AC 14/7/2016, Item No. 4.64

UNIVERSITY OF MUMBAI

Bachelor of Engineering

First Year Engineering (Semester I & II), Revised course (REV-2016)from Academic Year 2061 -17,(Common for All Branches of Engineering)

(As per Choice Based Credit and Grading System with effect from the A. Y. 2016 - 17)

From Co-ordinator's Desk:-

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) give freedom to affiliated Institutes to add few (PEO's) course objectives course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, developed curriculum accordingly. In addition to outcome based education, **Choice Based Credit and Grading System** is also introduced to ensure quality of engineering education.

Choice Based Credit and Grading System enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes Faculty of Technology has devised a transparent credit assignment policy adopted ten points scale to grade learner's performance. Credit grading based system was implemented for First Year of Engineering from the academic year 2016-2017. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2017-2018, for Third Year Final Year Engineering in the academic years 2018-2019, 2019-2020, respectively.

Dr. S. K. Ukarande
Co-ordinator,
Faculty of Technology,
Member - Academic Council
University of Mumbai, Mumbai

First Year Engineering (Semester I & II), Revised course from Academic Year 2016 -17, (REV- 2016) (Common for all Branches of Engineering)

Scheme for FE - Semester – I

Sub. Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Pract.	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 & Test 2					
FEC101	Applied Mathematics-I	20	20	20	80	25	-	-	125
FEC102	Applied Physics-I	15	15	15	60	25	-	-	100
FEC103	Applied Chemistry –I	15	15	15	60	25	-	-	100
FEC104	Engineering Mechanics	20	20	20	80	25	-	25	150
FEC105	Basic Electrical Engineering	20	20	20	80	25	-	25	150
FEC106	Environmental studies	15	15	15	60	-	-	-	75
FEL101	Basic Workshop Practice-I	-	-	-	-	50	-	-	50
				105	420	175		50	750

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC101	Applied Mathematics-I	04	-	01	04		01	05
FEC102	Applied Physics-I	03	01	-	03	0.5	-	3.5
FEC103	Applied Chemistry -I	03	01	-	03	0.5	-	3.5
FEC104	Engineering Mechanics	05	02	-	05	01	-	06
FEC105	Basic Electrical Engineering	04	02	-	04	01	-	05
FEC106	Environmental studies	02	-	-	02	-	-	02
FEL101	Basic Workshop Practice-I	-	04	-	-	02	-	02
		21	10	01	21	05	01	27

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut	Total
FEC101	**Applied Mathematics-I**	04	-	01	04	-	01	05

Sub Code	Subject Name	Examination Scheme							
		Theory				Term Work	Practical exam.	Oral exam	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Av of Test 1 & 2					
FEC101	**Applied Mathematics-I**	20	20	20	80	25	--	--	125

Course Objectives: The course is aimed to develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

1) Matrices –To provide detailed of matrices which is applied for solving system of linear equations and useful in various fields of technology.

2) Partial Derivatives – This course enables to provide an overview of partial derivatives and its applications which is used for solving optimization problems and concepts is needed in study of wave, heat equation of various orders and also in calculation of errors in various engineering subjects.

3) Complex numbers – This course enables the students to learn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of engineering subjects like electrical circuits, Electromagnetic wave theory, and complex analysis etc.

4) Indeterminate forms and Taylor series- It helps the students to understand and apply the concept of existence of limits, indeterminate conditions, expansion of standard and non standard functions in series form.

5) Successive Differentiation – To provide understanding of existence of n'th order derivative.

6) Numerical methods and scilab: To build ability to solve numerically system of linear equations, algebraic and transcendental equations. To provide an overview of the experimental aspect of applied mathematics.

Course outcomes:

At the end of this course, students will be able to

1. Apply the knowledge of matrices to solve the problems.
2. Know and to understand various types of numerical methods.

3. Ability to interpret the mathematical results in physical or practical terms for complex numbers.
4. Inculcate the Habit of Mathematical Thinking through Indeterminate forms and Taylor series expansion
5. Solve and analyze the Partial derivatives and its application in related field of engineering.

