

**MVJ COLLEGE OF ENGINEERING**  
**Department of Chemistry**  
**Scheme of Teaching and Examination 2019-20**  
**Outcome Based Education(OBE) and Choice Based Credit System (CBCS)**  
**(Effective from the academic year 2019-20)**

**I SEMESTER B.E./B.Tech (CHEMISTRY GROUP)**

S No	Course and Course code		Course Title	Teaching Department	Teaching hours/week			Total Marks				Credits
					Theory	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total marks	
					L	T	P					
1	BSC	MVJ20MAT11	Calculus and Linear Algebra	Mathematics	3	0	2	3	50	50	100	4
2	BSC	MVJ20CHE12	Engineering Chemistry	Chemistry	3	1	1	3	50	50	100	4
3	ESC	MVJ20CSE13	C Programming for Problem Solving	Computer Science & Engineering	3	2	0	3	50	50	100	4
4	ESC	MVJ20EC14	Basic Electronics	Electronics & Communication Engineering	2	2	0	3	50	50	100	3
5	ESC	MVJ20ME15	Elements of Mechanical Engineering	Mechanical Engineering	2	0	2	3	50	50	100	3
6	BSC	MVJ20CHEL16	Engineering Chemistry Lab	Chemistry	0	0	2	3	50	50	100	1
7	ESC	MVJ20CPS17	C Programming Lab	Computer Science & Engineering	0	0	2	3	50	50	100	1
8	HSMC	MVJ20EGH18	Technical English I	Humanities	0	2	0	3	50	50	100	1

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course.  
 Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

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**II SEMESTER B.E./B.Tech (CHEMISTRY GROUP)**

S No	Course and Course code		Course Title	Teaching Department	Teaching hours/week			Total Marks			Credits	
					Theory	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks		Total marks
					L	T	P					
1	BSC	MVJ20MAT21	Advanced Calculus and Numerical Methods	Mathematics	3	0	2	3	50	50	100	4
2	BSC	MVJ20CHE22	Engineering Chemistry	Chemistry	3	1	1	3	50	50	100	4
3	ESC	MVJ20CSE23	C Programming for Problem Solving	Computer Science & Engineering	3	2	0	3	50	50	100	4
4	ESC	MVJ20EC24	Basic Electronics	Electronics & Communication Engineering	2	2	0	3	50	50	100	3
5	ESC	MVJ20ME25	Elements of Mechanical Engineering	Mechanical Engineering	2	0	2	3	50	50	100	3
6	BSC	MVJ20CHEL26	Engineering Chemistry Lab	Chemistry	0	0	2	3	50	50	100	1
7	ESC	MVJ20CPS27	C Programming Lab	Computer Science & Engineering	0	0	2	3	50	50	100	1
8	HCMC	MVJ20EGH28	Technical English II	Humanities	0	2	0	3	50	50	100	1

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course.  
 Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

Course Title	<b>Calculus and Linear Algebra-Math Lab</b>	Semester	I
Course Code	<b>MVJ20MAT11</b>	<b>CIE</b>	50
Total No. of Contact Hours	60 L : T : P :: 40 : 0 : 20	<b>SEE</b>	50
No. of Contact Hours/week	4	<b>Total</b>	100
<b>Credits</b>	4	<b>Exam. Duration</b>	3hrs

**Course objective is to:** This course Calculus and Linear algebra 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.

<b>Module-1</b>	<b>L1,L2</b>	12Hrs.
<p>Differential Calculus-1:</p> <p>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.</p> <p>Laboratory Sessions- Plotting of standard Cartesian curves using Python</p> <p>Applications: Differential Calculus is applied in all Science and Engineering</p> <p>Video link ; <a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a> <a href="https://www.youtube.com/watch?v=s6F5yjY6jWk&amp;list=PLMLsjhQWWIUgBoTCQDtYllol-o-9hxp11">https://www.youtube.com/watch?v=s6F5yjY6jWk&amp;list=PLMLsjhQWWIUgBoTCQDtYllol-o-9hxp11</a></p>		
<b>Module-2</b>	<b>L1,L2</b>	12Hrs.

Differential Calculus-2:

Maclaurin's series expansions for one variable, indeterminate forms - L'Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions, Jacobians , Method of Lagrange multipliers with one subsidiary condition ,Maxima and minima for a function of two variables- Applications with illustrative examples.

