

University of Mumbai

Class – F.E. (all Branches of Engineering)
Subject – Engineering Mechanics

Semester – I

Periods per week (each of 60 minutes)	Lecture	5	
	Practical	2	
	tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	3	100
	Practical and Oral Examination	2	25
	Oral Examination	--	--
	Term Work	--	25
	Total		150

Details of Syllabus –

Sr. No.	Topics	Hrs
01	1.1 Systems of Coplanar Forces:- Resultant of concurrent forces, parallel forces & Non concurrent Non parallel system of forces. Moment of Force about any point, Couples, Varignon's Theorem. Distributed forces in plane.	05
	1.2 Introduction to Centroid & Centre of Gravity, Introduction to Moment of Inertia & its theorem.	05
02	2.1 Equilibrium of system of coplanar forces :- Condition of equilibrium for concurrent forces, Parallel forces & Non concurrent Non parallel general system of forces & couples.	06
	2.2 Types of supports, loads, beams. Determination of reactions at supports for various types of loads on beams.	04
	2.3 Analysis of plane trusses by using Method of Section and Method of joints.	04
03	3.1 Friction :- Introduction to laws of friction, Cone of friction, Equilibrium of bodies on inclined plane. Application of problems involving wedges, ladders, screw friction.	05
	3.2 Belt friction: transmission of power by belts and ropes, centrifugal and initial tension in the belts and ropes. Condition of maximum power transmission. Flat belts and flat pulleys & ropes on grooved pulleys.	05
04	4.1 Kinematics of Particle:- Velocity and acceleration in terms of rectangular coordinate system, Rectilinear motion. Motion along plane curved path. Tangential and Normal components of acceleration. Motion Curves (a-t, v-t, s-t curves). Projectile motion. Relative motion.	10
05	5.1 Kinematics of Rigid Bodies Introduction to general plane motion, Instantaneous center of rotation for the velocity, velocity diagrams for bodies in plane motion, (up to two linkage mechanism)	06

06	6.1 Kinetics of particles Introduction of basic concepts., Newton’s second law, work energy principle, D’Alembert’s principles, equation of dynamic equilibrium. 6.2 Moment of Energy principles: Linear momentum, principle of conservation of momentum, Impact of solid bodies, direct and oblique impact, impact of solid bodies, semi elastic impact and plastic impact.	06 04
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Theory Examination:

1. Question paper will be comprising of total 7 question, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q, 1 will be compulsory and based on entire syllabus
4. Remaining questions will be mixed in nature (e.g. suppose Q.2 has part (a) form, module 3 then part (b) will be form any module other then module3)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Practical and oral Examination:

Practical and oral examination will be based on one experiment performed form the list of experiment given in the syllabus and the oral will be based on the same experiment.

Term Work.

- Term work shall consist of minimum six experiments, assignments consisting numerical based on above syllabus and a written test.
- The distribution of marks for term work shall be as follows,
- Laboratory work (Experiments and Journal): 10 Marks
- Test (at least one) : 10 Marks
- Attendance (Practical and Theory) : 05 Marks
- The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term –work.

List of Experiments.

As per University syllabus	List of conducted Experiments.
<ul style="list-style-type: none"> • Polygon law of coplanar forces (concurrent) • Non-concurrent non-parallel(general) • Bell crank lever • Support reaction for beam • Simple/ compound pendulum • Inclined plane (to determine coefficient of fiction) • Collision of elastic bodies(Law of conservation of momentum • Moment of inertia of fly wheel. • Screw fiction by using screw jack Any other experiment based on above syllabus. 	<ul style="list-style-type: none"> • Beam Reactions • Funicular polygon • Jib crane • Friction • Simple pendulum • Fly wheel

University of Mumbai

Class – F.E. (All Branches of Engineering)
Subject – Basic Electrical and Electronics Engineering

Semester – I

Periods per week (each of 60 minutes)	Lecture	5	
	Practical	2	
	tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	3	100
	Practical and Oral Examination	2	25
	Oral Examination	--	--
	Term Work	--	25
	Total		150

