

MVJ College of Engineering, Whitefield, Bangalore

An Autonomous Institution, Affiliated to VTU, Belagavi

Scheme of Teaching and Examination 2021-21

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

Effective from the academic year 2021-22

I SEMESTER B.E. (CHEMISTRY GROUP)

S. No	Course		Course Title	Teaching Department	Teaching hours/week				Examination				Credits
					Theory Lecture	Tutorial	Practical/Drawing	Self-Study Component	Duration in Hours	CIE Marks	SEE Marks	Total marks	
	L	T			P	S							
1	BSC	MVJ21MAT11	Calculus and Linear Algebra with Python	Mathematics	3	1	1		5	50	50	100	4
2	BSC	MVJ21CHE12	Engineering Chemistry	Chemistry	2	2	0		4	50	50	100	3
3	ESC	MVJ21CS13	C Programming for Problem Solving	Computer Science & Engineering	2	2	0		4	50	50	100	3
4	ESC	MVJ21EC14	Basic Electronics	Electronics & Communication Engineering	2	2	0		4	50	50	100	3
5	ESC	MVJ21ME15	Elements of Mechanical Engineering	Mechanical Engineering	2	2	0		4	50	50	100	3
6	BSC	MVJ21CHEL16	Engineering Chemistry Lab	Chemistry	0	0	2		2	50	50	100	1
7	ESC	MVJ21CSL17	C Programming Lab	Computer Science & Engineering	0	0	2		2	50	50	100	1
8	HSMC	MVJ21EGH18	Business Correspondence - I	Humanities	1	0	0		1	50	50	100	1
9	AEC	MVJ21AEC19	Ability Enhancement Course		1	0	0		1	50	50	100	1
Total					13	11	5		29	450	450	900	20

Note: BSC: Basic Science, ESC: Engineering Science, HSMC: Humanity and Social Science, AEC: Ability Enhancement Course

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Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

Effective from the academic year 2021-22

II SEMESTER B.E. (CHEMISTRY GROUP)

S. No	Course		Course Title	Teaching Department	Teaching hours/week				Examination				Credits
					Theory Lecture	Tutorial	Practical/Drawing	Self-Study Component	Duration in Hours	CIE Marks	SEE Marks	Total marks	
	L	T			P	S							
1	BSC	MVJ21MAT21	Advanced Calculus and Numerical Methods with Python	Mathematics	3	1	1		5	50	50	100	4
2	BSC	MVJ21CHE22	Engineering Chemistry	Chemistry	2	2	0		4	50	50	100	3
3	ESC	MVJ21CS23	C Programming for Problem Solving	Computer Science & Engineering	2	2	0		4	50	50	100	3
4	ESC	MVJ21EC24	Basic Electronics	Electronics & Communication Engineering	2	2	0		4	50	50	100	3
5	ESC	MVJ21ME25	Elements of Mechanical Engineering	Mechanical Engineering	2	2	0		4	50	50	100	3
6	BSC	MVJ21CHEL26	Engineering Chemistry Lab	Chemistry	0	0	2		2	50	50	100	1
7	ESC	MVJ21CSL27	C Programming Lab	Computer Science & Engineering	0	0	2		2	50	50	100	1
8	HSMC	MVJ21EGH28	Professional Writing -II	Humanities	1	0	0		1	50	50	100	1
9	AEC	MVJ21AEC29	Ability Enhancement Course		1	0	0		1	50	50	100	1
Total					13	11	5		29	450	450	900	20

Note: BSC: Basic Science, ESC: Engineering Science, HSMC: Humanity and Social Science, AEC: Ability Enhancement Course

Course Title	CALCULUS AND LINEAR ALGEBRA WITH PYTHON	Semester	I
Course Code	MVJ21MAT11	CIE	50
Total No. of Contact Hours	50 L : T : P :: 3 : 1 : 1	SEE	50
No. of Contact Hours/week	5	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

This course Engineering Mathematics-I will enable students:

- To familiarize the important tools of calculus and differential equations that are essential in all branches of engineering.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner

Module-1

L1 & L2

10 Hours

Differential Calculus-1:

Review of elementary differential calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms– applications to evolutes and involutes

Self Study : Centre and Circle of Curvature

Laboratory Sessions- Plotting of standard Cartesian curves using Python

Applications: Differential Calculus is applied in all Science and Engineering

Video link : <https://www.khanacademy.org/>

<https://www.youtube.com/watch?v=s6F5yjY6jWk&list=PLMLsjhQWWIUqBoTCQDtYllol-o-9hxp11>

Module-2 Differential Calculus-2:

L1 & L2

10 Hours

Maclaurin's series expansions for one variable, indeterminate forms ($1^\infty, 0^0, \infty^0$) - L'Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians, Maxima and minima for a function of two variables- problems.

Self Study : Other indeterminate forms

Laboratory Sessions: Obtaining partial derivative of some standard functions using Python

Applications: Differential Calculus is applied in all Science and Engineering.

Video link: <https://www.khanacademy.org/>

<https://www.youtube.com/watch?v=s6F5yjY6jWk&list=PLMLsjhQWWIUqBoTCQDtYllol-o-9hxp11>

Module-3 Integral Calculus:

L1, L2 & L3

10 Hours

Double and triple integrals. Evaluation of double integrals- change of order of integration and changing into polar co-ordinates. Applications to find area and volume. Beta and Gamma functions: Definitions, Relation between beta and gamma functions - problems.

Self Study: Finding Area and Volume of Integrals.

Laboratory Sessions: Evaluation of the double integral using Python

Applications: Several physical applications of the definite integral are common in engineering and physics like Areas between Curves, Arc length of curve and surface area.

Video link :

https://www.youtube.com/watchv=db7d_a0wiUg&list=PLU6SqDYcYsfLoKyzF_dwxAQf8Ili6VC54

<https://www.khanacademy.org/math/ap-calculus-ab/ab-integration-new/ab-6-1/v/introduction-to-integral-calculus>

Module-4 Ordinary differential equations of first order:

L1,L2 & L3

10 Hours

Exact and reducible to exact differential equations, Bernoulli's equation, Applications of ODE's-orthogonal trajectories and Newton's law of cooling .

Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p; Clairaut's and reducible to Clairaut's equations.

Self Study :L-R circuits

Laboratory Sessions: Problems on Ordinary differential equation using Python

Applications: Cooling/Warming Law, series circuit, Survivability with AIDS, Draining a tank, Determining the current or charge in the circuit.

Video link:

<https://users.math.msu.edu/users/gnagy/teaching/ode.pdf>

<https://www.mathsisfun.com/calculus/differential-equations.html>

Module-5 Linear Algebra:

L1,L2 & L3

10 Hours

Rank of a matrix-echelon form, Solution of system of linear equations – Gauss-elimination method and Gauss-Seidel method, Eigen values and eigenvectors using Rayleigh's power method, Diagonalization of a square matrix of order two.