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

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



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Video link: <https://www.khanacademy.org/>  
<https://www.youtube.com/watch?v=s6F5yjY6jWk&list=PLMLsjhQWWIUgBoTCQDtYllol-o-9hxp11>

<b>Module-3</b>	<b>L1,L2,L3</b>	12Hrs.
<p>Integral Calculus:</p> <p>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.</p> <p>Beta and Gamma functions: Definitions, Relation between beta and gamma functions and problems.</p> <p>Laboratory Sessions: Evaluation of the double integral using Python</p> <p>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.</p> <p>Video link : <a href="https://www.youtube.com/watch?v=db7d_a0wiUg&amp;list=PLU6SqdyCysfLoKyzF_dwxAQf8Ili6VC54">https://www.youtube.com/watch?v=db7d_a0wiUg&amp;list=PLU6SqdyCysfLoKyzF_dwxAQf8Ili6VC54</a>  <a href="https://www.khanacademy.org/math/ap-calculus-ab/ab-integration-new/ab-6-1/v/introduction-to-integral-calculus">https://www.khanacademy.org/math/ap-calculus-ab/ab-integration-new/ab-6-1/v/introduction-to-integral-calculus</a></p>		
<b>Module-4</b>	<b>L1,L2,L3</b>	12Hrs.
<p>Ordinary differential equations(ODE's)of first order:</p> <p>Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's - orthogonal trajectories and Newton's law of cooling .</p> <p>Nonlinear differential equations: Introduction to general and singular solutions ; Solvable for p; Clairaut's and reducible to Clairaut's equations.</p> <p>Laboratory Sessions: Problems on Ordinary differential equation using Python</p> <p>Applications: Cooling/Warming Law, series circuit, Survivability with AIDS, Draining a tank, Determining the current or charge in the circuit.</p> <p>Video link: <a href="https://users.math.msu.edu/users/gnagy/teaching/ode.pdf">https://users.math.msu.edu/users/gnagy/teaching/ode.pdf</a>  <a href="https://www.mathsisfun.com/calculus/differential-equations.html">https://www.mathsisfun.com/calculus/differential-equations.html</a></p>		
<b>Module-5</b>	<b>L1,L2,L3</b>	12 Hrs.



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**Linear Algebra:**

Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and eigen vectors-Rayleigh’s power method. Diagonalization of a square matrix of order two.

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 eigen vectors required for matrix diagonalization process.

**Reference Books:**

1.	B.S. Grewal, “Higher Engineering Mathematics” Khanna Publishers, 43 <sup>rd</sup> Edition, 2013.
2.	Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley-India publishers, 10th edition,2014.
3.	Ramana B. V., “Higher Engineering Mathematics”, Tata Mc Graw-Hill, 2006.
4.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19



Course Title	<b>Engineering Chemistry</b>	Semester	I/II
Course Code	<b>MVJ20CHE12/22</b>	<b>CIE</b>	50
Total No. of Contact Hours	60 L : T : P :: 40 : 10 : 10	<b>SEE</b>	50
No. of Contact Hours/week	5	<b>Total</b>	100
<b>Credits</b>	4	<b>Exam. Duration</b>	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 its applications in various fields of Engineering.

<b>Module-1</b> <b>Water and its treatment</b>	<b>RBT Level</b> L1,L2,L3	9 Hrs.
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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), Boiler feed water – requirement - troubles (scale & sludge, priming & foaming, boiler corrosion) and its treatment, Softening methods, Dissolved oxygen (DO), Biological oxygen demand (BOD), Chemical oxygen demand (COD). Specifications for drinking water, membrane based treatment processes.

**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>

<b>Module-2</b> <b>Chemistry of Advanced Materials</b>	<b>RBT Level</b> L1,L2,L3	11 Hrs.
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**Polymers:**

Introduction : Basics of Polymer chemistry, Degree of polymerization, Classification of polymers, Structure-property relationship, Molecular shape and Crystallinity, Glass transition temperature (T<sub>g</sub>), Basic factors affecting T<sub>g</sub> of polymers (with examples), Synthesis and uses of commercially important polymers (HDPE, LDPE, PLA), Conducting polymers- mechanism of conduction in Poly aniline, Polymer composites-fibre reinforced polymers-Kevlar, carbon fibre-synthesis properties and applications.

**Nanomaterials:**

Introduction to nanomaterials, size dependent properties (surface area, optical and catalytic

properties), Synthesis of nanomaterial by Top- down and bottom-up methods, Sol-gel, Solution combustion and chemical vapor deposition methods. Applications of nanomaterials in catalysis, electronic and telecommunication, medicines and energy sciences.