Sr. No.	Topics	Hrs
Prerequisite	A. Concepts of c.m.f, potential difference & current, battery. B. Capacitors, with uniform & composite medium, energy stored in a capacitor, R-C time constant. C. Magnetic field, magnetic circuit, Faraday's laws of electromagnetic induction, Hysteresis & Eddy current losses, energy stored in an inductor time constant in R-L Circuit.	
1.	DC circuits: (only independent sources). Ohm's law resistance, receptivity, series & parallel connections, star delta transformation, power dissipation in resistance, effect of temperature on resistance. Kirchhoffs laws Mesh laws Mesh & Nodal analysis. Source transformation, Superposition, Thevenin's. Norton's and Maximum power transfer theorems.	12 hours
2.	AC circuits: Generation of alternating voltage & currents, R.M.S. & Average value form factor crest factor A.C. Through resistance inductance & capacitance. R-L,R-C & R-L-C series & parallel circuits, phasor diagrams. Power & power factor, series & parallel resonance. Problems by analytical as well as phical methods.	16 hours
3.	Three phase circuits: Three phase voltage & current generation, star & delta connections (balanced load), relationship b between phase & line currents and voltages, phasor diagrams, measurement of power by two wattmeter method. Problems by analytical as will graphical methods.	8 hours
4.	Single phase transformer: Construction, working principle, c.m.f. equation, ideal & practical transformer, phasor diagrams, equivalent circuit, O.C.& S.C. tests, efficiency & regulation. All day efficiency.	08 hours

5.	Electrical Machines: (No numerical is expected). <ul style="list-style-type: none"> • DC Generators & Motors: Construction, working principle, e.m.f. equation, classification & applications. • Three phase Induction Motor: construction, working principle, squirrel cage rotor & phase wound rotor, production of rotating magnetic field, slip. • Single phase Induction Motor: Construction working principle, double field revolving theory, split phase, capacitor start, & shaded pole motor. 	09 hours
6.	A. Semiconductor Devices: (No numerical is expected) P-N Junction diode, Zener diode, their construction, working and characteristics. BJT its construction, characteristics & applications. (only CE configuration) B. Rectifiers: (No numerical is expected) Analysis of half wave & full wave rectifier with resistive load and its parameters ripple factor rectification efficiency, regulation. Rectifier circuit with capacitive filter only.	04 hours 04 hours

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Q.1. Will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature. (e.g.- suppose Q.2. has part(a) from. module 3 then part (b) will be from any module other than module 3.)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No. question should be asked from pre-requisite module.

Practical and oral Examination:

Practical and oral examination will be based on one experiment performed from the list of experiment given in the syllabus and the oral will be based on the same experiment.

Term Work.

- Term work shall consist of minimum eight experiments, and a written test.
The distribution of mark shall be as follows,
- Laboratory work (Experiments and Journal: 10 Marks
- Test (at least one) : 10 Marks
- Attendance (Practical and Theory) : 05 Marks
- The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term –work.

List of laboratory experiments:

1. Mesh and Nodal analysis.
2. Verification of Superposition theorem.
3. Maximum Power Transfer theorem (Thevenin and Norton)
4. Diode characteristics.
5. R-L-C- Series & Parallel circuit.

6. Relationships between phase & line currents and voltages in a Three phase system (star & delta).
7. Power and phase measurement in three phase system by two wattmeter method.
8. Load test on a single phase transformer by direct loading.
9. O.C. & S.C. tests on single phase transformer.
10. Half wave & full wave rectifier (with & without filter)
11. Input and output characteristics of CE-BJT configuration.
12. Study of electrical machines.

Recommended Books:

1. Vincent Deltoro: Electrical Engineering Fundamentals. Pearson Education.
2. M.S.Naidu. S. Kamakshaiah Introduction to Electrical Bngneering, Tata McGrow Hill (Revised edition).
3. MITTLE & MITTAL, Basic Electrical Engg. 2/e.(New), Tata McGraw Hill
4. Edward Hughes: Electrical Technology. Pearson Education. (Seventh edition).
5. Joseph. A. Edminster: Electrical Circuits. Schaums outline series. Tata McGraw Hill
6. H.Cotton: Advanced E;ectroca; Technology, Wheeler Publication.
7. I.J. Nagrath & D.P. Kothari: Electrical machines. Tata McGraw Hill (Second edition).
8. Dr. P.S. Bimbhra: Electric Machinery, Khanna Publishers. (Revised edition).
9. William Hayt, Kemmerly, Durbin: engineering Circuit Analysis, Tata McGraw Hill (Sixth edition).
10. Boylestad, Nashelsky: Electronic Devices & Circuit Theory. Pearson Education.
11. Bhargava, Kulshreshtha, Gupta: Basic Electronics & Linear Circuits, TTTI, Chadigarh, Tata McGraw Hill
12. S.K. Bhattacharya S. Chatterjee: Industrial Electronics & Control. TTTI, Chadigarh, Tata McGraw Hill