Self Study :Gauss – Jordan Method

Laboratory Sessions: Solving system of Linear equations using Python

Applications:Used in all science and Engineering Like-Heat Distribution, Coding

Theory,GamesNetworking,Image compression

Video link :<https://www.math.ust.hk/~machas/matrix-algebra-for-engineers.pdf>

<https://www.khanacademy.org/math/linear-algebra>

Course outcomes:

CO1	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve
CO2	Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.
CO3	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4	Solve first order linear/nonlinear differential equation analytically using standard methods.
CO5	Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.

Text Books:

1	B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2	E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.
3	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

Reference Books:

1	N.P. Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
2	B.V. Ramana: "Higher Engineering Mathematics" Tata McGraw-Hill, 2006.
3	H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes (10 marks)
- Assignments (10 Marks)

SEE Assessment:

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain subdivisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	1	1
CO2	2	3	0	3	0	0	0	0	0	0	1	1
CO3	2	2	0	2	0	0	0	0	0	0	1	0
CO4	3	2	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	2	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1

Course Title	ADVANCED CALCULUS AND NUMERICAL METHODS WITH PYTHON	Semester	II
Course Code	MVJ21MAT21	CIE	50
Total No. of Contact Hours	50 L : T : P :: 3 : 1 : 1	SEE	50
No. of Contact Hours/week	5	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

This course viz., Advance Calculus and Numerical Methods aims to prepare the students:

- To familiarize the important tools of vector calculus, ordinary/partial differential equations and power series required to analyze the engineering problems.
- To apply the knowledge of interpolation/extrapolation and numerical integration technique whenever analytical methods fail or very complicated, to offer solutions

Module-1 Vector Calculus

L1 & L2

10 Hours

Vector Differentiation: Scalar and vector fields. Gradient, curl and divergence, solenoidal and irrotational vector fields- problems, Vector identities.

Vector Integration: Line integrals, Theorems of Green, Gauss divergence and Stokes. Applications to work done by a force and flux.

Self Study : Physical Interpretation of Curl and Divergence, Directional Derivative

Laboratory Sessions-To demonstrate the physical interpretation of gradient, divergence and curl using Python

Applications: Vector Calculus is applied in all Science and Engineering .Used in 2-D and 3-D gaming theory.

Video link :

<https://www.slideshare.net/raghuram401/vector-calculus-20955340>

<https://www.slideshare.net/jacobblackvampire/rajatshukla>

<https://www.youtube.com/watch?v=sO9Z2RSeH4s>

Module-2

L1 & L2

10 Hours

Differential Equations of higher order:

Second order linear ODE's with constant coefficients-Inverse differential operators, Cauchy's and Legendre homogeneous equations. Applications to L-C-R circuits.

Self Study: Method of Variation of Parameter

Laboratory Sessions: Finding complementary function of constant coefficient second and higher order ordinary differential equations using Python

Applications: Differential equation has highest application in all field of science and engineering

Videolink:<https://www.slideshare.net/ayeshajavednoori/application-of-higher-order-differential-equations>

<https://www.math24.net/topics-higher-order-differential-equations/>

Module-3

L1 & L2

10 Hours

Partial Differential Equations:

Formation of PDE's by elimination of arbitrary constants and functions, Solution of non-homogeneous PDE by direct integration, Homogeneous PDE's involving derivative with respect to one independent variable only. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables.

Self Study: More number of engineering application problems on heat and wave equations

Laboratory Sessions: Solutions to the problems on different types of Partial differential equations using Python

Applications: Tangent Plane and Linear approximation .To find Local Maxima and Minima

Video link : <http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx>

<https://www.khanacademy.org/>

<http://www.nptelvideos.in/>

<https://www.classcentral.com/>

Module-4

L1,L2 & L3

10 Hours

Infinite Series:Series of positive terms-convergence and divergence. P-series test, comparison test D'Alembert's ratio test and Cauchy's root test – examples.

Power Series solutions-Recurrence relation, Series solution of Bessel's differential equation leading to $J_n(x)$ - Bessel's function of first kind, orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$ - Legendre polynomials. Rodrigue's formula- problems.

Self Study : Proofs of D'Alembert's ratio test and Cauchy's root test

Laboratory Sessions: Illustration of convergent, divergent and oscillatory sequences using Python.

Applications: Series solution helps in understand the derivative in term of series solution using Powerseries and Frobenius Method.

Video link:

<http://easymathseasytricks/>

<http://www.nptelvideos.in/>

<https://www.classcentral.com/>

Module-5

L1,L2 & L3

10 Hours

Numerical Methods:

Finite differences: Interpolation and Extrapolation using Newton's forward and backward difference formula, Newton's divided difference and Lagrange's formula.

Solution of polynomial and transcendental equations– Newton-Raphson and Regula-Falsi methods-Problems.

Numerical integration: Simpson's (1/3)rd and (3/8)th rules, Weddle's rule– Problems.

Self Study : Proof's of Newton Raphson and Regula-Falsi Method

Laboratory Sessions: Solving algebraic equation (Regula-Falsi and Newton-Raphson methods) using Python

Applications: Use of Numerical Methods help in reducing the theoretical work

<http://www.nptelvideos.in/>

<http://www.class-central.com/subject/math>

Course outcomes:

CO1	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
CO2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.
CO3	Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.
CO4	Explain the applications of infinite series and obtain series solution of ordinary differential equations.
CO5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

Text Books:

1	B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2	E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.
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CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes (10 marks)
- Assignments/ Self- study/ Seminars (10 Marks)

SEE Assessment:

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	2	0	0	0	0	0	0	1	1
CO2	3	3	0	2	0	0	0	0	0	0	1	1
CO3	3	3	0	3	0	0	0	0	0	0	0	1
CO4	2	2	0	3	0	0	0	0	0	0	1	1
CO5	2	2	0	2	0	0	0	0	0	0	0	1

High-3, Medium-2, Low-1

Course Title	Engineering Chemistry	Semester	I/II
Course Code	MVJ21CHE12/22	CIE	50
Total No. of Contact Hours	40 L:T:P::2:2:0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3hrs

Course objective is to:

The objective of the Engineering Chemistry course is to acquaint the students with the basic phenomenon/concepts of chemistry and it's applications in various fields of Engineering.

Module-1	RBT Level	9
Water and its treatment	L1,L2,L3	Hrs.

Introduction, Sources and impurities, Hardness, Types of hardness, Units of hardness of water (numericals), Determination of hardness by EDTA method (numericals), Alkalinity of water and its significance (numericals), Dissolved oxygen (DO), Determination by Winkler's method, Biological oxygen demand (BOD), Chemical oxygen demand (COD). Specifications for drinking water, softening methods - Reverse osmosis method (membrane-based treatment processes), Disinfection of water by Ultra-violet irradiation, Desalination of sea-water by solar evaporation.

Laboratory Sessions/ Experimental learning: Water analysis (samples from home, hostel, etc.) for different water quality parameters.

Applications: Water technology and their treatment process are very important for industrial and domestic application.

