
1	Problem Solving Strategies, Program Design Tools and Programming Paradigms	9- Hrs
2	Features of Object-Oriented Programming, Merits and Demerits of OOP Languages	
3	Features of Python and Python IDLE	
4	Literal Constants, Variables, Identifiers, Data Types, Input/Output Operations, Comments and Indentation	
5	Reserved Words, Operators and Expressions, Type Conversion	

Module II

Decision Control Statements, Functions and Modules

Sr. No	Topics to be covered	Hours required
1	Introduction, Selection and Conditional Branching Statements	8- Hrs
2	Iterative Statements, Nested Loops, break, continue and pass	

	Statements	
3	Function Definition, Need for Functions, Variable Scope and Lifetime	
4	Types of Arguments, Lambda Functions and Recursive Functions	
5	Modules, Importing Techniques, Standard Library Modules and Packages	
6	Introduction, Selection and Conditional Branching Statements	
Module III		
Lists, Tuples and Sets		
Sr. No	Topics to be covered	Hours required
1	List definition, Characteristics and List methods	9- Hrs
2	List operations and Looping in Lists	
3	Creating Tuples, Basic Tuple operations, Tuple assignment and Nested Tuples	
4	Variable-Length Argument Tuples, Introduction to Sets, Set Functions and Set Operations	
5	Applications of Sets, Frozen Sets and List Comprehension	
Module IV		
Dictionaries, Strings and File Handling		
Sr. No	Topics to be covered	Hours required
1	Creating Dictionaries, Built-in Dictionary Functions and Methods	8- Hrs
2	Dictionary Operations, Looping over Dictionaries and Nested Dictionaries	
3	Introduction to Strings, String Formatting, Built-in String Methods and Functions	
4	String Operations, Iterating Strings, String Module, Comparing Strings and Regular Expressions	
5	File Paths, Types of Files, Opening and Closing Files, Reading and Writing Files, Directory Methods	
6	Creating Dictionaries, Built-in Dictionary Functions and Methods	
Module V		
Error and Exception Handling, Classes and Objects		
Sr. No	Topics to be covered	Hours required
1	Types of Errors, Exception Handling, Raising and Instantiating Exceptions	8- Hrs
2	Handling Exceptions in Invoked Functions, Built-in and User-Defined Exceptions	
3	finally Block, Assertions, Defining Classes and Creating Objects	
4	Class Methods, Built-in Class Attributes, __init__(), __str__(), Public and Private Data Members, Pure Functions and Modifiers	
5	Inheritance and Types of Inheritance, Polymorphism, Operator Overloading and Method Overriding	
Textbooks:		
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein		

"Introduction to Algorithms", MIT Press, 2022.

2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson, 2022.

Reference Books:

1. Al Sweigart, "Automate the Boring Stuff with Python- Practical Programming for Total Beginners", No Starch Press, 2nd Edition, 2022.
2. Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons, "Programming with Python", Cengage, 2023.

Course Outcomes: :

the student will be able to:

CO1: Explain foundational programming concepts, design tools, paradigms, and the basics of Python programming.

CO2: Apply control structures, modular programming, and function-based design to build executable Python programs.

CO3: Analyse and differentiate among Python's built-in data structures for effective data organization and manipulation.

CO4: Evaluate and construct robust Python applications using advanced data structures, file operations, exception handling, and object-oriented principles.

CO5: Apply principles of programming and robust exception handling in Python to design sustainable, modular, and reusable software systems aligned with responsible technology use and innovation goals.

CO-PO Mapping

CO/ PO	PO1	PO 2	PO 3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO11	PSO 1	PSO 2
CO1	3	2	1								2	3	2
CO2	3	3	2		1				2		2	3	2
CO3	3	3	3		2				2		2	3	2
CO4	3	3	3		2				2		2	3	2
CO5	3	3	3		2				2		2	3	2

High-3: Medium-2: Low-1

Evaluation Method:

Continuous Internal Evaluation (CIE):

- Three Internal Tests will be conducted for 50 marks each and average of best two will be taken. The student should score minimum 30% marks of the average test score to avoid NSSR. (A).
- Alternative Assessment Tools (AAT) should be a project / Quiz/ Seminar cum Presentation / other suitable alternate assessment methods for 30 marks. Two evaluations will be conducted (B).
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C).