**Lubricants:** Types and constituents of lubricants and properties, Applications.

**Laboratory Sessions/ Experimental learning:** Preparation of synthetic resin by condensation polymerization/ Determination of effects of temperature on viscosity of daily using lubricants

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

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

- 1) <http://www.stephensinjectionmoulding.co.uk/thermoplastics/>
- 2) <https://www.classle.net/book/vulcanisation-rubber>
- 3) <http://www.stephensinjectionmoulding.co.uk/thermoplastics/>
- 4) <http://www.fi.tartu.ee/~rynno/raamat/Introduction%20in%20nanomaterials-sisu.pdf>

<b>Module-3</b> <b>Electrochemistry</b>	<b>RBT Level</b> L1,L2,L3	6 Hrs.
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Introduction to electrolytes, electrochemical cells and cell conductance, Cell constant determination, Specific and Molar conductance (numericals), Electrolytic and galvanic cells, Single electrode potentials (origin and HDL), electrochemical series, Nernst equation and numerical problems, cell emf measurement, Thermodynamic overview of Electrochemical processes, Reversible and irreversible cells

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

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

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

- 1) <http://www.tutorvista.com/physics/animations/daniell-cell-animation>
- 2) <http://amrita.olabs.co.in/?sub=73&brch=8&sim=153&cnt=1>

<b>Module-4</b> <b>Corrosion and its control</b>	<b>RBT Level</b> 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 , ceramic coating

**Metal finishing:** Introduction, technological importance, Electroplating process, Electroless plating.

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

**Applications:** This is the basic concepts to understand the behaviour of metals and useful in constructing and designing machineries..

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

1) <https://www.princeton.edu/~maelabs/mae324/12/electrochemical.htm>

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

<b>Module-5</b> <b>Energy sources and storage devices</b>	<b>RBT Level</b> L1,L2,L3	8 Hrs.
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Introduction, Types of energy resources: nuclear energy, solar energy – solar cells, wind energy, Ocean thermal power energy . Fuels and its types, Calorific value of fuels, Calorific value determination, Theoretical calorific value and its numerical problems, Coal analysis-proximate analysis, Petroleum refining, Liquid fuel, Fuels used in IC engines, Octane and Cetane number, Knocking and anti-knocking, Cracking of Petroleum oils.

**Energy storage devices:** Primary and Secondary batteries, Zinc –air battery, Li-ion battery, Lead storage battery.

**Fuel cells-** Hydrogen-oxygen fuel cell- principle, construction, working and it's applications, advantages/disadvantages.

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

**Laboratory Sessions/ Experimental learning:** Construction of solar cell.

**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) <https://www.khanacademy.org/science/chemistry/oxidation-reduction/battergalvanicvoltaic-cell/v/lead-storage-battery>

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

**Course outcomes:**

Through this course students should be able to

CO1	transform fundamental knowledge of Chemical Sciences in the field of Engineering along with understanding of various techniques of water treatment.
CO2	illustrate various types of polymers- nanomaterials- lubricants, and learn their synthesis, properties and applications.
CO3	understand and apply the electrochemical processes and corrosion control methods in daily

	life.
CO4	familiarize the operating principles and applications of energy conversion its processes and storage devices.
CO5	

Reference Books:

1.	ENGINEERING CHEMISTRY DR. SUBA RAMESHM AND DR. S. VAIRAM WILEY
2.	ENGINEERING CHEMISTRY PAYAL B. JOSHI OXFORD UNIVERSITY PRESS
3	ENGINEERING CHEMISTRY BY P C JAIN
4.	Engineering Chemistry by R.V Gadag and Nityanand Shetty
5.	Nano: The Essentials: Understanding Nanoscience and Nanotechnology- T. Pradeep, TataMcGraw Hill-2008 Ed

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	<b>C PROGRAMMING FOR PROBLEM SOLVING</b>	Semester	I/II
Course Code	<b>MVJ20CS13/23</b>	<b>CIE</b>	50
Total No. of Contact Hours	60 L: T : P :: 40 : 0 : 20	<b>SEE</b>	50
No. of Contact Hours/week	5	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	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**

**12 Hrs.**

**Introduction to Computer Hardware and software:** Computer types, bits, bytes and words, Basic organization of a computer, Types of Memory, Computers in a network, Network hardware, Software basics, software types.

**Introduction to Algorithms and Flowchart:** Definition and Symbols. Problems on algorithms and flowchart.

**Overview of C:** Basic structure of C program, Executing a C program.

**Constant, variable and data types:** Character Set, C Tokens, Keywords and Identifiers, constants, variables, Data Types, Declaration of Variables, Assigning Values to variables, Defining Symbolic Constants, Declaring a variable as Constant.

**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/IdXrCPzNnkU>
- <https://youtu.be/PwWuOFYH92U>

**Module-2**

**L1,L2,L3**

**12 Hrs.**

**Operators and Expressions:** Arithmetic operators, Relational Operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operator, Bitwise operator, Special operators, Arithmetic Expressions, Evaluation of expressions, Type conversion in expressions, operator Precedence and Associativity.