Video link/Additional online information (related to module if any):

- 1) <http://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1>
- 2) <https://vlab.amrita.edu/?sub=3&brch=272&sim=1430&cnt=2>

Module-2	RBT Level	11
Chemistry of Advanced Materials	L1,L2,L3	Hrs.
<p>Polymers:</p> <p>Introduction: Basics of Polymer chemistry, Degree of polymerization, Classification of polymers, Glass transition temperature (T_g), Basic factors affecting T_g of polymers (with examples), Synthesis, properties and uses of and uses of commercially important polymers-Teflon, Buna-S, Thermocol. Conducting polymers- mechanism of conduction in Polyaniline and its application, Polymer composites- fibre reinforced polymers-Kevlar, carbon fibre-synthesis properties and applications, Recycling and Reuse of plastics, Degradable polymers. Classification with examples.</p>		

Nanomaterials:

Introduction to nanomaterials, size dependent properties (surface area, optical and catalytic properties), Synthesis of nanomaterial by Top- down and bottom-up methods- chemical vapor deposition methods. Applications of nanomaterials in catalysis, electronic and telecommunication, medicines, energy sciences with reference to batteries.

Laboratory Sessions/Experimental learning: Preparation of synthetic resin by condensation polymerization

Applications: This topic will give understanding about various advanced materials used in different field of engineering and industries.

Video link/Additional online information (related to module if any):

1) <https://nptel.ac.in/courses/103/107/103107139/>

2) <https://nptel.ac.in/courses/118/102/118102003/>

3) <https://nptel.ac.in/courses/118/104/118104008/>

Module-3 Electrochemistry	RBT Level L1,L2,L3	6 Hrs.
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Introduction: Electrochemical cells, Electrolytic and galvanic cells, Single electrode potentials (origin and HDL), electrochemical series, Nernst equation and numerical problems, on E, E^o cell, emf measurement, Electrodes-Types -Reference electrode- Construction, working and application of Calomel electrode. Indicator electrode- Glass electrode- Construction, working and application in pH determination. Construction and working of Ag - AgCl electrode and comparison between calomel and Ag - AgCl electrode, Concentration cell.

Laboratory Sessions/ Experimental learning: Construction of battery or any energy resources.

Applications: This is the basic concepts for developing and fabricating new electrochemical Devices (galvanic cell etc.)

Video link/Additional online information (related to module if any):

1) <http://amrita.olabs.co.in/?sub=73&brch=8&sim=153&cnt=1>

Module-4 Corrosion and its control	RBT Level L1,L2,L3	6 Hrs.
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Definition and scope of corrosion, Direct chemical corrosion, Electrochemical corrosion -Galvanic and concentration cells, Types of corrosion-Differential aeration corrosion, Water-line corrosion and Pitting corrosion, factors affecting corrosion, corrosion control: Anodizing, cathodic protection,

Metal finishing: Introduction, technological importance, Electroplating Process-Chromium electroplating and Electroless-plating Process-copper, Manufacture of double-sided PCB.

Laboratory Sessions/Experimental learning: Demonstration of electroplating of metals.

Applications: This is the basic concepts to understand the materials coating for decorative and electronic application.

Video link/Additional online information (related to module if any):

1) <https://nptel.ac.in/courses/113/104/113104082/>

2) <http://nptel.ac.in/courses/113108051/>

Module-5 Energy sources, storage devices and Green Chemistry	RBT Level L1, L2, L3	8 Hrs.
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Introduction: Fuels and its classification, Calorific value of fuels, Calorific value determination by bomb calorimeter and numerical problems on bomb calorimeter, Cracking of Petroleum oils- FCC. Octane and Cetane number, Reforming of petroleum. Knocking- reaction mechanism and anti- knocking agents, Hydrogen as fuel for future energy requirement- Advantages, synthesis of hydrogen by water splitting.

Energy storage devices: Primary and Secondary batteries, Li-ion battery, Lead storage battery.

Fuel cells- Hydrogen-oxygen fuel cell-principle, construction, working and its applications, advantages/disadvantages.

Introduction to Green Chemistry: Definition, principles and applications of Green Chemistry. **Laboratory**

Sessions/Experimental learning: Determination of effects of temperature on viscosity and flash point of daily using fuels/oils

Applications: This is the basic concepts for understanding, developing and fabricating new energy resources.

Video link/Additional online information (related to module if any):

1) <http://vlab.amrita.edu/?sub=2&brch=190&sim=1352&cnt=1>

2) <https://www.slideshare.net/AijazAliMooro/fundamentals-of-petroleum-engineering-module1>

Course outcomes:

Through this course students should be able to

CO1	Transform fundamental knowledge of Chemical Sciences in the field of Engineering alongwith understanding of various techniques of water treatment.
CO2	Illustrate various types of polymers-nanomaterials and learn their synthesis, properties and applications in Engineering and technology.
CO3	Understand and apply the electrochemical processes for energy and analytical applications.
CO4	Understand the mechanism of destruction of metals (corrosion) and effective preventive measures. Principles of metal deposition for electronic and decorative applications.
CO5	Familiarize the energy storage devices for daily use, present energy resources and future requirement.

Textbooks

1.	Engineering Chemistry by R.V Gadag and Nityanand Shetty
2.	Engineering Chemistry by P C Jain
3	Engineering Chemistry by Dr BS Jai Prakash, R Venugopal, Dr Shivakumariah and DrPushpa Iyenger

Reference books

1.	Engineering Chemistry by O. G. Palanna
2	Engineering Chemistry by S S Dara

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes, MCQs (10 marks)
- Assignment (10 marks)

SEE Assessment:

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	2	3	1	1	1	1	3
CO2	3	3	3	1	3	3	3	2	1	1	1	3
CO3	3	3	3	1	1	2	1	2	3	3	3	3
CO4	3	3	3	1	1	1	2	2	2	2	2	3
CO5	3	3	1	3	1	3	3	2	2	2	2	3

High-3, Medium-2, Low-1

Course Title	C PROGRAMMING FOR PROBLEM SOLVING	Semester	I/II
Course Code	MVJ21CS13/23	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L: T : P :: 2 : 2 : 0)	Total	100
Credits	3	Exam. Duration	3Hrs.

Course objective is to:

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions.
- Use and implement data structures like arrays and structures to obtain solutions
- Define and use of pointers with simple applications.

Module-1

L1,L2,L3

9 Hrs.

Problem Solving Using Computers: Computer Overview, Introduction to components of a computer system, Algorithms, Flowchart, Pseudo code with examples, Number systems (Decimal & Binary Conversion).

Overview of C: History of C, Basic structure of C- program, Creating and Running C- Program, Input and output statements.

Laboratory Sessions/ Experimental learning:

1. Program to print sample strings like “hello world” , “Welcome to C Programming” with different formats using escape sequences.
2. Program to print different data types in C and their ranges.
3. Program to initialize, assignment & printing variables of different data types.

Video link / Additional online information:

- <https://nptel.ac.in/courses/106/105/106105171/#>
- <https://youtu.be/5AHRXOtn9bY>
- <https://youtu.be/O8vPR3zh5go>
- <https://youtu.be/ldXrCPzNnkU>
- <https://youtu.be/PwWuOFYH92U>

Module-2

L1,L2,L3

9 Hrs.

Pre-processor Directives: Introduction to pre-processor, Macro substitution and file inclusion directives.