University of Mumbai

Class – F.E. (All Branches of Engineering)
Subject – Computer Programming-1

Semester – I

Periods per week (each of 60 minutes)	Lecture	3	
	Practical	2	
	tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	3	100
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	25
	Total		125

Details of the Syllabus:-

Sr. No.	Details	Hrs
01	Structured Programming using C++ 1.1.C++ as a superset of C programming language 1.2.C++ Fundamentals: Character set, identifiers and Keywords, data Types, constants, and Variables Declarations, Operators & Expression, Library functions, statements, Symbolic Constants, Preprocessor directives	05
02	2.1. Data Input and Output: getchar(), putchar() scanf(), gets() puts(), cin, cout, setw(), endl etc. 2.2. Control Statements: If else, while, do-while, go to, for statements, nested control structures, switch, break, continue statements, comma operator.	06
03	3.1 Functions: Functions prototypes. passing arguments to a function by value and by reference, recursion, over loading functions, storage classes 3.2. Arrays: Defining-processing array, passing arrays to function introduction to Multidimensional arrays, arrays and strings.	08
04	4.1 Pointers Declaration Referencing and de-referencing, passing pointers to functions pointer to functions, pointer to arrays Creation and manipulation of linked list 4.2. Structures and Unions: Defining and processing a structure,	07
05	5.1 Introduction to object Oriented Programming in C++ 5.2. Classes, Objects, data encapsulation, access specifier: Private, public and protected, inheritance in details, operator overloading of Unary and Binary arithmetic operators, virtual functions, pure virtual functions.	08
06	6.1 late binding, friend functions, Object as function parameter overriding functions and over loaded constructors copy constructor, static class members.	06

Term work:

Each student is to appear for at least one written test (preferably on-line) during the term. Term work shall consist of graded answer paper of the test and at least five assignments as follows:

- 1) Five programs developed under control structures using C++.
- 2) Ten program under arrays, functions and structures using C++.
- 3) Ten debugged program listing demonstrating Object oriented constructs and concepts.

Programs should be debugged (hand written & computer print- out) and should have suitable comments.

Recommended compilers turbo C++/Borland C++ or visual C++

The distribution of term work mark shall be as follows:

- Laboratory work (Experiment/ Programme and Journal) :10 Marks.
- Test (at least one) : 10 Marks
- Attendance: (Practical and Theory) : 05 Marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

- Programming in C++ Balagurusamy, Tata McGraw Hill
- Programming in C++ schuam out line series
- Let us C, Yaswant Kanetkar, BPB publications
- Practical C++, programming 'O' Reilly
- Algorithms with C++, 'O' Reilly.

University of Mumbai

Class – F.E. (All Branches of Engineering)
Subject – Workshop practice -1

Semester – I

Periods per week (each of 60 minutes)	Lecture	--	
	Practical	4	
	tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	--	--
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	50
	Total		50

University of Mumbai

Class – F.E. (All Branches of Engineering)
Subject – Workshop practice -I

Semester –I

Periods per week (each of 60 minutes)	Lecture	--	
	Practical	4	
	tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	--	--
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	50
	Total		50

Detailed Syllabus:-

Sr. No.	Details	Periods per week Hrs
Note:	<p>The syllabus and the Term-work to be done during Semester I & Semester II are given together.</p> <p>Jobs for practice and demonstration and spread the work over entire two semesters. The objective is to impart training to help the students develop skill sets for creating entities from primitive engineering materials and establishing connections through wires and cables. This exercise also aims in inculcating respect for physical work and hard labor in addition to some amount of value addition by getting exposed to interdisciplinary engineering domains. The two compulsory trades (Sr.No1 & 2) shall be offered in separate semesters. Select any four trade topics (two per semester) out of the topic at Sr. n. 3 to10. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the term-work.</p>	

1	Fitting (Compulsory) Use and setting of fitting of setting of fitting of fitting tools for chipping, cutting, fitting	24
2	Carpenter (Compulsory) Use ad setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood turning modern wood turning methods. Term work to include one carpentry job involving a joint and a report on demonstration of a job involving wood turning.	24
3	Forging (Smithy) At least one workshop practice job (Lifting hook and handle) is to be demonstrated.	12
4	Welding Edge preparation for welding jobs. Arc welding for different job like Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles.	12
5	Machine Shop At least one turning job is to be demonstrated.	12
6	Electrical board wiring House wiring, staircase wiring for fluorescent tube light, go-down wiring and three phase wiring for electrical motors.	12
7	PCB Laboratory Exercises Layout drawing, Positive and negative film making PCB etching and drilling, Tinning and soldering techniques.	12