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

**Managing Input and output operations:** Reading and Writing a character, Formatted input and output functions.

**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/HyDpW7A16\\_E](https://youtu.be/HyDpW7A16_E)
- <https://youtu.be/d1EHD8RoLDQ>

**Module-3**

**L1,L2,L3**

12 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/K92NI2WT_AU)
- <https://youtu.be/TV88Pkjt8yo>
- <https://youtu.be/FTYgwvFpfP8>
- <https://youtu.be/SSYiEDSUTGM>

**Module-4****L1,L2,L3**

12 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/LoIe\\_9cTtPE](https://youtu.be/LoIe_9cTtPE)

**Module-5****L1,L2,L3**

12 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.

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](https://youtu.be/Z_0xXmOgYtY)

**Course outcomes:**

CO1	Illustrate simple algorithms from the different domains such as mathematics, physics etc.
CO2	Construct a programming solution to the given problem using C
CO3	Design programs using arrays.
CO4	Modularize the given problem using functions
CO5	Design programs using structures, pointers and illustrate various domains used in software industry as a nutshell.

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

**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	MVJ20EC14/24	<b>CIE</b>	50
Total No. of Contact Hours	60 L : T : P :: 40 : 0 : 20	<b>SEE</b>	50
No. of Contact Hours/week	4	<b>Total</b>	100
<b>Credits</b>	3	<b>Exam. Duration</b>	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.

<b>Module-1</b>	<b>RBT Level L1, L2, L3 &amp; L6</b>	12Hrs.
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**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**

12Hrs.

**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;

**Silicon Controlled Rectifier (SCR)** – Operation, Construction, Characteristics, Ratings, Applications.

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

**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**

12Hrs.

**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.

**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.

**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**

12Hrs.

**Digital Electronics Fundamentals:**

*Prerequisites:* Number systems. Analog and Digital Signals. Boolean Algebra, Boolean theorems and postulates.

**Logic Gates:** NOT Gate, Transistor as Inverter, CMOS Inverter, AND, OR, NAND, NOR, XOR, XNOR Gates. CMOS NAND gate. Applications; Half adder, Full adder, Multiplexer, Demultiplexer, Encoder, Decoder.

**Flip-Flops:** Working Principle, S-R, J-K, T and D Flip-Flops. Registers.

**Laboratory Sessions/ Experimental learning:**

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.

**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.

**Video link / Additional online information :**

1. <https://nptel.ac.in/courses/108105113/>
2. <https://nptel.ac.in/courses/117106086/>

**Module-5**

**RBT Level**  
**L1, L2, L3**

12Hrs.

**Communication Systems:** General communication system, Need for modulation and types.

**Transducers and Sensors:** Basic working Principles, Types; Passive Sensors or Active Sensors. Analogue and Digital Sensors. Choice of sensors based on applications. Temperature Sensors: Thermistors, Thermostat. Light Sensors; LDR (Light Dependent Resistor), Photodiode, Phototransistor.

**Laboratory Sessions/ Experimental learning:** Study the Characteristics of sensors and Transducers.

**Applications:** Measurement, and Control systems.

**Video link / Additional online information:**

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.

**Reference Books:**

1.	Santiram Kal, "Basic Electronics- Devices, Circuits and IT Fundamentals", Prentice Hall, India-2002
2.	Robert L. Boylestad, Louis Nashelsky " Electronic devices and circuit theory" PHI Publication, 11th Edition, 2012

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	MVJ20ME15/25	<b>CIE</b>	50
Total No. of Contact Hours	60 L: T : P :: 40 : 0 : 20	<b>SEE</b>	50
No. of Contact Hours/week	05	<b>Total</b>	100
<b>Credits</b>	03	<b>Exam. Duration</b>	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, 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.

<b>Module-1</b>	<b>RBT Level L1, L2</b>	13 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 in order to produce electricity.

**Applications:** It can be seen in human's daily activities.

**Video link / Additional online information:**

1. <https://examupdates.in/elements-of-mechanical-engineering/>

2. [https://www.youtube.com/watch?v=Ew\\_xRvXorKU](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](https://www.youtube.com/watch?v=F_NmS-Wy2IE)
5. <https://www.youtube.com/watch?v=dHdIH3l8FkM>

<b>Module-2</b>	<b>RBT Level L1, L2</b>	11 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](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=s6RIx0SL3C8>

<b>Module-3</b>	<b>RBT Level L1, L2, L3</b>	12 Hrs.
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**Internal Combustion Engines:** Classification, 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 Engine.

**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 vapor 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 Refrigeration system in Heat Transfer Laboratory.