Final CIE Marks will be calculated as (A+B+ C)/2 for 50 marks.

Semester End Examination (SEE):

The question paper consists of two parts, A and B.

Part A: Consists of 10 questions (2 questions from each module) of 2 marks each.

Part B: The question paper should have 10 questions. Each question carries 16 marks. There should be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The Final mark for the course is sum of the CIE and SEE Marks, scaled to 100.

Course delivery methods		Assessment methods	
1	Chalk and Talk	1	IA tests
2	PPT and Videos	2	Open Book Assignments (OBA)/ Lab Project
3	Flipped Classes	3	Alternative Assessment Tools (AAT)
		4	Semester End Examination

B.E,Semester I ((ECE, IIOT, EC(ACT), VLSI, EEE, CV, AE, AS, ME, CH)

Semester:I			
Python Programming Lab			
Course Code	MVJ26PLCKL16	Scheme	2026
Type of Course	PLCL	Semester	I
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks	50
Credits	1	Total Marks	100
Examination type (SEE)	Practical	Exam Hours	3
CourseObjectives: This course will give the ability to: • Understand the primitive language constructs of Python. • Demonstrate the methods to manipulate primitive Python data structures • Apply the Python standard libraries and file operations • Illustrate the concepts of Object-Oriented Programming in Python.			
Guidelines/SpecificRequirements,ifany: Implementalltheprograms inPythonProgrammingLanguage using Jupyter Notebook.			
Sl. No.	ExperimentsList		
1.	a. Find the length of a given list without using the len() function. b. Find the largest and smallest elements in a list. c. Calculate the sum and average of elements in a list.		
2.	a. Remove duplicate elements from a list. b. Merge two lists into one. c. Check whether a given element exists in a list.		
3.	a) Develop a Python program to create a tuple from a list of numbers and perform basic tuple operations. Create two sets and perform union, intersection, difference and membership operations.		
4.	Develop a Python program to accept a string from the user and perform the following operations: find the length of the string, count vowels, reverse the string, convert it to uppercase and lowercase, and check whether a given substring is present.		
5.	Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the Dictionary in reverse order of frequency and display the dictionary slice of the first 10 items.		
6.	Develop a program to read 6 subject marks from the console for a student. Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1D array and sort using Buddle sort Technique].		
7.	Develop a Python program to demonstrate functions by creating functions with different types of arguments. Use a lambda function to perform a simple calculation and a recursive function to find the factorial of a number.		
8.	Develop a Python program to create a class Student with data members for name and marks. Define methods to read the student details and display the details. Create and use an object of the class.		

9.	Develop a Python program with a base class Shape and derive Rectangle and Circle classes from it. Override a method in the derived classes to calculate their respective areas.
10.	Develop a Python program to create a Date class and overload the + operator to add a specified number of days to a given date. Display the resulting date.

Course Outcomes:

The student will be able to:

- CO1:** Explain foundational programming concepts, design tools, paradigms, and the basics of Python programming.
- CO2:** Apply control structures, modular programming, and function-based design to build executable Python programs.
- CO3:** Analyse and differentiate among Python's built-in data structures for effective data organisation and manipulation.
- CO4:** Evaluate and construct robust Python applications using advanced data structures, file operations, exception handling, and object-oriented principles.
- CO5:** Apply principles of programming and robust exception handling in Python to design sustainable, modular, and reusable software systems aligned with responsible technology use and innovation goals.

CO PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1		1				1	1		2	1
CO2	3	2	1	1	1				1	1		2	1
CO3	3	3	2	2	3			1	2	1	1	3	2
CO4	2	3	2	2	2			1	1	1	1	2	3
CO5	2	3	3	2	3	1	1	1	2	2	2	3	2

Evaluation Method

Continuous Internal Evaluation (CIE):

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) + Record Book (6 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(A)**.
- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. **(B)**.