University of Mumbai

Class – F.E. (all Branches of Engineering)

Semester – I

Subject – Applied Physics -I

Periods per week (each of 60 minutes)	Lecture	3	
	Practical	1	
	Tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	2	75
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	25
	Total		100

Details of Syllabus –

Sr. No.	Details	Hrs
01	<p>Crystallography & X-rays:</p> <ul style="list-style-type: none"> ▶ Lattice basis, crystal axes, unit cells, lattice parameters & crystal systems, SC, BCC, FCC, diamond, NaCl, Zinc blend and HCP crystal structures, Miller indices. Planes & directions, Liquid crystals & phases, LCD display & its specifications. ▶ X-rays- origin of x-rays and x-ray spectra, x-ray diffraction & Bragg's is law and determination of crystal structure. ▶ Real crystals- crystal imperfections, point defects and dislocations. 	12
02	<p>Physics of Semiconductors:</p> <ul style="list-style-type: none"> ▶ Classification of solids, Fermi-Dirac statistics, concept of Fermi level & its variation with temperature, impurity and applied voltage. ▶ Intrinsic & extrinsic carrier concentrations, carrier drift, mobility resistivity and Hall effect, carrier diffusion, Einstein's relations, current density & continuity equations. ▶ Energy band diagrams of p-n junction, formation of depletion region, derivation for depletion layer width. 	08
03	<p>Super conductivity:</p> <ul style="list-style-type: none"> ▶ Critical temperature, critical magnetic field, Type I Type II superconductors, high Tc superconductors. ▶ Meissner effect, Josephson effect. ▶ SQUIDS, plasma confinement, Maglev. 	05
04	<p>Acoustics:</p> <ul style="list-style-type: none"> ▶ acoustics of Building, Absorption, Importance of Reverberation Time, Units of Loudness, Decibel, Phon. ▶ Conditions for Good Acoustics methods of Designs for Good Acoustics, determination of Absorption coefficient, Noise Pollution. 	05
05	<p>Ultrasonics:</p> <ul style="list-style-type: none"> ▶ Principles of production, piezoelectric & magnetostriction effect. ▶ Piezoelectric & magnetostriction oscillator: ultrasonic materials- quartz & ferroelectric materials, cavitation effect. ▶ Applications based on cavitation effect and echo sounding, ultrasonic imaging & medical diagnosis. 	05
06	<p>Electron optics:</p> <ul style="list-style-type: none"> ▶ Electrostatic & Magnetostatic focusing system ▶ Construction & working of CRT, CRO & its applications. 	05

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 15 marks.
2. Only 5 questions need to be solved.
3. Q, 1 will be compulsory and based on entire syllabus
4. Remaining questions will be mixed in nature (e.g. suppose Q.2 has part (a) form, module 3 then part (b) will be form any module other than module3)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work.

Term work shall consist of minimum five experiments and a written test. The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments and journal) : 10 Marks
- Test (at least one) : 10 Marks
- Attendance (Theory and Theory) : 05 Marks
- Total : 25 Marks
- The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term –work.

Suggested Experiments: Applied Physics1:

1. PF of SC, BCC, FCC, diamond and HCP (Zn) crystal structures.
2. Crystal lattice planes, Miller indices and interplanar spacing of (100) (110) & (111) set of planes in SC, BCC& FCC.
3. Hall effect & determination of Hall coefficient.
4. I-V characteristics of si & GaAs diodes. (IRLED)
5. CRO-measurement of frequency & amplitude.
6. CRO-Lissa Jous patterns & measurement of phase difference.
7. Ultrasonic distance meter.
8. Measurement of wavelength & velocity of ultrasonic waves.

Recommended Books:

1. Solid State Physics – Charles Kittel, EEE Pbl
2. Physics of Semiconductors- S.M. Sze, wiley Eastern.
3. Engineering physics- Gaur & Gupta, Dhanpat Rai & Co.
4. A Textbook of Engineering Physics- Kshirsagar & Avadhanulu, S chand.
5. Modern Engineering Physics- vasudeva S Chand Pbl
6. Concepts of Modern Physics- Arther Beiser Tata Mcgraw Hill.