Decision Making and Branching: Simple if statement, if-else Statement, Nesting of if...else, The else if Ladder, The Switch Statements. The goto Statement.

Decision Making and Looping: Introduction, The While Statement, The do-while statement, the for statement, Jumps in Loops.

Laboratory Sessions/ Experimental learning:

1. Program to demonstrate logical operators
2. Program to demonstrate bitwise operators
3. Program to display the following pattern

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

Video link / Additional online information:

- <https://nptel.ac.in/courses/106/105/106105171/#>
- <https://youtu.be/L2oataK7F10>
- <https://youtu.be/s4EiG4RXwyU>
- https://youtu.be/HyDpW7Al6_E
- <https://youtu.be/d1EHD8RoLDQ>

Module-3

L1,L2,L3

9 Hrs.

Arrays: One- dimensional Arrays, Declaration and Initialization of one- dimensional Array, Two- Dimensional Array, Initialization of Two- dimensional Array.

Character arrays and Strings: Declaring and Initializing String variables, Reading strings from terminal, Writing strings to screen, Arithmetic operations on characters ,Putting strings together, Comparison of two strings, String handling functions.

Basic Algorithms: Searching and Sorting Algorithms (Linear search, Binary search, Bubble sort and Selection sort).

Laboratory Sessions/ Experimental learning:

1. Program to find largest and smallest element of a single dimensional array.
2. Program to perform addition of two matrices
3. Program to perform various string operations without using built-in function.
4. Program to sort elements in an array using Selection sort.

Video link / Additional online information:

- <https://nptel.ac.in/courses/106/105/106105171/#>
- <https://youtu.be/I9828WOCEMg>
- https://youtu.be/K92NI2WT_AU
- <https://youtu.be/TV88Pkit8yo>
- <https://youtu.be/FTYgwwFpfP8>
- <https://youtu.be/SSYiEDSUTGM>

Module-4

L1,L2,L3

9 Hrs.

Functions: Need for User defined functions, Elements of user defined function, Definition of functions, Return values and their types, function calls, function declaration, Categories of user defined function, Parameter passing Techniques (Call by Value and Call by reference), Passing arrays to functions, Passing strings to functions, The scope, visibility and lifetime of variables, Recursion. Example programs on recursion: - Finding Factorial of a positive integers and Fibonacci series.

Laboratory Sessions/ Experimental learning:

1. Program to find the area of a circle using function
2. Program to swap two numbers using call by value.
3. Program to swap two numbers using call by reference.
4. Program to generate Fibonacci Series using recursion

Video link / Additional online information :

- <https://nptel.ac.in/courses/106/105/106105171/#>
- <https://youtu.be/JenkXelhImM>
- <https://youtu.be/zUzEbLdt8zU>
- <https://youtu.be/AJvCmpt1UU8>
- https://youtu.be/Lole_9cTtPE

Module-5

L1,L2,L3

9 Hrs.

Structure: Defining and declaring a structure, Accessing structure members, Array of structures, Array within structure.

Pointer: Understanding Pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables.

File I/O: Streams, Files, File Operations, File Opening Modes, Formatted File I/O Functions, Unformatted File I/O Functions, File Status Functions, File Positioning Functions.

Application : An Engineering problem Solving Methodology: Freezing Temperature of Seawater.

Recent Trends In Technology as open Assignments.

1. IOT
2. Cloud Computing
3. AI
4. Big Data
5. Android Application
6. Sensor Networks
7. Data Science

Laboratory Sessions/ Experimental learning:

1. Program to maintain a record of 'n' employee details with four fields(Emp id, Name, Department and Salary). Print the details of employees whose salary is more than 50,000rs on the output screen.
2. Write a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.

Video link / Additional online information:

- <https://nptel.ac.in/courses/106/105/106105171/#>
- <https://youtu.be/kDDd7AmXq1w>
- <https://youtu.be/PFebR3CbftE>
- https://youtu.be/Z_0xXmOgYtY

Course outcomes:

CO1	Exhibit profound knowledge to create, debug, execute and document C programs to cater the needs of computer hardware and software problems.
CO2	Define the programming syntax and constructs of Control Statements to develop elegant, legible and reusable codes.
CO3	Design programs using arrays.
CO4	Modularize the given problem using functions.
CO5	Demonstrate an ability to design and develop C based novel products.

Text Books:

1.	E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill
2.	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Reference Books:

1.	Sumitabha Das, Computer Fundamentals & C Programming, Mc Graw Hill Education.
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2.	Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
3.	R S Bichkar, Programming with C, University Press, 2012.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1									1
CO2	3	3	1									1
CO3	3	3	1									1
CO4	3	3	1									1
CO5	3	3	1									2

High-3, Medium-2, Low-1

Course Title	Basic Electronics	Semester	I/II
Course Code	MVJ21EC14/24	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 2 : 0)	Total	100
Credits	3	Exam. Duration	3Hrs

Course objective is to:

- Provide an introduction to the field of Electronics Engineering.
- Make the students to understand of the devices, instruments.
- Provide knowledge about interdisciplinary applications.
- Design and analyse simple electronic circuits.
- Emphasize more on the laboratory/practical use of the knowledge gained from the course lectures.

Module-1

**RBT Level
L1, L2, L3 & L6**

8Hrs.

Semiconductor Diode:

Prerequisites: Basics of materials, semiconductor properties.

Diode -Basic types, characteristics, Ideal versus Practical, Diode Equivalent Circuits, Applications: Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms.

Special Diodes: Zener Diode, LEDs, Photo Diode – Operation and Applications

Laboratory Sessions/ Experimental learning:

1. Identification and Specifications of electronic components: Resistors, Inductors, Capacitors, Diodes, BJTs, JFETs, MOSFETs, SCRs and LEDs.
2. Testing of R, L, C Components
3. Study and use of; Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs).
4. Study and Operation of; Digital Multi Meter, Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Lissajous Patterns on CRO; (CRO).
5. Experimental Verification of Diode Characteristics in A) Forward Bias B) Reverse Bias.
6. Zener Diode Characteristics.
7. Study of Half Wave and Full Wave Rectification, Regulation with Filters,
8. Zener Diode as Voltage Regulator.
9. Applications: Regulated Power Supply, Switch.

Video link / Additional online information :

1. <https://nptel.ac.in/courses/117103063/>
2. <https://nptel.ac.in/courses/117107095/>

3. <http://nptelvideos.com/video.php?id=2441>
4. <http://www.nptelvideos.com/video.php?id=429>

Module-2	RBT Level L1, L2, L3 & L6	8Hrs.
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Transistors: Bipolar Junction Transistor (BJT) – Construction, types, Operation. Transistor configurations: Common Base, Common Emitter and Common Collector Configurations; characteristics, Applications. Applications: As a switch and an amplifier. Operating Point analysis. Need for biasing. Voltage Divider Bias Configuration;

Field Effect Transistor (FET): Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS.

Laboratory Sessions/ Experimental learning: Input and Output Characteristics of BJT in Common Emitter (CE) Configuration.