Final CIE Marks of practical should be calculated as A+B for 50 marks

Semester End Examination (SEE) for Practical:

The SEE of practical is evaluated for 50 marks, distributed as follows:

- Experiment Conduction with Results: 40 marks
- Viva Voce: 10 marks
- **Total 50 marks (Y)**

The Final mark for the SEE is X+Y of total 100 marks

Coursedeliverymethods		Assessmentmethods	
1	Chalkandtalk	1	LabTest
2	Practice session/DemonstrationsinLabs	2	SemesterEndExamination

B.E, I Semester (ECE, IIOT, EC(ACT), VLSI, EEE)

Semester: I			
Applied Chemistry Lab- Electrical			
Course Code:	MVJ26CHEEL17	Scheme	2026
Type of Course	ASCL	Semester	I
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks:	50
Credits	1	Total:	100
Examination type (SEE)	Practical	SEE Duration:	3 hrs
Course Objectives: • Develop practical skills in quantitative chemical analysis using classical and instrumental methods. • Familiarize students with the analysis of water, wastewater, industrial effluents, and e-waste for important chemical and environmental parameters. • Introduce students to electroanalytical and optical techniques, including conductometry, potentiometry, pH-metry, and colorimetry. • Enable students to evaluate the physicochemical properties of industrially relevant materials, such as lubricants and biofuels. • Develop an understanding of green chemistry and sustainable materials synthesis			
Sl. No.	Experiments List		
1.	Estimation of total hardness of water by EDTA method		
2.	Determination of chemical oxygen demand (COD) of industrial wastewater		
3.	Estimation of iron in steel industry effluent by diphenyl amine indicator method		
4.	Determination of alkalinity of water using standard NaOH solution		
5.	Estimation of acid mixture in electrochemical bath effluent using conductometric sensor (Conductometry)		
6.	Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)		
7.	Determination of pKa of acid electrolyte using pH sensor (Glass electrode)		
8.	Estimation of copper present in e-waste by optical sensor (Colorimetry)		
9.	Estimation of copper in effluent from electroplating industry (Iodometry)		

10.	Corrosion rate determination by weight loss method.
11.	Green synthesis of copper nanoparticles for conductive inks(Demoexperiment).
12.	Synthesis of polylactic acid (PLA) (Demo experiment)

Course Outcomes:

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

- **CO 1** :Apply volumetric and classical analytical techniques for the quantitative estimation of chemical species in water, wastewater, and industrial samples.
- **CO2**: Analyze water and industrial effluents by determining parameters such as hardness, alkalinity, COD, and metal-ion concentration.
- **CO3**: Apply instrumental analytical techniques, including conductometry, potentiometry, pH-metry, and colorimetry, for chemical analysis.
- **CO4**: Determine important physicochemical properties of industrially relevant materials, including lubricants and biofuels, using appropriate analytical methods.
- **CO5**: Demonstrate the principles of green chemistry and sustainable materials synthesis

CO-PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	1	2	2	-	2	1	2	1	1
CO2	3	3	1	3	2	-	3	1	2	1	1
CO3	3	3	1	3	3	-	2	1	2	1	1
CO4	3	2	2	2	2	1	2	1	1	1	2
CO5	3	2	2	3	3	2	3	1	2	1	2

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

The Final CIE Marks of practical should be calculated as A+B for 50 marks.

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) +Record Book (6 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(A)**.

- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. **(B)**.

Final CIE Marks of practical should be calculated as A+B for 50 marks

Semester End Examination (SEE):

The SEE of practical is evaluated for 50 marks, distributed as follows:

- Experiment Conduction with Results: 40 marks
- Viva Voce: 10 marks
- **Total 50 marks (Y)**