University of Mumbai

Class – F.E. (all Branches of Engineering)

Semester – I

Subject – Applied Chemistry –I

Periods per week (each of 60 minutes)	Lecture	3	
	Practical	1	
	Tutorial	--	
		Hours	marks
Evaluation System	Theory Examination	2	75
	Practical	--	--
	Oral Examination	--	--
	Term Work	--	25
	Total		100

Details of Syllabus –

Sr. No.	Details	Hrs
01	<p>Polymers:</p> <ul style="list-style-type: none"> ▶ Introduction, classification, Hydrocarbon Molecules, Thermoplastic, Thermosetting Polymers. ▶ Basic Concepts Molecular Weight, Molecular Shape, Polymer Crystallinity. Crystallization, Melting & Glass Transition Phenomena. ▶ Viscoelasticity, Deformation Fracture, Defects in Polymers. ▶ Polymerization addition, Polymerization Copolymerization and Condensation Polymerization. ▶ Advanced polymer Material, Conducting Polymers Electrical Properties of Polymers. Liquid Crystal Properties Molecular Electronics & Polymers & Supramolecular Chemistry. ▶ Fabrication of Polymers <p>i) Compression Moulding ii) Injection Moulding iii) Transfer Moulding iv) Extrusion Moulding</p> <p>Synthesis Properties & uses of PE PMMA Formaldehyde resin Polymer composite Materials.</p>	10
2	<p>Water:</p> <ul style="list-style-type: none"> ▶ Hardness of water, effect of hard water in the manufacture sector types of hardness, determination of hardness by EDTA method and Problems. ▶ Softening of water by i) Lime soda method with equations in general Hot- cold lime soda method and problems ii) zeolite process & problems iii) Ion exchange method iv) reverse osmosis, ultrafiltration & its industrial application. ▶ Methods to determine extent of water pollution i) BOD ii) COD. ▶ Methods to control water pollution. ▶ Industrialization- materials cycle & pollution. Recycling issues. 	08
3	<p>Lubricants</p> <ul style="list-style-type: none"> ▶ Definition, classification, characteristic properties, problems on acid value and saponification value. Theories of lubrication. ▶ Additives for lubricants, selection of lubricant. 	05

4	Energy: ▶ Classification Solar energy, hydropower, wind power Biomass energy using bio technology Hydrogen as a fuel ▶ Solar energy, Production of electricity using solar energy Rechargeable alkaline storage batteries, Nickel Hydrogen Batteries. Rechargeable Lithium ion batteries	05
5	Phase Rule and steels: ▶ Gibbs Phase Rule, One Component System Water, Two Component System Iron-carbon Equilibrium Diagram with Microstructures. ▶ Limitations & Application of Phase Rule. ▶ Plain Carbon Steel.Limitations. ▶ Introduction to Alloy Steels, special steels. ▶ Principles of shape memory effect & its applications.	06
6	Nano-materials: ▶ Introduction to nano-materials. ▶ Graphite, fullerenes carbon nanotubes, nanowires, nanocones, Haeckelites. Their electronic and mechanical properties ▶ Production methods for CNTS. ▶ Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Environmental & related fields. v) Mechanics.	06

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 15 marks.
2. Only 5 questions need to be solved.
3. Q, 1 will be compulsory and based on entire syllabus
4. Remaining questions will be mixed in nature (e.g. suppose Q.2 has part (a) form, module 3 then part (b) will be form any module other than module3)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work.

Term work shall consist of minimum five experiments and a written test. The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments and journal) : 10 Marks
- Test (at least one) : 10 Marks
- Attendance (Theory and Theory) : 05 Marks
- Total : 25 Marks
- The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term –work.

Suggested Experiments	Applied Physics 1:
	1) To determine total, temporary and permanent hardness of water sample.
	2) Removal of hardness using ion exchange column.
	3) To determine specification value of a lubricating oil.
	4) To determine acid value of a lubrication oil
	5) To determine COD of a effluent sample.
	6) To determine CO ₂ content from air by Orsat's apparatus.
	7) To determine flash point and fire point of a lubrication oil.
	8) To determine conductance of polymer.
	9) To determine melting point and/or glass transition temperature of a polymer.
	10) to prepare nono-oxide using combustion method.

Recommended Books:

1. Engineering Chemistry-Jain & Jain, dhanpat Rai
2. Engineering Chemistry-Dara & dara, S Chand
3. Materials Science & Engineering – William Callister,
4. Chemistry of advanced materials- CNR Rao, RSC Pbl
5. Polymer Chemistry- Vasant Gowarikar
6. Membrane Filtration- Gutman Adam Hilger Bristol
7. Nano scopic materials- Emil Roduner- RSC Publishing
8. Nano Chemistry- Ozin et. al-RSC publishing
9. Physical Metallurgy- B.K. Agarwal.