**Applications:** Road vehicles, Airplane, Refrigerator, Air conditioners, etc.

**Video link / Additional online information:**

1. <https://www.youtube.com/watch?v=fTAUq6G9apg>
2. <https://www.youtube.com/watch?v=Pu7g3uIG6Zo>
3. <https://www.youtube.com/watch?v=9uCeFhO8H40>

**Module-4**

**RBT Level**  
L1, L2, L3

12 Hrs.

**Power Transmission System:**

**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.

**Gear drives:** Types – spur, helical, bevel, worm and rack and pinion. Velocity ration, advantages and disadvantages over belt drives.

**Engineering materials and their applications:** Conventional Materials: Classification of Materials.

**Joining Processes:** Soldering, Brazing and Welding Definitions, Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding.

**Laboratory Sessions/ Experimental learning:**

- To make fabrication models by using welding, soldering in workshop.

**Applications:** Automotive vehicles, Industries, etc.

**Video link / Additional online information:**

1. [https://www.youtube.com/results?search\\_query=belt+drive+animation](https://www.youtube.com/results?search_query=belt+drive+animation)
2. [https://www.youtube.com/results?search\\_query=gear+drive+animation](https://www.youtube.com/results?search_query=gear+drive+animation)
3. [https://www.youtube.com/results?search\\_query=joining+process+in+manufacturing](https://www.youtube.com/results?search_query=joining+process+in+manufacturing)

**Module-5**

**RBT Level**  
L1,L2

12 Hrs.

**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.

**Special Machining Processes** – Introduction to special machining processes such as, milling, shaping. (Layout sketches of the above machines need not be dealt. Sketches need to be used only for explaining the operations performed on the machines)

**Introduction to Advanced Manufacturing Systems**

Computer Numerical Control (CNC): Introduction, components of CNC machine.

**Robots:** Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection.

**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=r7tvsqUIf2U>
2. [https://www.youtube.com/results?search\\_query=milling+operations+animation](https://www.youtube.com/results?search_query=milling+operations+animation)
3. <https://www.youtube.com/watch?v=FNYEXjRmDtI>
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 IC engines and working principle of refrigeration, properties of common engineering materials and their applications in engineering industry and able to recognize various metal joining processes.
CO4	Students will be able to discuss the 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.

**Reference Books:**

1.	R.K. Rajput, " <i>Elements of Mechanical Engineering</i> ", Firewall Media, 2005.
2.	A. S. Ravindra, " <i>Elements of Mechanical Engineering</i> " Best Publications, 7th edition, 2009.
3.	Craig, J. J., " <i>Introduction to Robotics: Mechanics And Control</i> ", 2nd Ed. Addison-Wesley Publishing Company, Reading, MA, 1989.
4.	B.K. Agrawal, " <i>Introduction to Engineering Materials</i> ", Tata McGraHill Publication, New Delhi.

5.	D.S. Kumar, <i>"Thermal Science and Engineering"</i> S.K. Kataria & sons Publication, New Delhi.
6.	K. R. Gopalakrishna, <i>"Elements of Mechanical Engineering"</i> , Subhas Publications, Bangalore, 2008
7.	Hajra Choudhury, <i>"Elements of Mechanical Engineering"</i> Vol-1 and 2, Media Promoters, New Delhi, 2001.
8.	S. Trymbaka Murthy, <i>"A Text Book of Elements of Mechanical Engineering"</i> , 3rd revised edition 2006, I.K. International Publishing House Pvt. Ltd., New Delhi.

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

Course Title	C programming laboratory	Semester	I/II
Course Code	MVJ20CSL17/27	CIE	50
Total No. of Contact Hours	40 L : T : P :: 10 : 10 : 20	SEE	50
No. of Contact Hours/week	3	Total	100
Credits	1	Exam. Duration	

Course objective is 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

#### Laboratory Sessions

Laboratory Experiment:		Revised Bloom's Taxonomy Levels (RBT Level)
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
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	Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.	L3
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

5	Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.	L3
6	Develop a Program to compute Sin(x) using Taylor series approximation. Compare your result with the built- in Library function. Print both the results with appropriate messages	L3
7	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
<b>PART B</b>		
8	Introduce 1D Array manipulation and implement Binary search.	L3
9	Develop a program to sort the given set of N numbers using Bubble sort.	L3
10	Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.	L3
11	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.	L3
12	Implement using functions to check whether the given number is prime and display appropriate messages. (No built-in math function).	L3
13	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

**OPEN ENDED EXPERIMENT**

- Given the marks in the three subjects, write a C program to process the application to list the eligible candidates.  
Admission to a professional course is based on following conditions:-  
Marks in Maths  $\geq 60$   
Marks in Physics  $\geq 50$   
Marks in Chemistry  $\geq 40$   
Total in all three subject  $\geq 200$       or      Total in Math and Subjects  $\geq 150$
- Write a C program for real time Bank application to perform the following operations.