Semester: I			
Applied Chemistry Lab- Mechanical			
Course Code:	MVJ26CHEML17	Scheme	2026
Type of Course	ASCL	Semester	I
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks:	50
Credits	1	Total:	100
Examination type (SEE)	Practical	SEE Duration:	3 hrs
Course Objectives: • Develop practical skills in quantitative chemical analysis using classical and instrumental methods. • Familiarize students with the analysis of water, wastewater, industrial effluents, and e-waste for important chemical and environmental parameters. • Introduce students to electroanalytical and optical techniques, including conductometry, potentiometry, pH-metry, and colorimetry. • Enable students to evaluate the physicochemical properties of industrially relevant materials, such as lubricants and biofuels. • Develop an understanding of green chemistry and sustainable materials synthesis			
Sl. No.	Experiments List		
1.	Estimation of total hardness of water by EDTA method		
2.	Determination of chemical oxygen demand (COD) of industrial wastewater		
3.	Estimation of iron in steel industry effluent by diphenyl amine indicator method		
4.	Determination of alkalinity of water using standard NaOH solution		
5.	Estimation of acid mixture in electrochemical bath effluent using conductometric sensor (Conductometry)		
6.	Estimation of iron in rust sample by Potentiometric sensor (Potentiometry)		
7.	Determination of pKa of acid electrolyte using pH sensor (Glass electrode)		
8.	Estimation of copper present in e-waste by optical sensor (Colorimetry)		
9.	Estimation of copper in effluent from electroplating industry (Iodometry)		

10.	Corrosion rate determination by weight loss method.
11.	Green synthesis of copper nanoparticles for conductive inks(Demoexperiment).
12.	Synthesis of polylactic acid (PLA) (Demo experiment)

Course Outcomes:

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

- **CO 1** :Apply volumetric and classical analytical techniques for the quantitative estimation of chemical species in water, wastewater, and industrial samples.
- **CO2**: Analyze water and industrial effluents by determining parameters such as hardness, alkalinity, COD, and metal-ion concentration.
- **CO3**: Apply instrumental analytical techniques, including conductometry, potentiometry, pH-metry, and colorimetry, for chemical analysis.
- **CO4**: Determine important physicochemical properties of industrially relevant materials, including lubricants and biofuels, using appropriate analytical methods.
- **CO5**: Demonstrate the principles of green chemistry and sustainable materials synthesis

CO-PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	1	2	2	-	2	1	2	1	1
CO2	3	3	1	3	2	-	3	1	2	1	1
CO3	3	3	1	3	3	-	2	1	2	1	1
CO4	3	2	2	2	2	1	2	1	1	1	2
CO5	3	2	2	3	3	2	3	1	2	1	2

High-3: Medium-2: Low-1

Evaluation Method

Continuous Internal Evaluation (CIE):

The Final CIE Marks of practical should be calculated as A+B for 50 marks.

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Preparedness / Observation (6 Marks) + Experiment Conduction/ Execution (9 Marks) + Viva Voce (9 Marks) +Record Book (6 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(A)**.

- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks. The student should score minimum 30% in the average test marks (i.e. 6 marks) to avoid NSSR. **(B)**.

Final CIE Marks of practical should be calculated as A+B for 50 marks

Semester End Examination (SEE):

The SEE of practical is evaluated for 50 marks, distributed as follows:

- Experiment Conduction with Results: 40 marks
- Viva Voce: 10 marks
- **Total 50 marks (Y)**

B.E,Semester I, (Common to all Engineering Courses)

Semester:I			
Innovation&Design ThinkingLab			
Course Code:	MVJ26IDTKL18	Scheme	2026
Type of Course	SDCL	Semester	I
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks:	50
Credits	1	Total:	100
Examination type (SEE)	Project	SEE Duration:	2 Hrs.
Course Objectives: The Course will give ability to: • Empathize with community problems and define meaningful challenges • Apply design thinking principles and multidisciplinary skills to develop user-centric solutions. • Build and test basic prototypes using tools available in the Atal Idea/Tinkering Labor Makers Space. • Pitch socially relevant ideas with scalable models. • Collaborate effectively in diverse teams.			
Sl. No.	Experiments List		
1.	Week-1&2:IntroductiontoSocialEntrepreneurship,InnovationandDesignThinking Group discussion on What are Innovation vs Invention. Why Design Thinking is important.Brief about 5 stages: Empathize – Define – Ideate – Prototype – Test.		
2.	Week-3:Innovationwarm-upactivities, forminginterdisciplinaryteams		
3.	Week-4&5:Field(anypublicplacesofstudent’sinterestEg-Village,GovernmentOffice, Industry. R&D institute, NGO etc) visits, stakeholder interviews and interaction. Recording all interaction through handwritten in activity book prescribed by the University.		
4.	Week-6: Documentation, categorization and Group discussion on interactions and problems/challenges.		
5.	Week-7&8: Problemframingusing“HowMightWe”approach,Identificationofsocial problemsanduserinsightsthroughaffinityClusteringandProblemTree.		
6.	Week-9&10: Presentation by teams on Defined Problems, Brainstorming interactions and Mind Mapping.		
7.	Week-10:IdeaFiltering-Shortlistofcreative,eco-friendlyandfeasibleideas.		
8.	Week-12&13: Building low-fidelity and working models using tools like Arduino, 3D printers,: Digital fabrication, electronics kits and recycled materials		
9.	Week-14: User testing, Feedback collection, Iteration - Observation Notes, Feedback Forms (Designing a business model for impact and scalability, if possible) Preparation of Draft of social venture plan)		
10.	Week15&16: FinalDemoandSocialPitch		