Detailed Syllabus

Sr. No.	Topics	Hours
1	**Module-1: Complex Numbers** **Pre-requisite**: Review of Complex Numbers-Algebra of Complex Number, Different representations of a Complex number and other definitions, D'Moivre's Theorem. 1.1. Powers and Roots of Exponential and Trigonometric Functions. 1.2. Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sines and cosines of multiples of θ and Expansion of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ 1.3. Circular functions of complex number and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of Functions.	3 hrs 2 hrs 4 hrs
2	**Module-2:Logarithm of Complex Numbers , Successive Differentiation** 2.1. Logarithmic functions, Separation of real and Imaginary parts of Logarithmic Functions. 2.2. Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems	4 hrs 4 hrs
3	**Module-3:Matrices** **Pre-requisite**: Inverse of a matrix, addition, multiplication and transpose of a matrix 3.1. Types of Matrices (symmetric, skew- symmetric, Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and properties of Matrices). Rank of a Matrix using Echelon forms, reduction to normal form, PAQ in normal form, system of homogeneous and non –homogeneous equations, their consistency and solutions. Linear dependent and independent vectors. Application of inverse of a matrix to coding theory.	9 hrs
4	**Module-4: Partial Differentiation** 4.1. Partial Differentiation: Partial derivatives of first and higher order. Total differentials, differentiation of composite and implicit functions. 4.2. Euler's Theorem on Homogeneous functions with two and three independent variables (with proof).Deductions from Euler's Theorem	6 hrs 3 hrs

5	**Module-5: Applications of Partial Differentiation , Expansion of Functions** 1.1 Maxima and Minima of a function of two independent variables, Jacobian. 1.2 Taylor's Theorem (Statement only) and Taylor's series, Maclaurin's series (Statement only).Expansion of e^x , sin(x), cos(x), tan(x), sinh(x), cosh(x), tanh(x), log(1+x), $sin^{-1}(x)$,$cos^{-1}(x)$,$tan^{-1}(x)$, Binomial series.	4 hrs 4 hrs.
6	**Module-6: Indeterminate forms, Numerical Solutions of Transcendental Equations and System of Linear Equations** 6.1. Indeterminate forms, L- Hospital Rule, problems involving series. 6.2. Solution of Transcendental Equations: Solution by Newton Raphson method and Regula –Falsi Equation. 6.3. Solution of system of linear algebraic equations, by (1) Gauss Elimination Method, (2) Gauss Jacobi Iteration Method, (3) Gauss Seidal Iteration Method. (Scilab programming for above methods is to be taught during lecture hours)	2 hrs 4 hrs 3 hrs

Recommended Books:

A text book of Applied Mathematics, P.N.Wartikar and J.N.Wartikar, Vol – I and –II by Pune VidyarthiGraha.

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9thEd.
3. Matrices, Shanti Narayan.S. Chand publication
4. Numerical Methods, Dr. P. Kandasamy , S. Chand Publication
5. Howard Anton and Christ Rorres. Elementary Linear Algebra Application Version. 6th edition. John Wiley & Sons, INC.
6. Eisenberg, Murray. Hill Ciphers and Modular Linear Algebra. 3 Nov 1999 (accessed 26 November - 2 December 2001) <http://www.math.umass.edu/~murray/Hillciph.pdf>

Theory Examination:

Question paper will comprise of 6 questions, each carrying 20 marks.

1. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 3 to 4 marks will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each Module.

Term Work:

General Instructions:

(1) Batch wise tutorials are to be conducted. The number of students per batch should be as per University pattern for practical.

(2) Students must be encouraged to write Scilab Programs in tutorial class only. Each Student has to write at least 4 Sci-lab tutorials (including print out) and at least 6 class tutorials on entire syllabus.
(3) Sci-Lab Tutorials will be based on (i) Guass - Elimination Method (ii) Guass -Scidal Iteration Method , (iii)Gauss Jacobi Iteration Method (iv) Newton Raphson Method (v) R egula –Falsi Method (vi) Maxima and Minima of functions of two variables

he distribution of Term Work marks will be as follows -

- Attendance (Theory and Tutorial) : 05 marks Class Tutorials on entire syllabus : 10 marks
- Sci-Lab Tutorials : 10 marks

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

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Term Work/ Practical	Tutorial	Total
FEC102	**Applied Physics-I**	03	01	-	03	0.5	-	3.5

Subject Code	Subject Name	Examination Scheme							
		Theory							
		Internal Assessment			End SEM. Exam.	Term Work	Practical	Oral	Total
		Test 1	Test 2	Average of Test 1 & 2					
FEC102	**Applied Physics-I**	15	15	15	60	25	-	-	100

COURSE OBJECTIVES

Identify and understand the fundamental physical principals underlying engineering devices and processes—a prerequisite to become successful engineers.

To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.