Applications: Amplifiers and switches (Low power and high power applications).

Video link / Additional online information:

1. <https://nptel.ac.in/courses/117106087/>
2. <https://www.youtube.com/watch?v=ANHTfy9feZg>
3. <https://nptel.ac.in/courses/108102095/>

Module-3	RBT Level L1, L2, L3 & L6	8Hrs.
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Coupling: Need of coupling, Types and brief qualitative analysis.

Feedback Amplifiers: Need for feedback, types- Principle, applications.

Oscillators – Principles. Types- Sinusoidal and Non-Sinusoidal Oscillators RC Phase Shift Oscillator.

555 Timer: Qualitative approach of Astable, Monostable and Bistable multivibrators.

Laboratory Sessions/ Experimental learning:

1. Applications of 555 Timer – Astable and Monostable Multivibrators.
2. Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Differentiator and Integrator.

Applications: Oscillators, Multivibrators, Op-Amps as adder, subtractor, integrator, differentiator.

Video link / Additional online information:

1. <https://www.youtube.com/watch?v=m4sjTt7rhow>
2. <https://nptel.ac.in/courses/117101106/>
3. <https://nptel.ac.in/courses/108108114/>

Module-4	RBT Level L1, L2, L3	8Hrs.
<p>Digital Electronics Fundamentals:</p> <p><i>Prerequisites:</i> Number systems. Analog and Digital Signals. Boolean Algebra, Boolean theorems and postulates.</p> <p>Logic Gates: NOT Gate, CMOS Inverter, AND, OR, NAND, NOR, XOR, XNOR Gates. CMOS NAND gate. Applications; Half adder, Full adder, Multiplexer, De-multiplexer, Encoder, Decoder.</p> <p>Flip-Flops: Working Principle, S-R, J-K, T and D Flip-Flops. Registers.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Study of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. 2. Study of Flip-Flops – SR, JK and D. 3. Study of Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations, Counters. <p>Applications: Burglar alarms, buzzers, push button switches, functioning of street lights, combinational circuits like multiplexers, demultiplexers, encoders, decoders etc. A few arithmetic circuits such as adder, subtractor, comparator etc.. Flip-flops, counters and registers are made to store data.</p> <p>Video link / Additional online information :</p> <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/108105113/ 2. https://nptel.ac.in/courses/117106086/ 		
Module-5	RBT Level L1, L2, L3	8Hrs.
<p>Operational Amplifiers and Applications; Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op- Amp, Characteristics of Ideal Op- Amp, Concept of Virtual Ground. Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator, Differentiator and Integrator.</p> <p>Communication Systems: General communication system, Need for modulation and types.</p> <p>Laboratory Sessions/ Experimental learning: Study the Characteristics of sensors and Transducers.</p> <p>Applications: Measurement, and Control systems.</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/117102059/ 2. https://www.rfwireless-world.com/Articles/sensors-and-transducers.html 3. https://www.freebookcentre.net/Electronics/Basic-Electronics-Books.html 		

Course outcomes:	
CO1	Analyse the operation and characteristics of Electronic devices and use of them in applications.
CO2	Study and analyse the performance of electronic circuits.
CO3	Demonstrate the electronic systems and analyse their applicability
CO4	Analyse requirement of electronic devices and systems.
CO5	Design a simple prototype for a certain application.

Text Books:	
1.	Robert L. Boylestad, Louis Nashelsky“ Electronic devices and circuit theory” PHI Publication, 11th Edition, 2012
2.	M Morris Mano , Digital Design, 4 th edition, Pearson Prentice Hall,2008.

Reference Books:	
1.	D.P. Kothari, I. J. Nagrath, “Basic Electronics”, McGraw Hill Education (India) Private Limited, 2014.
2.	David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, 5th Edition, 2008.

CIE Assessment:	
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests	
<ul style="list-style-type: none"> - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks) 	

SEE Assessment:	
i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.	
ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.	
iii. One question must be set from each unit. The duration of examination is 3 hours.	

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	-	-	-	2	1	1	1
CO2	3	3	1	2	2	1	-	-	2	1	1	1
CO3	3	3	2	3	3	1	-	-	2	1	2	1
CO4	3	3	2	3	3	1	1	-	2	1	2	2
CO5	3	3	3	3	2	2	2	-	3	2	3	3

High-3, Medium-2, Low-1

Course Title	ELEMENTS OF MECHANICAL ENGINEERING	Semester	I/II
Course Code	MVJ21ME15/25	CIE	50
Total No. of Contact Hours	40 L: T : P :: 2:2:0	SEE	50
No. of Contact Hours/week	04	Total	100
Credits	03	Exam. Duration	3 hrs

Course objective is to:

Provide an introduction to the Mechanical Sciences and Engineering.

- Comprehend the fundamental concepts of energy sources and its conversion and basic concepts of thermodynamics.
- Understand the concepts of boilers, turbines, pumps, internal combustion engines, hybrid and electric vehicles and refrigeration.
- Enumerate the knowledge of engineering applications of advanced materials and different metal joining techniques. Also understand the working principles of conventional machine tools, automation and robot.
- Have the practical exposures on the concepts of energy conversion and electric current generation, hydraulic turbines and Pumps by making the working models.

Module-1	RBT Level L1, L2	08 Hrs.
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Prerequisites: Different forms of Energy, fossil fuel formation

Sources of Energy: Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.

Basic concepts of Thermodynamics: Introduction, states Zeroth, 1st, 2nd and 3rd laws of thermodynamics.

Steam: Formation of steam and thermodynamic properties of steam. Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories.

Laboratory Sessions/ Experimental learning:

- To make working models of different energy conversion technologies in order to produce electricity.

Applications: Solar Panels, Wind mills, Pressure Cookers, Boilers and Process industries.

Video link / Additional online information:

1. <https://examupdates.in/elements-of-mechanical-engineering/>
2. https://www.youtube.com/watch?v=Ew_xRvXorKU
3. <https://www.youtube.com/watch?v=6QXtnmB1vqk>
4. https://www.youtube.com/watch?v=F_NmS-Wy2IE
5. <https://www.youtube.com/watch?v=dHdIH3I8FkM>

Module-2	RBT Level L1, L2	08 Hrs.
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Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine.

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming. Applications of Hydraulic pumps.

Laboratory Sessions/ Experimental learning:

- To make working models of Hydraulic Turbines and Pumps.
- Demo on different hydraulic Turbines in Fluid Mechanics Laboratory.

Applications: Hydro Power plants, Industries, etc.

Video link / Additional online information:

1. https://www.youtube.com/watch?v=qbyL--6q7_4
2. <https://www.youtube.com/watch?v=3BCiFeykRzo>
3. <https://www.youtube.com/watch?v=0p03UTgpnDU>
4. <https://www.youtube.com/watch?v=BaEHVpKc-1Q>
5. <https://www.youtube.com/watch?v=s6Rlx0SL3C8>

Module-3	RBT Level L1, L 2, L3	08 Hrs.
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Automotive Engine Systems: Introduction, Classification of Engines, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. Introduction to Hybrid Engines and Electric Vehicle Technologies.