University of Mumbai

Class – F.E. (all Branches of Engineering)

Semester – I

Subject – Applied Mathematics -I

Periods per week (each of 60 minutes)	Lecture	4	
	Practical	--	
	Tutorial	1	
		Hours	marks
Evaluation System	Theory Examination	3	100
	Practical and Oral Examination	--	--
	Oral Examination	--	--
	Term Work	--	25
	Total		125

Details of Syllabus –

Sr. No.	Detailed Syllabus:	Lectures/Week
1.1	<p>Module 1 Complex numbers.</p> <p>1.1.1 Review of complex numbers. Cartesian, Polar and Exponential form of a complex number.</p> <p>1.1.2 De Moivre's Theorem (without proof). Powers and roots of Exponential and Trigonometric functions.</p> <p>1.1.3 Circular and Hyperbolic functions.</p>	02 03
1.2	<p>Module 2 Complex numbers and successive differentiation.</p> <p>1.2.1 Inverse circular and Inverse Hyperbolic Functions Logarithmic functions</p> <p>1.2.2 Separation of real and imaginary parts of all types of functions.</p> <p>1.2.3 Successive differentiation –nth derivative of standard functions-e^{ax}, $(ax=b)^{-1}$, $(ax=b)^m$, $(ax=b)^{-m}$, $\log(ax+b)$ $\sin(ax+b)$ $\cos(ax+b)$. $e^{ax} \sin(bx+c)$. $e^{ax} \cos(bx+c)$.</p> <p>1.2.4 Leibnitz's theorem (without proof) and problems.</p>	03 02 04 03
1.3	<p>Module 3 Partial differentiation</p> <p>1.3.1 Partial derivatives of first and higher order, total differential coefficients, total differentials, differentiation of composite and implicit functions.</p> <p>1.3.2 Euler's theorem on Homogeneous function with two and three independent Variables (with proof), deductions from Euler's theorem.</p>	05 03 Total:08
1.4	<p>Module 4 Application of partial differentiation, Mean Value theorems</p> <p>1.4.1 Errors and approximations. Maxima and Minima of a function of two independent variables. Lagrange's method of undetermined multipliers with one constraint.</p> <p>1.4.2 Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (all theorems without proof). Geometrical interpretation and problems.</p>	04 03 Total:07

1.5	Module 5 Vector algebra & Vector calculus 1.5.1 Vector triple product and product of four vectors. 1.5.2 Differentiation of a vector function of a single scalar variable. Theorems on derivatives (without proof). curves in space concept of a tangent vector (without problems) 1.5.3 Scalar point function and vector point function. Vector differential operator del. Gradient, Divergence and curl-definitions, Properties and problems. Applications-Normal, directional derivatives, Solenoidal and Irrotational fields.	01 02 06 Total:09
1.6	Module 6 Infinite series, Expansion of functions and indeterminate forms. 1.6.1 Infinite series-Idea of convergence and divergence. D' Alembert's root test, Cauchy's root test. 1.6.2 Taylor's theorem (Without proof) Taylor's series and Maclaurin's series (without proof) Expansion of standard series such as e^x , $\sin x$, $\cos x$, $\tan x$, $\sinh x$, $\cosh x$, $\tanh x$, $\log(1+x)$, $\sin^{-1}x$, $\tan^{-1}x$, binomial series, expansion of functions in power series. 1.6.3 Indeterminate forms- $\frac{0}{0}, \frac{x}{x}, 0x, \infty - \infty, 0^0, \infty^0, 1^x$ BHospitalsrule – problem sin volving series also.	02 04 02 Total-08
	Recommended Books: • A textbook of Applied Mathematics. P.N. & J.N wartikar, volume 1 & 2 pune Vidyarthi Griha. •Higher Engineering Mathematics Dr. B.S. Grewal, Khanna Pulications. •Advanced Engineering Mathematics, Erwai Kreyszing, Wiley Eastern Limited, 8 th Ed. •Vector analysis- Murray R., Spiegel- Scham series •Higher Engineering mathematics by B.V. Ramana-Tata McGraw Hill.	

Theory Examination:

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5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work.

Term work will beshall consist of minimum five experiments and a written test. The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments and journal) : 10 Marks
- Test (at least one) : 10 Marks
- Attendance (Theory and Theory) : 05 Marks
- Total : 25 Marks
- The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term –work.