Creating new account – To create a new account  
 Cash Deposit – To Deposit some amount in newly created account  
 Cash withdrawal – To Withdraw some amount from your account  
 Display Account information – It will display all information of the existing accounts

**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.

**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

<b>Course Title</b>	Engineering Chemistry Lab	<b>Semester</b>	I/II
<b>Course Code</b>	MVJ20CHEL16/26	<b>CIE</b>	50
<b>Total No. of Contact Hours</b>	40 L : T : P :: 0 : 10 : 30	<b>SEE</b>	50
<b>No. of Contact Hours/week</b>	3	<b>Total</b>	100
<b>Credits</b>	1	<b>Exam. Duration</b>	3hrs
<b>RBT Level</b>	L1,L2,L3		

**Course objective is to:**

The objective of this course is to acquaint the students with practical knowledge of the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and engineering field.

**Laboratory Experiments:**

1) To determine the total hardness of the given hard water sample using EDTA method.

**Video link / Additional online information:**

<https://www.youtube.com/watch?v=Sa0WfA9UGG0>

**Virtual Lab:**

<http://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=4>

2) To determine the alkalinity of a given water sample.

**Video link / Additional online information:**

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

**Virtual Lab:**

<https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1>

3) To determine the amount of chemical oxygen demand (COD) of the given industrial waste water sample.

**Video link / Additional online information:**

**Virtual Lab:**

<https://vlab.amrita.edu/?sub=3&brch=272&sim=1413&cnt=2>

4) To determine the amount of dissolved oxygen (DO) of the given water sample Winkler's method.

**Video link / Additional online information:**

**Virtual Lab:**

<https://vlab.amrita.edu/?sub=3&brch=272&sim=1430&cnt=2>

5) Colorimetric estimation of Copper.

**Video link / Additional online information:**

<https://www.youtube.com/watch?v=bZ5TOecenyc>

**Virtual Lab:**

<https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1>

6) To determine the strength of given acid mixture conductometrically.

**Video link / Additional online information:**

<https://www.youtube.com/watch?v=amFOhvc6p74>

**Virtual Lab:**

<https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1>

7) To estimate the amount of FAS potentiometrically using standard  $K_2Cr_2O_7$

**Video link / Additional online information:****Virtual Lab:**

<https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1>

8) To determine the pKa of weak acid.

**Video link / Additional online information:****Virtual Lab:**

9) To determine the flash and fire point of the given lubricant (Abel's or Penski Martin apparatus).

**Video link / Additional online information:**

<http://web.iitd.ac.in/~pmvs/courses/mcl241/Flash%20and%20fire%20point.pdf>

**Virtual Lab:**

10) To determine the variation of viscosity of lubricating oil and coconut oil with temperature.

**Video link / Additional online information:****Virtual Lab:****Additional Experiment**

11) To determine the strength of given solution of ferrous ammonium sulphate (Mohr's salt) by titrating it against potassium dichromate and potassium permanganate solutions.

12) Transesterification of vegetable oil using alcohol.

**Video link / Additional online information:**

<https://www.youtube.com/watch?v=6IQfpNgVzyU>

**Virtual Lab:**

<http://www.kentchemistry.com/moviesfiles/Units/Redox/redox.html>

**Course outcomes:** Through this course students should be able to

CO1

perform laboratory experiments demonstrating safe and proper use of standard chemistry

	glassware and equipment.
CO2	relate concepts learned in chemistry and engineering department classes to real world situations.
CO3	analyze and determine total hardness, alkalinity, COD, DO, Free residual chlorine of given sample water.
CO4	know the different types of titrations and quantitative measurements of various solution.
CO5	determine and relate importance of flash and fire point determination with application of lubricants and fuels

Reference Books:

1.	ESSENTIALS OF EXPERIMENTAL ENGINEERING CHEMISTRY by SHASHI CHAWLA, DHANPAT RAI PUBLICATIONS.
2.	VOGEL'S QUANTITATIVE CHEMICAL ANALYSIS by J. MENDHAM, R.C. DENNEY, J. D. BARNES, M.J.K. THOMAS, PEARSON.

CO-PO Mapping

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

High-3, Medium-2, Low-1

Technical English I B.E. I Semester Common to all Branches [As per Choice Based Credit System (CBCS) scheme]			
Subject Code	MVJ20EGH18	IA Marks	50
Number of Lecture Hours/Week	02	Exam marks	50
Total Number of Lecture Hours	35 hours		
<b>Credits – 1</b>			
Course Objectives: This course will enable students <ul style="list-style-type: none"> <li>• To enhance their English vocabulary and language proficiency</li> <li>• To communicate effectively and with self-confidence, in any given situation</li> <li>• To master the Functional aspects of the language</li> <li>• To acquire proficiency in basic English grammar and essential language skills</li> <li>• To identify the nuances of phonetics, intonation and enhance their pronunciation skills</li> </ul>			
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			
Modules			RBT Level
Module -1			
<b>Introduction to Technical Communication</b> 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			L1, L2, L3
Module - 2			
<b>Introduction to Listening Skills and Phonetics</b> 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			L1, L2, L3