Evaluation Method

Teaching-Learning Process (Innovative Delivery Methods)

1. Activity Based Learning
2. Group discussion, Presentations.
3. One faculty member shall be assigned to group of 60 students or one division.
4. Each group shall contain Min.10 and Max.15 students.
5. Nature of the group shall be multidisciplinary. (Group shall be formed by selecting students

from all branches)

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% Weightage.

Continuous Internal Evaluation (CIE):

- **Weekly Evaluation for 30 Marks:** Weekly evaluation should be conducted for every experiment. Marks of each evaluation includes Lab Attendance (5 Marks) + Experiment conduction along with Record / Observation (15 Marks) + Viva (10 Marks) for each experiment. All weekly marks are added and scaled to 30 marks **(A)**.
- Two CIE tests for 20 Marks each should be conducted and averaged to 20 Marks **(B)**.

CIE Parameters (50 Marks)

Sl. No.	CIE Component/Week	Marks	Description
1	Orientation Activities & Communication Skills	5	Participation in Week 1–3 orientation, communication and team work skill-building exercises.
2	Empathy & Field Exploration Documentation	10	Quality and completeness of field visit reflections, stakeholder interviews, and activity book.
3	Problem Definition and Framing	10	Clarity of challenge statements, use of “How Might We”, Affinity Mapping, Problem Trees.
4	Ideation & Mind Mapping	5	Participation in brain storming, mind mapping, idea filtering sessions.
5	Prototype Development & Iteration	10	Quality and creativity of prototype/model, user testing, feedback collection, iterations.
6	Final Presentation & Pitch	5	Project pitching, poster presentation, story telling and scalability model.
7	Team work, Journal, and Engagement	5	Peer and mentor evaluation of participation, Team work, journal updates.
8	Total CIE marks	50	Final CIE marks to be considered

Final CIE Marks of practical should be calculated as A+B for 50 marks.

Semester End Examination (SEE):

SEE shall be conducted by one Internal and one External Examiner

Sl. No.	Evaluation Parameter	Marks	Details
1	Prototype/Solution Demonstration	30	Working functionality, creativity, use of lab tools, relevance to the problem.
2	Final Presentation/Social Pitch	20	Clarity, storytelling, problem-solution fit, communication, visual aids.
3	Business Modeler Sustainability Plan	10	Feasibility, cost-effectiveness ,scalability, and alignment with SDGs.
4	Viva Voce	20	Individual understanding, contribution, tools used, learning outcomes.
5	Documentation Report/ Portfolio	20	Project report, reflection, team activity log, stakeholder input summaries.

The SEE of practical is evaluated for 50 marks, distributed as follows:

- Experiment Conduction with Results: 40 marks
- Viva Voce: 10 marks
- Total 50 marks

The Final mark for the course is the sum of CIE and SEE Marks.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1					3				
CO2	1	1					3				
CO3	1	1					2				
CO4	1	1					2				
CO5	1	1					2				