COURSE OUTCOME

1) Explain the concept of crystallography and apply it to different crystal structures.

2) Understand the principles of quantum mechanics and its key.

3) Apply semiconductor properties in electronic devices as well as to comprehend the concept of superconductors and their applications.

4) Learn the principles behind the Acoustic Design of a Hall and also methods of production of Ultrasonic and its Applications in various fields.

Module 1	**CRYSTAL STRUCTURE** Introduction to crystallography; Study of characteristics of unit cell of Diamond, ZnS, NaCl and HCP; Miller indices of crystallographic planes & directions; interplanar spacing; X-ray diffraction and Bragg's law; Determination of Crystal structure using Bragg's diffractometer; Frenkel and Schotkey crystal defects; Ionic crystal legancy (3,4,6,8); Liquid crystal phases.	**07 hrs**
Module 2	**QUANTUM MECHANICS** Introduction, Wave particle duality; de Broglie wavelength; experimental verification of de Broglie theory; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of	**09 hr**

	wave function; Heisenberg's uncertainty principle; Electron diffraction experiment and Gama ray microscope experiment; Applications of uncertainty principle; Schrodinger's time dependent wave equation; time independent wave equation; Motion of free particle; Particle trapped in one dimensional infinite potential well.	
Module 3	**SEMICONDUCTOR PHYSICS** Splitting of energy levels for band formation; Classification of semiconductors(direct & indirect band gap, elemental and compound); Conductivity, mobility, current density (drift & diffusion) in semiconductors(n type and p type); Fermi Dirac distribution function; Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration and temperature on fermi level; Fermi Level diagram for p-n junction(unbiased, forward bais, reverse bias); Breakdown mechanism (zener & avalanchy), Hall Effect Applications of semiconductors: Rectifier diode, LED, Zener diode, Photo diode, Photovoltaic cell, BJT, FET, SCR., MOSFET	**14 hrs**
Module 4	**SUPERCONDUCTIVITY** Introduction, Meissner Effect; Type I and Type II superconductors; BCS Theory (concept of Cooper pair); Josephson effect Applications of superconductors- SQUID, MAGLEV	**03 hrs**
Module 5	**ACOUSTICS** Conditions of good acoustics; Reflection of sound(reverberation and echo); absorption of sound; absorption coefficient; Sabine's formula; Acoustic Design of a hall; Common Acoustic defects and acoustic materials	**03 hrs**
Module 6	**ULTRASONICS** Ultrasonic Wave generation; Magnetostriction Oscillator; Piezoelectric Oscillator; Applications of ultrasonic: Eco sounding; NDT; ultrasonic cleaning(cavitation); ultrasonic sensors; Industrial applications of ultrasonic(soldering, welding, cutting, drilling)	**03 hrs**

Books Recommended:

1. A text book of Engineering Physics-Avadhanulu&Kshirsagar, S.Chand
2. Applied Solid State Physics –Ranikant, Wiley India
3. Solid State Electronic Devices- B. G. Streetman, Prentice Hall Publisher
4. Physics of Semiconductor Devices- S. M. Sze, John Wiley & sons publisher
6. Modern Engineering Physics – Vasudeva, S.Chand
7. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill
8. Engineering Physics- V. Rajendran, Tata McGraw Hill
9. Introduction to Solid State Physics- C. Kittle, John Wiley & Sons publisher
10. Engineering Physics-H. K. Malik, McGraw Hill

Suggested Experiments: (Any five)

1. Study of Diamond, ZnS, NaCl crystal structure.
2. Study of HCP structure.
3. Study of Miller Indices, Plane and direction.
4. Study of Hall Effect.
5. Determination of energy band gap of semiconductor.
6. Study of Ultrasonic Distance Meter.
7. Study of I / V characteristics of Zener diode.
8. Determination of 'h' using Photo cell.
9.Study of I / V characteristics of semiconductor diode

Note: Distribution of marks for term work

1. Laboratory work (Experiments and Journal): 10 marks
2. 02 Assignments: 10 marks
3. Attendance (Practical): 05marks

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 15 marks.
2. Total 4 questions need to be solved.
3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4: Remaining question will be randomly selected from all the modules.
5: Weightage of marks should be proportional to number of hours assigned to each Module.