Module -3						
<b>Developing Listening Skills</b> 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 Preposition, and those Prepositions often confused 1.10 Prepositional phrases 1.11 Listening Comprehension	L1, L2, L3					
Module - 4						
<b>Speaking Skills and Vocabulary-1</b> 1.1 Vocabulary used in everyday situations 1.2 Words 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	L1, L2, L3					
Module - 5						
<b>Speaking Skills and Vocabulary-2</b> 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, professing appreciation etc.	L1, L2, L3					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"><b>Details of Topics to be covered</b></td> </tr> <tr> <td>Interactive practice sessions in Language Lab</td> </tr> <tr> <td>Role plays to master functional language skills – asking and giving directions, greeting, introducing, asking and providing information, offering help</td> </tr> <tr> <td>Listening Comprehension</td> </tr> <tr> <td>Pronunciation, Intonation, Stress and Rhythm – Reading practice</td> </tr> </table>		<b>Details of Topics to be covered</b>	Interactive practice sessions in Language Lab	Role plays to master functional language skills – asking and giving directions, greeting, introducing, asking and providing information, offering help	Listening Comprehension	Pronunciation, Intonation, Stress and Rhythm – Reading practice
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Interactive practice sessions in Language Lab						
Role plays to master functional language skills – asking and giving directions, greeting, introducing, asking and providing information, offering help						
Listening Comprehension						
Pronunciation, Intonation, Stress and Rhythm – Reading practice						

**Course Outcomes:**

- CO1: Use English that is grammatically correct and identify the nuances of phonetics, intonation and flawless pronunciation
- CO 2: Enhance the repertoire of English vocabulary
- CO 3: Identify common errors in spoken and written communication
- CO 4: Understand and improve non-verbal communication and kinesics
- CO 5: Perform with confidence at campus recruitment, engineering and all other competitive examinations

**Question Paper pattern:** The SEE question paper will be set for 100 marks and the pattern of the paper will be a mix of Objective type (MCQ) and Descriptive type

**Suggested Reading:**

**English for Technical Communication** by N. P. Sudharshana and C. Savitha, Cambridge University Press - 2016

**Technical Communication** by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition} - 2018

**Practical English Usage** by Michael Swan, Oxford University Press -2016

**High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd. - 2015

**Effective Technical Communication** - Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited - 2018



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**Accredited by NBA & NAAC**

Course Title	<b>Advanced Calculus and Numerical Methods -Math Lab</b>	Semester	II
Course Code	<b>MVJ20MAT21</b>	<b>CIE</b>	50
Total No. of Contact Hours	60 L : T : P :: 40 : 0 : 20	<b>SEE</b>	50
No. of Contact Hours/week	4	<b>Total</b>	100
<b>Credits</b>	4	<b>Exam. Duration</b>	3hrs

**Course objective is to:** This course viz., 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.

<b>Module-1</b>	<b>L1,L2</b>	12Hrs.
<p>Vector Calculus:-</p> <p>Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- Illustrative problems; Vector identities.</p> <p>Vector Integration: Line integrals, Theorems of Green, Gauss divergence and Stokes. Applications to work done by a force and flux.</p> <p>Laboratory Sessions- To demonstrate the physical interpretation of gradient, divergence and curl using Python</p> <p>Applications: Vector Calculus is applied in all Science and Engineering .Used in 2-D and 3-D gaming theory.</p> <p>Video link ; <a href="https://www.slideshare.net/raghuram401/vector-calculus-20955340">https://www.slideshare.net/raghuram401/vector-calculus-20955340</a>  <a href="https://www.slideshare.net/jacobblackvampire/rajatshukla">https://www.slideshare.net/jacobblackvampire/rajatshukla</a>  <a href="https://www.youtube.com/watch?v=sO9Z2RSeH4s">https://www.youtube.com/watch?v=sO9Z2RSeH4s</a></p>		