High-3: Medium-2: Low-1

Semester:I			
Indian Constitution and Engineering Ethics			
Course Code:	MVJ26ICOK19	Scheme	2026
Type of Course	NCMC	Semester	I
Teaching Hours/Week (L:T:P)	1:0:0	CIE Marks:	100
Total Hours of Pedagogy (L:T:P:SL&TW)	14:0:0:16	SEE Marks:	-
Credits	0	Total:	100
Examination type (SEE)	--	SEE Duration:	---
Course Objectives: This course will give ability to: • To know about the basic structure of the Indian Constitution. • To know the Fundamental Rights (FRs), DPSP's, and Fundamental Duties (FD's) of our constitution. • To know about our Union Government, political structure & codes, and procedures. • To know the State Executive & Elections system of India. • To learn the Amendments and Emergency Provisions, other important provisions given by the constitution			
Teaching-Learning Process These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools. (i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation-based learning, (v) Personalized learning, (vi) Problems based learning through discussion. Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills.			
Module I			
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.			3 Hrs
Module II			
FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.			3 Hrs
Module III			
Union Executive: Parliamentary System, Union Executive – President, Prime			3 Hrs

Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	
Module IV	
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.	2 Hrs
Module V	
Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	3 Hrs
Textbooks: 1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. - 2022	
Reference Books: 1. HN Nagamohan Dhas, Sahayana, kerekon, "Samvidhana Odu - for Students & Youths Justice". 2. Shubham Singles, Charles E. Haries, and etal, "Constitution of India, Professional Ethics and Human Rights", published by Cengage Learning India, Latest Edition - 2019. 3. Durga Das Basu (DD Basu), "Introduction to the Constitution of India", (Students Edition.), Prentice-Hall, 2008. 4. Merunandan K B, "The Constitution of India" published by Merugu Publication, Second Edition, Bengaluru.	
Course Outcomes: At the end of the course, the student will be able to: CO1: Analyze the basic structure of Indian Constitution. CO2: Remember their fundamental rights, DPSP's and Fundamental duties (FD's) of our constitution. CO3: Know about your Union government, political structure & codes, procedure. CO4: Understand our State Executives & Election systems of India. CO5: Remember the Amendments and Emergency provisions, other important provisions given by the constitution. Evaluation Method 1. Internal Assessment Tests (100 Marks): Two Internal Assessment tests will be conducted of 50 Marks of MCQs Type.	

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C01	3	3		3							
C02	3	3		3							
C03	3	3		2							
C04	3	3		3							
C05	3	2		3							

High-3: Medium-2: Low-1

Semester:I			
Communication Skills			
Course Code:	MVJ26ENGK110	Scheme	2026
Type of Course	AEC	Semester	I
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks:	50
Total Hours of Pedagogy (L:T:P:SL&TW)	0:0:28:2	SEE Marks:	50
Credits	1	Total:	100
Examination type (SEE)	Theory	SEE Duration:	2 Hrs.
Course Objectives: This course will give ability to: • Use English as a communication tool through the four skills of listening, speaking, reading and writing to meet basic and practical communication needs on familiar topics related to college, recreational activities, career, etc. • Continue to formulate and develop basic knowledge of English, including pronunciation, vocabulary and grammar; and through English, have a more extensive understanding of the landscape, people and culture of English-speaking countries and other countries in the world. • Use English to improve the quality of learning other subjects in the general education curriculum. • Use English for further education or immediate employment • Use a variety of learning strategies to manage learning time, apply information technology in learning and self-learning, consolidate self-learning and self-assessment methodology and take responsibility for learning outcomes, and form lifelong learning habits.			
Module I			
COMMUNICATION SKILLS: Glimpses of Essential English for Engineers (General Overview). Communication Skills: Process, Verbal and Non-Verbal, Proxemics, Chronemics and Barriers. Writing: Word Classification – Parts of Speech, Sentence structures. Speaking & Listening: Listening to English Pronunciation – English Phonemes – Intelligible Accent – Speech Organs- Syllable Structures, Intonation, and Practice, Reading Material for Dramatized Reading “The Chimney Sweeper” by William Blake, Martin Luther King Jr's “I Have a Dream” Speech			3 Hrs
Module II			
INTERPERSONAL SKILLS: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks, Personal Empowerment, Participating in Group Discussion and Debates, Giving Technical Presentation. Reading: Reading the Interview of an Achiever (Skimming and Scanning) (CaseStudies). Writing: Writing a Short Biography of an Achiever Based on given reflections, Grammar: Sentence patterns. Vocabulary Development: Idioms and Phrases.			3 Hrs
Module III			
ENGLISH FOR EMPLOYABILITY: Formal Letter writing (Enquiry, Order, and Complaint). Tenses – Reported Speech, Voice - Email Etiquettes, Structure,			3 Hrs