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Term Work/ Practical	Tutorial	Total
FEC103	**Applied Chemistry-I**	03	01	-	03	0.5	-	3.5

Subject Code	Subject Name	Examination Scheme							
		Theory				Term Work	Practical	Oral	Total
		Internal Assessment			End SEM. Exam.				
		Test 1	Test 2	Average of Test 1 & 2					
FEC103	**Applied Chemistry-I**	15	15	15	60	25	-	-	100

Course Objectives:

To make the students understand the chemistry of i) Water ii) Polymers iii) Lubricants iv) Various other Engineering materials.

Course Outcomes

Students will be able to;

1. i) Calculate the types & percentage of impurities in water
   ii) Calculate various reagents required to soften hard water
   iii) Understand methods of purification of water as per the standards.
2. Understand the chemistry of polymers along with their applications.
3. Understand mechanism of lubrication and its properties.
4. Understand thermodynamics of chemical processes.
5. Understand the process of manufacture of cement and Engineering materials.

Module 1	**Water** Impurities in water, Hardness of water, Determination of Hardness of water by EDTA method and problems, Softening of water by Hot and Cold lime Soda method and numerical problems. Zeolite process and numerical problems. Ion Exchange process and numerical problems. Potable water standard as per BIS w.r.t. i) pH, ii) Alkalinity, iii) TDS, iv) Hardness; Drinking water or Municipal water -Treatments removal of microorganisms by adding Bleaching powder, Chlorination (no breakpoint chlorination), Disinfection by Ozone, Electrodialysis, Reverse osmosis, and Ultra filtration. BOD, COD- definition & significance, sewage treatment (only activated sludge process), Numerical problems related to COD.	**12 hrs**
Module 2	**Polymers** Introduction to polymers, Classification, Types of polymerization, Thermoplastic and Thermosetting plastic; Compounding of plastic,Fabrication of plastic by Compression, Injection, Transfer and Extrusion moulding. Preparation, properties and uses of Phenol formaldehyde, PMMA, Kevlar. Effect of heat on the polymers (Glass transition temperature), Viscoelasticity. Conducting polymers, Engineering Plastics, Polymers in medicine and surgery. Rubbers : Natural rubber- latex, Drawbacks of natural rubber, Vulcanization of rubber,	**12 hrs**

	Preparation, properties and uses of Buna-S, Silicone and Polyurethane rubber.	
Module 3	**Lubricants** Introduction, Definition, Mechanism of lubrication, Classification of lubricants, Solid lubricants (graphite & Molybdenum disulphide), Semisolid lubricants, Liquid lubricants, Additives in blended Oils. Important properties of lubricants - Definition and significance of - Viscosity, Viscosity index, Flash and fire points, Cloud and pour points, Oiliness, Emulsification, Acid value and numerical problems, Saponification value and numerical problems.	**07 hrs**
Module 4	**Phase Rule** Gibb's Phase Rule, Terms involved with examples, One Component System (Water), Reduced Phase Rule, Two Component System (Pb- Ag), Advantages and Limitations of Phase Rule.	**04 hrs**
Module 5	**Important Engineering Materials** Cement – Manufacture of Portland Cement, Chemical Composition and Constitution of Portland Cement, Setting and Hardening of Portland Cement, Concrete, RCC and Decay. Nanomaterials, preparation (Laser and CVD) method, properties and uses of CNTS, Fullerene - properties and uses.	**05 hrs**

Theory Examination :

1. Question paper will comprise of total 6 questions, each of 15 marks.
2. Total four questions need to be solved.
3. Question – 1 will be compulsory and based on entire syllabus wherein sub questions of 3 marks will be asked.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be form any module other than module
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. The distribution of marks for term work shall be as follows:

Laboratory Work (Experiments and journal) : 10 marks
Attendance (Practical and Theory) : 05 marks
Assignments and Viva on practical's : 10 marks
Total : 25 marks

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

Suggested Experiments:

1) To determine total, temporary and permanent hardness of water sample.
2) Removal of hardness using ion exchange column.
3) To determine acid value of a lubricating oil.

4) To determine free acid pH of different solutions using pHmeter
5) To determine metal ion concentration using colorimeter.
6) To determine flash point and fire point of a lubricating oil
7) To determine Chloride content of water by Mohr's Method.
8) To determine melting point and /or glass transition temperature of a polymer
9) Molecular weight determination of polymers by Oswald Viscometer.
10) To determine the percentage of lime in cement.
11) Hardening and setting of cement using Vicat's apparatus
12) Determination of Viscosity of oil by Redwood Viscometer.