Refrigeration and Air conditioning: Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapour compression refrigeration and vapour absorption refrigeration. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners.

Laboratory Sessions/ Experimental learning:

- Demo on IC Engines in Energy Conversion Laboratory.
- Demo on Refrigeration system in Heat Transfer Laboratory.

Applications: Conventional Road vehicles, Electric Vehicles, Refrigerator, Air conditioners, etc.

Video link / Additional online information:

1. <https://www.youtube.com/watch?v=fTAUq6G9apg>

2. <https://www.youtube.com/watch?v=Pu7g3ulG6Zo>
3. <https://www.youtube.com/watch?v=9uCeFhO8H40>

Module-4	RBT Level L1, L2, L3	08 Hrs.
<p>Power Transmission System:</p> <p>Belt drives: Open and Crossed belt drives, definitions –Slip, creep, velocity ration, advantages and disadvantages of V belt and timing belts. Simple numerical on Belt tension ratio and Length of open belt drive and cross belt drive.</p> <p>Gear drives: Types – spur, helical, bevel, worm and rack and pinion. Velocity ration, advantages and disadvantages over belt drives.</p> <p>Engineering materials and their applications: Introduction to Engineering Materials: Classification of Engineering Materials.</p> <p>Joining Processes: Soldering, Brazing and Welding Definitions, Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> • To make fabrication models by using welding, soldering in workshop. <p>Applications: Automotive vehicles, Industries, etc.</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://www.youtube.com/results?search_query=belt+drive+animation 2. https://www.youtube.com/results?search_query=gear+drive+animation 3. https://www.youtube.com/results?search_query=joining+process+in+manufacturing 		
Module-5	RBT Level L1,L2	08 Hrs.
<p>Lathe - Principle of working of a centre lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swivelling method.</p> <p>Special Machining Processes – Introduction to special machining processes such as, milling, shaping. (<i>Layout sketches of the above machines need not be dealt. Sketches need to be used only for explaining the operations performed on the machines</i>)</p> <p>Introduction to Advanced Manufacturing Systems</p> <p>Computer Numerical Control (CNC): Introduction, components of CNC machine.</p> <p>Robots: Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection.</p>		

Laboratory Sessions/ Experimental learning:

- Demo on metal cutting operations such as Lathe operations, Milling, Drilling, etc. in Machine Shop Laboratory.

Applications: Manufacturing Industries, Automotive Industries, etc.

Video link / Additional online information:

1. <https://www.youtube.com/watch?v=r7tvsgUlf2U>
2. https://www.youtube.com/results?search_query=milling+operations+animation
3. <https://www.youtube.com/watch?v=FNyEXjRmDtl>
4. <https://www.youtube.com/watch?v=sIF3eFToLGI>

Course outcomes:

CO1	Students will be able to identify different sources of energy and their conversion process and able to explain the working principle of hydraulic turbines, pumps.
CO2	Students will be able to explain the principles of Basic Thermodynamics.
CO3	Students will be able to identify different types of automotive engines and the working principle of refrigeration, properties of common engineering materials and their applications in engineering industry.
CO4	Students will be able to discuss the various metal joining processes, working of conventional machine tools, machining processes, advanced manufacturing systems and Robots.
CO5	Students will be able to understand practically the energy conversion to generate electricity, concepts of turbine and hydraulic pumps by making working models.

Text Books:

1.	S. Trymbaka Murthy, "A Text Book of Elements of Mechanical Engineering", 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.
2.	K. R. Gopalakrishna, "Elements of Mechanical Engineering", Subhas Publications, Bangalore, 2008.

Reference Books:

1.	A. S. Ravindra, "Elements of Mechanical Engineering" Best Publications, 7th edition, 2009.
2.	R.K. Rajput, "Elements of Mechanical Engineering", Firewall Media, 2005.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (10 marks)
- Assignment (10 marks)

SEE Assessment:

- i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
- iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	2	1	1	-	-	-	-	-
CO2	3	3	1	1	1	1	-	-	-	-	-	-
CO3	3	3	2	1	1	1	-	-	-	-	-	-
CO4	2	1	1	-	3	1	1	-	-	-	-	-
CO5	3	2	2	2	2	1	-	-	2	2	3	-

High-3, Medium-2, Low-1

Significance of the Syllabus of Module – 1

The syllabus content of module 1 deals with the sources of energies and their conversion into useful form for real time applications especially for generation of electricity required to power the computers, various electronic devices, home appliances and power tools and industrial equipment. The students of all the branches will be able to appreciate the first principles of thermodynamics in the field of energy technology.

Significance of the Syllabus of Module – 2

The syllabus content of module 2 deals with the prime movers and pumps and the real time applications especially for wind power, hydro power, heat engines and for propulsion systems. The students of all the branches have to gain this fundamental knowledge especially for the technology know how behind

Gas Turbine Engines, Hydraulic and Pneumatic pumps for Lifts, Escalators, Automation systems and Automotive and Aerospace industrial applications.

Significance of the Syllabus of Module – 3

Engines power the world's passenger vehicles, trucks and other heavy duty vehicles. Hence a better understanding of the fundamental processes affecting the engine performance and the latest advances in the field is the need of the hour. The students of all the branches have to gain this fundamental knowledge of automotive engine systems and latest trends of Refrigeration and air conditioning systems.

Significance of the Syllabus of Module – 4

The syllabus content of module 4 deals with the power transmission systems and the fabrication techniques. The students irrespective of their branch of engineering have to possess basic knowledge of the power transmission devices and the fabrication technologies especially for new age multi-disciplinary applications.

Significance of the Syllabus of Module – 5

Robots and industrial automations are the heart and soul of Industry 4.0 and Smart Factories with opportunities for the students of all the branches of engineering to make up their career. Hence there is a need for new age engineers to have an exposure to the basics of smart manufacturing, robotics and CNC machines.

Course Title	ENGINEERING CHEMISTRY LAB	Semester	I/II
Course Code	MVJ21CHEL16/26	CIE	50
Total No. of Contact Hours	20 L : T : P :: 00 : 00 : 2	SEE	50
No. of Contact Hours/week	2	Total	100
Credits	01	Exam. Duration	3 Hours
RBT Level	L1, L2, L3		

Course objective is to:

- Quantitative analysis of materials by classical method of analysis.
- Instrumental methods for developing experimental skills in building technical competence.