Writing and Responding to Emails. Paragraph Writing (Descriptive, Argumentative, Expository, Short Story, and Narrative), Blog Writing. Reading: Proofreading (Spelling, Punctuation, Grammar). Error Identification Exercises. Speaking: Questions & Requests (non-Wh questions and Question tags)	
Module IV	
ENGLISH IN DIGITAL WORLD: Framing of search terms/keywords in search engines/ Commands for search on open AIs - Tools to support synchronous communication, such as webinar platforms, and asynchronous communication, such as forums and social media - Online communication - Types – pros and cons of online communication. Acceptable online roles and behaviours – Netiquettes - Etiquettes of social media. Problems and opportunities in handling digital resources -Tools to check grammar. Writing: Citing information accurately from source material - Plagiarism – Infringement, Importance of academic integrity	3 Hrs
Module V	
APPLYING FOR JOBS: Listening: TED Talks. Speaking: Mock Interview, Telephone Interviews. Reading: Reading a Job Interview- language used in formal professional settings, formal vs. informal tone, nonverbal communication cues, Statement of Purpose, Company Profile and Completing Comprehension Exercises. Writing: Job Applications and Resumes, Grammar: Conditional Clauses, Modal Verbs, Vocabulary Development: Technical Vocabulary, Purpose Statement.	2 Hrs
Reference Books: 1. Kumar, A. R., "English for engineers and technologists", Orient BlackSwan, (2008). 2. Raman, M., & Sharma, S. "Technical communication: Principles and practice" (3rd ed.). Oxford University Press, (2015). 3. Floyd, K., & Cardon, P. W. "Business and professional communication", (3rd ed.). 4. Ashraf M. Rizvi, Priyadarshi Patnaik, "Effective Technical Communication", 3e, © 2024 Published: September 12, 2024 5. Yadav, D. P., "A course in English pronunciation", Notion Publications, (2022).	
Course Outcomes: At the end of the course, the student will be able to: CO1: Build essential verbal, non-verbal, and phonetic communication skills for clarity and effectiveness. CO2: Use interpersonal skills in group discussions, presentations, and professional interactions. CO3: Apply formal writing, email etiquette, and creative content development for employability CO4: Communicate effectively in digital platforms, following netiquette and academic integrity. CO5: Prepare job applications, resumes, and perform confidently in interviews Evaluation Method Continuous Internal Evaluation (CIE) – 50 Marks The CIE for the mandatory credit courses common across all disciplines comprises two components as follows: Internal Assessment Tests (30 Marks): (A) Two Internal Assessment tests will be conducted, comprising multiple-choice questions as	

well as descriptive questions to evaluate students' writing skills for 30 marks each. The average of the two test scores will be scaled down to 30 marks.

Assignments (20 Marks): (B)

Students are required to complete two assignments, each carrying 10 marks.

These assignments may include PowerPoint presentations, product descriptions, seminars, or similar academic activities. The marks of these two assignments are added to get 20 marks.

Together, these two components are added to get the Final CIE marks of 50. (A+B)

Semester End Examination (SEE) – 50 Marks

A Semester End Examination is conducted for 50 marks, including multiple-choice questions (MCQs) for 10 marks and descriptive-type questions for 40 marks to assess the students' writing skills.

The final score for the course out of 100 is the Sum Total of SEE and CIE.

Activity Based Learning (Suggested Activities in Class)/Practical-Based Learning

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students, instruct the students to prepare PowerPoint presentations and lecture notes
- ✓ Organizing Group-wise discussions connecting to placement activities
- ✓ Quizzes and Discussions, Seminars, and Assignments

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1									3	3	2
CO2									3	3	2
CO3									2	3	2
CO4									2	3	2
CO5									3	3	2

High-3: Medium-2: Low-1