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<b>Module-2</b>	<b>L1,L2</b>	12Hrs.
<p>Differential Equations of higher order:-Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to L-C-R circuits.</p> <p>Laboratory Sessions: Finding complementary function of constant coefficient second and higher order ordinary differential equations using Python</p> <p>Applications: Differential equation has highest application in all field of science and engineering</p> <p>Videolink:<a href="https://www.slideshare.net/ayeshajavednoori/application-of-higher-order-differential-equations">https://www.slideshare.net/ayeshajavednoori/application-of-higher-order-differential-equations</a>  <a href="https://www.math24.net/topics-higher-order-differential-equations/">https://www.math24.net/topics-higher-order-differential-equations/</a></p>		
<b>Module-3</b>	<b>L1,L2,L3</b>	12Hrs.
<p>Partial Differential Equations(PDE's):-Formation of PDE's by elimination of arbitrary constants and functions. Solution of non- homogeneous PDE by direct integration. Homogeneous PDEs 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</p> <p>Laboratory Sessions: .Solutions to the problems on different types of Partial differential equations using Python</p> <p>Applications: Tangent Plane and Linear approximation .To find Local Maxima and Minima</p> <p>Video link : <a href="http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx">http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx</a>  <a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a>  <a href="http://www.nptelvideos.in/">http://www.nptelvideos.in/</a>  <a href="https://www.classcentral.com/">https://www.classcentral.com/</a></p>		
<b>Module-4</b>	<b>L1,L2,L3</b>	12Hrs.
<p>Infinite Series: Series of positive terms- convergence and divergence. P-series test, comparison test, Cauchy's root test and D'Alembert's ratio test - Illustrative examples.</p> <p>Power Series solutions- Recurrence relation, Series solution of Bessel's differential equation leading to</p>		



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$J_n(x)$ - 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.

.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 Power series and Frobenius Method.

Video link: <http://easymathseasytricks/>  
<https://www.khanacademy.org/>  
<http://www.nptelvideos.in/>  
<https://www.classcentral.com/>

<b>Module-5</b>	<b>L1,L2,L3</b>	12 Hrs.
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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- Illustrative examples. Numerical integration: Simpson's (1/3)rd and (3/8)th rules, Weddle's rule– Problems.

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

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

Video link : <https://www.khanacademy.org/>  
<http://www.nptelvideos.in/>  
<https://www.classcentral.com/>

<b>Course outcomes:</b>	
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.



Technical English II B.E. II Semester Common to all Branches [As per Choice Based Credit System (CBCS) scheme]			
Subject Code	MVJ20EGH28	IA Marks	50
Number of Lecture Hours/Week	02	Exam marks	50
Total Number of Lecture Hours	35 hours		
<b>Credits – 1</b>			
Course Objectives: This course will enable students: <ul style="list-style-type: none"> <li>• To use English vocabulary aptly and flawlessly, and ensure language proficiency</li> <li>• To achieve better Technical writing and Presentation skills</li> <li>• To Identify the common errors in Spoken and Written English</li> <li>• To acquire Employment and Workplace communication skills</li> </ul>			
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			
Modules			RBT Level
Module - 1			
<b>Introduction to Technical Communication</b> 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			L1, L2, L3
Module-2			
<b>The Nuances of Writing</b> 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 (Precise 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			L1, L2, L3

Module -3							
<b>Honing Writing Skills</b> 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 Voices in Report writing 1.7 Report writing 1.8 Sentence Improvement Exercises, Cloze Test and Theme Detection Exercises.		L1, L2, L3					
Module - 4							
<b>Writing Emails and Letters</b> 1.1 Components of a Formal Letter 1.2 Formats and Types of Business Letters 1.3 Email Writing – Dos and Don'ts 1.4 Practice in writing various types of Emails		L1, L2, L3					
Module-5							
<b>Non-Verbal Communication</b> 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 1.4 Presentation skills and Formal Presentations by Students		L1, L2, L3					
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Interactive practice sessions in Language Lab							
Listening Comprehension							
Delivering Speeches							
Role plays to enhance Functional Language skills – responding to enquiries, offering suggestions, agreeing, disagreeing, complaining, apologizing, expressing preferences							
<b>Course outcomes:</b> On completion of the course, students will be able to: CO 1: Identify common errors in Spoken and Written communication CO 2: Reach higher levels of perfection in English vocabulary and language CO 3: Improve nature and style of sensible writing and acquire employment and workplace communication skills CO 4: Improve their Technical Communication Skills through Technical Reading and Writing practices CO 5: Perform well at campus recruitment, engineering and other competitive examinations							

**Question paper pattern:** The SEE question paper will be set for 100 marks and the pattern of the paper will be a mix of Objective type (MCQ) and Descriptive type

**Suggested Reading:**

**Technical Communication** by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition} - 2018.

**Communication Skills** by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018

**High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd. 2015

**English Language Communication Skills - Lab Manual cum Workbook**, Cengage learning India Pvt. Limited [Latest Revised Edition} - 2018

**Technical Communication - Principles and Practice**, Third Edition by Meenakshi Raman and Sangeetha Sharron, Oxford University Press 2017

**Effective Technical Communication - Second Edition** by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited - 2018

**Intermediate Grammar, Usage and Composition** by M L Tichoo, A L Subramanian, P R Subramanian, Orient Black Swan – 2016.