Sl No	Experiment Name	RBT Level	Hours
1.	Estimation of FAS potentiometrically using standard K ₂ Cr ₂ O ₇ .	L3	3
2.	Colorimetric estimation of Copper in given Cu alloy.	L3	3
3.	Estimation of Acids in acid mixture conductometrically.	L3	3
4.	Determination of pK _a value of a weak acid using pH meter.	L3	3
5.	To determine the variation of viscosity of lubricating oil and coconut oil with temperature.	L3	3
6.	To determine the flash point of the given fuel/oil (Penski Martin apparatus).	L3	3
7.	Estimation of Total hardness of water by EDTA complexometric method.	L3	3
8.	Determination of chemical oxygen demand (COD) of the given industrial waste water sample.	L3	3
9.	To determine the amount of dissolved oxygen (DO) of the given water sample Winkler's method..	L3	3
10.	To estimate the amount of iron in steel solution.	L3	3
11.	To determine the alkalinity of a given water sample	L3	3
12.	Standardization of potassium permanganate solution using FAS volumetrically.	L3	3

Course Outcomes	
CO1	Water analysis (samples from home, hostel, etc.) for different water quality parameters.
CO2	Synthesis of engineering material (polymer/nanomaterials)
CO3	Construction of battery or any energy resources device
CO4	Experiments on corrosion control methods
CO5	Experiments on green and sustainable chemistry

Reference Books	
1	Vogel's Textbook of Quantitative Chemical Analysis, Sixth Edition, J Mendham, R C Denney, J D Barnes, M J K Thomas

CIE Assessment:
Regular Lab work 25 Record writing :5 Lab Tests(Minimum 2 tests shall be conducted for 10 marks and average of two will be taken) Viva 10 marks
SEE Assessment:
Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be, <ul style="list-style-type: none"> i. Writeup : 15 marks ii. Conduction : 52 marks iii. Calculation : 18 marks iv. Viva : 15

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	3	3	2	3	2	3	3
CO2	3	3	3	3	1	3	3	2	3	2	3	3
CO3	2	2	2	2	1	2	2	2	3	3	3	3
CO4	3	3	3	3	1	3	3	2	3	2	3	3
CO5	3	3	3	3	1	3	2	2	3	2	3	3

High-3, Medium-2, Low-1

Course Title	C programming laboratory	Semester	I/II
Course Code	MVJ21CSL17/27	CIE	50
Total No. of Contact Hours	20	SEE	50
No. of Contact Hours/week	2(L : T : P :: 0 : 0 : 2)	Total	100
Credits	1	Exam. Duration	2 hrs

Course objective is to: *The students will be able to*

- Write flowcharts, algorithms and programs.
- Familiarize the processes of debugging and execution.
- Implement basics of C programming Language.
- Illustrate solution to the laboratory programs

S No	Experiment Name	RBT Level	Hours
1	Familiarization with computer hardware and programming environment, concept of naming the program files, storing, compilation, execution and debugging. Taking any simple C- code.	L3	3
PART A			
2	Develop a program to solve simple computational problems using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function)	L3	3
3	Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.	L3	3
4	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.	L3	3
5	Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.	L3	3
6	Develop a program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don't use library function sqrt(n).	L3	3

PART B			
7	Introduce 1D Array manipulation and implement Binary search.	L3	3
8	Develop a program to sort the given set of N numbers using Bubble sort.	L3	3
9	Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.	L3	3
10	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.	L3	3
11	Implement using functions to check whether the given number is prime and display appropriate messages. (No built-in math function).	L3	3
12	Implement structures to read, write, compute average- marks and the students scoring above and below the average marks for a class of N students	L3	3
13	Write C programs for the following: a) Copy the contents of one file to another. b) Merge the contents of two files and store it in a third file. Reverse the contents of a file.	L3	3
	<p>OPEN ENDED EXPERIMENT</p> <p>1. Given the marks in the three subjects, write a C program to process the application to list the eligible candidates.</p> <p>Admission to a professional course is based on following conditions:-</p> <p>Marks in Maths ≥ 60 Marks in Physics ≥ 50 Marks in Chemistry ≥ 40</p> <p>Total in all three subject ≥ 200 or Total in Math and Subjects ≥ 150</p> <p>2. Write a C program for real time Bank application to perform the following operations.</p> <p>Creating new account – To create a new account</p> <p>Cash Deposit – To Deposit some amount in newly created account</p> <p>Cash withdrawal – To Withdraw some amount from your account</p> <p>Display Account information – It will display all information of the existing accounts</p>	L3	3

Course outcomes:

CO1	Write algorithms, flowcharts and program for simple problems.
CO2	Correct syntax and logical errors to execute a program.
CO3	Write iterative and whenever possible recursive programs.
CO4	Demonstrate use of functions and arrays in problem solving.
CO5	Demonstrate use of strings, structures and pointers in problem solving.

Reference Books:

1	E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill
2	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

CIE Assessment:

Regular Lab work :20

Record writing :5

Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken)

Viva 10 marks

SEE Assessment:

Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be,

- v. Writeup : 20 marks
- vi. Conduction : 40 marks
- vii. Analysis of results : 20 marks
- viii. Viva : 20

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1							2		1
CO2	2	1	1							2		1
CO3	2	1	1							2		1
CO4	2	1	1							2		1
CO5	2	1	1							2		1

High-3, Medium-2, Low-1

Course Title	Business Communication - I	Semester	01
Course Code	MVJ21EGH18	CIE	50
Total No. of Contact Hours	20	SEE	50
No. of Contact Hours/week	1 L: T:P: 1:0:0	Total	100
Credits	01	Exam. Duration	3 Hours

Course objective is to help students:

- To enhance their English vocabulary and language proficiency
- To communicate effectively and with self-confidence, in any given situation
- To master the Functional aspects of the language
- To acquire proficiency in basic English grammar and essential language skills
- To identify the nuances of phonetics, intonation and enhance their pronunciation skills

Module-1 Introduction to Technical Communication

RBT Level

Hours

L1 L2 L3

4hrs

- 1.1 Fundamentals of Communication Skills
- 1.2 Barriers to effective communication
- 1.3 The hallmark of effective communication
- 1.4 Distortion in Communication
- 1.5 Different styles in Communication – Formal and Informal
- 1.6 Types of Communication – oral, written, non-verbal
- 1.7 Interpersonal Communication Skills
- 1.8 Developing Interpersonal Skills
- 1.9 Information Transfer: Oral Presentation

Video Links/Any other special information (Papers): (For additional study of the concepts)

<https://youtu.be/-Y-R9hDI7IU>

Module-2 Introduction to Listening Skills and Phonetics

RBT Level

Hours

L1 L2 L3

4 hrs

- 1.1 Introduction to Phonetics
- 1.2 Phonetic symbols and transcription
- 1.3 Sounds Mispronounced
- 1.4 Speech Sounds: Vowels, Consonants and Diphthongs
- 1.5. Silent Letters

- 1.6 The magic 'e'
- 1.7 Homophones and Homonyms
- 1.8 Aspiration and Pronunciation of 'The'
- 1.9 Listening Comprehension
- 1.10 Articles: Use of Articles; common errors in the use of Articles

Video Links/Any other special information (Papers): (For additional study of the concepts)

<https://youtu.be/T8LXnYpqMc4> <https://youtu.be/adjawOYSInU> https://youtu.be/-8g_TKJ6oiw

Module-3	RBT Level	Hours
	L1 L2 L3	4 hrs
<p>Developing Listening Skills</p> <ul style="list-style-type: none"> 1.1 Importance of listening in communication 1.2. Techniques for effective listening 1.3 Incongruencies in English pronunciation 1.4 Word Accent - Rules for Word Accent, Stress Shift 1.5 Sentence stress 1.6 Standard pronunciation 1.7 Plural forms 1.8 Question forms and intonation 1.9 Prepositions, and those Prepositions often confused 1.10 Prepositional phrases 1.11 Listening Comprehension <p>Video Links/Any other special information (Papers): (For additional study of the concepts)</p> <p>https://youtu.be/-8g_TKJ6oiw</p>		
Module-4 Speaking Skills and Vocabulary-1	RBT Level	Hours
	L1 L2 L3	4 hrs
<ul style="list-style-type: none"> 1.1 Vocabulary used in everyday situations 1.2 Word formation - Prefixes and Suffixes 1.3 Contractions 1.4 Words often confused 1.5 Question Tags 1.6 Synonyms 1.7 Antonyms 		

1.8 Spelling Rules and Words often Misspelt

1.9 The sequence of Tenses

Video Links/Any other special information (Papers): (For additional study of the concepts)

<https://youtu.be/w1v3ddhojSs>

Module-5

RBT Level

Hours

L1 L2 L3

4 hrs

Speaking Skills and Vocabulary-2

1.1 Extempore Speaking / Public Speaking – Guidelines

1.2 Overcoming fears and inhibitions

1.3 Voice modulation

1.4 Mother Tongue Influence (MTI)

1.5 Techniques for Neutralization of Mother Tongue Influence

1.6 Listening Comprehension

1.7 Common Errors in Pronunciation

1.8 Speaking in given situations – opening bank account, visiting doctor, attending an interview, gathering information, making plans, making choices, congratulating, expressing appreciation and apologizing etc.

Video Links/Any other special information (Papers): (For additional study of the concepts)

<https://youtu.be/Y4TbGPhQ7Ik> https://youtu.be/JIKU_WTOBlS

Experiential Learning:

Language Lab:

To augment LSRW and GV skills (Listening, Speaking, Reading, Writing, Grammar and Vocabulary) through tests, activities, exercises etc. via comprehensive web-based learning and assessment systems.

Course outcomes:

CO1	Use English that is grammatically correct and identify the nuances of phonetics, intonation and flawless pronunciation
CO2	Enhance the repertoire of English vocabulary
CO3	Identify common errors in spoken and written communication
CO4	Understand and improve non-verbal communication and kinesics
CO5	Perform with confidence at campus recruitment, engineering and all other competitive examinations

Text Books:

1	English Communication Made Easy by Chitra Laxman – Sathyasri Printers Pvt. Ltd.
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Reference Books:

1	Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition} - 2018.
2	Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press - 2018

3	High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd. 2015
4	English Language Communication Skills - Lab Manual cum Workbook , Cengage learning India Pvt. Limited [Latest Revised Edition] – 2018
5	Technical Communication - Principles and Practice , Third Edition by Meenakshi Raman and Sangeetha Sharron, Oxford University Press 2017
6	Effective Technical Communication - Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited – 2018

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: three internal assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of the three tests Assignments (20 marks)

SEE Assessment:

- i. Question paper for the SEE consists of two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for a total of 20 marks, covering the whole syllabus.
- ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain subdivisions, each carrying 16 marks. Students have to answer all the five questions.
- iii. One question will be set from each unit. The duration of the examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										1		
CO2										1		
CO3										2		
CO4										1		
CO5										3		

High-3, Medium-2, Low-1

Course Title	Professional Writing - II	Semester	02
Course Code	MVJ21EGH28	CIE	50
Total No. of Contact Hours	20	SEE	50
No. of Contact Hours/week	1 L: T:P: 1:0:0	Total	100
Credits	01	Exam. Duration	3 Hours

Course objective:

- To use English vocabulary aptly and flawlessly, and ensure language proficiency
- To achieve better Technical writing and Presentation skills
- To Identify the common errors in Spoken and Written English
- To acquire Employment and Workplace communication skills

Module-1

RBT Level
L1 L2 L3

Hours
4hrs

Introduction to Technical Communication

1.1 Subject Verb Agreement (Concord Rules with Exercises)

1.2 Common errors in Subject-verb agreement, Noun-pronoun agreement

1.3 Common errors in the use of Adjectives, Adverbs and Conjunctions; misplaced modifiers

1.4 Word Order, errors due to the confusion of words

1.5 Anagrams, palindromes, puns

1.6 Idioms and phrases – common errors

1.7. Honing reading skills

Video Links/Any other special information (Papers): (For additional study of the concepts)

<https://youtu.be/-Y-R9hDI7IU>

Module-2

RBT Level
L1 L2 L3

Hours
4hrs

The Nuances of Writing

1.1 Organizing Principles of Paragraphs in Documents

1.2 Developing hints into organized paragraphs

1.3 Dialogue writing

1.4 Contextual vocabulary

1.5 Importance of proper Punctuation

1.6 One-word substitutes

1.7 Polishing writing skills – similes and metaphors

1.8 The Art of Condensation (Precis writing)

1.9 Word collocations

1.10 Redundancy and jargon in writing

1.11 Techniques in creative writing

1.12 Common Errors due to Indianism in English Communication

Video Links/Any other special information(Papers): (For additional study of the concepts)

<https://youtu.be/T8LXnYpqMc4>

<https://youtu.be/adjaWOYSInU>

https://youtu.be/-8g_TKJ6oiw

Module-3

RBT Level

Hours

L1 L2 L3

4 hrs

Honing Writing Skills

1.1 Effective Technical Reading and Writing Practices

1.2 Tips for good and effective writing

1.3 Parallelism in sentence structures

1.4 Describing processes

1.5 Interpretation of non-verbal data – pie-charts, flow charts etc.

1.6 Use of Passive Voice in Report writing

1.7 Report writing

1.8 Sentence Improvement Exercises, Cloze Test and Theme Detection Exercises.

Video Links/Any other special information(Papers): (For additional study of the concepts)

<https://youtu.be/w1v3ddhojSs>

Module-4

RBT Level

Hours

L1 L2 L3

4hrs

Writing Emails and Letters

1.1 Components of a Formal Letter

1.2 Formats and Types of Business Letters

1.3 Email Writing – Dos and Don'ts

Practice in writing various types of emails

Video Links/Any other special information (Papers): (For additional study of the concepts)

https://youtu.be/-8g_TKJ6oiw

Module-5

RBT Level

Hours

L1 L2 L3

4 hrs

Non-Verbal Communication

1.1 Significance of non-verbal communication

1.2 Body Language

1.3 Group Discussion

1.4. Describing people

1.5. Describing events and scenes

1.6 Presentation skills and Formal Presentations by Students

Video Links/Any other special information(Papers): (For additional study of the concepts)

<https://youtu.be/Y4TbGPhQ7Ik>

https://youtu.be/JIKU_WTOBlS

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Course outcomes:

CO1	Identify common errors in Spoken and Written communication
CO2	Reach higher levels of perfection in English vocabulary and language
CO3	Improve nature and style of sensible writing and acquire employment and workplace communication skills
CO4	Improve Technical Communication Skills through Technical Reading and Writing practices
CO5	Perform well at campus recruitment, engineering and other competitive examinations

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Reference Books:

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High-3, Medium-2, Low-1