Recommended Books :

1. Engineering Chemistry - Jain & Jain (DhanpatRai)
2. Engineering Chemistry – Dara &Dara (S Chand)
3. Engineering Chemistry - Wiley India (ISBN – 9788126519880)
4. A Text Book of Engineering Chemistry – Shashi Chawla (DhanpatRai)

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract.	Tut.	Total
FEC104	**Engineering Mechanics**	05	02	-	05	01	-	06

Sub Code	Subject Name	Examination Scheme							
		Theory (out of 100)				Term Work	Pract.	Oral	Total
		Internal Assessment (out of 20)			End sem. exam (out of 80)				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEC104	**Engineering Mechanics**	20	20	20	80	25	-	25	150

Course objective:

Students should be able to:

1. Understand the logical sequence of any problem.
2. Understand the given data and explain with diagram.
3. Think and find an appropriate solution of the day today problems.

Course outcome:

Students should be able to:

1. Construct free body diagram and calculate the reactions for static equilibrium.
2. Determine the centroid of plane lamina.
3. Calculate the internal forces, moments and distributed loads in members.
4. Evaluate the velocity, acceleration, time, force and energy of the particle as well as rigid bodies.
5. Locate instantaneous centre of rotation for rigid bodies having plane motion.

Details of Syllabus:

Sr.No.	Topics	Hrs
01	**1.1 System of Coplanar Forces:** Resultant of concurrent forces, parallel forces, non-concurrent non-parallel system of forces, Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane. **1.2 Centroid** for plane Laminas.	**05** **04**

02	**2.1Equilibrium of System of Coplanar Forces**: Condition of equilibrium for concurrent forces, parallel forces and non-concurrent non-parallel general forces and Couples. **2.2Types of support**: Loads, Beams, Determination of reactions at supports for various types of loads on beams.(Excluding problems on internal hinges) **2.3Analysis of plane trusses**: By using Method of joints and Method of sections.(Excluding pin jointed frames)	**06** **03** **05**
03	**3.1 Forces in space**: **Resultant of Non-coplanar Force Systems:** Resultant of concurrent force system, parallel force system and non-concurrent non-parallel force system. **Equilibrium of Non-coplanar Force Systems:** Equilibrium of Concurrent force system, parallel force system and non-concurrent non-parallel force system. **3.2 Friction**: Introduction to Laws of friction, Cone of friction, Equilibrium of bodies on inclined plane, Application to problems involving wedges, ladders. **3.3 Principle of virtual work:** Applications on equilibrium mechanisms, pin jointed frames.	**05** **07** **04**
04	**4.1 Kinematics of a Particle**: -Rectilinear motion, Velocity & acceleration in terms of rectangular co-ordinate system, Motion along plane curved path, Tangential& Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion.	**10**
05	**5.1 Kinematics of a Rigid Body** :- Introduction to general plane motion, Instantaneous center of rotation for the velocity, velocity diagrams for bodies in plane motion.	**06**
06	**6.1 Kinetics of a Particle: Force and Acceleration: -**Introduction to basic concepts, D'Alemberts Principle, Equations of dynamic equilibrium, Newton's second law of motion. **6.2 Kinetics of a Particle: Work and Energy:** Principle of work and energy, Law of conservation of energy. **6.3 Kinetics of a Particle: Impulse and Momentum:** Principle of linear impulse and momentum. Law of conservation of momentum. Impact and collision.	**04** **03** **03**

Recommended Books

1. Engineering Mechanics by R. C. Hibbeler.
2. Engineering Mechanics, statics by Meriam & kraige , Wiley Publications
3. Engineering Mechanics, Dynamics by Meriam & kraige , Wiley Publications
4. Engineering Mechanics by Beer &Johnston, Tata McGraw Hill
5. Engineering Mechanics by F. L. Singer, Harper& Raw Publication
6. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill
7. Engineering Mechanics by Shaum Series,
8. Engineering Mechanics by A K Tayal, Umesh Publication.
9. Engineering Mechanics by Kumar, Tata McGraw Hill

Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 20 marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub-questions of 2 to 5 marks will be asked.
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) having 20 marks each.
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

Oral Examination:-

Oral examination will be based on entire syllabus.

Term work:-

Term work shall consist of minimum six experiments (at least two experiments on Dynamics), assignments consisting numerical based on above syllabus, at least 3 numerical from each module.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiment/ programs and journal)	: 10 marks
Assignments	: 10 marks
Attendance (Theory and Practical)	: 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:-

1. Polygon law of coplanar forces.
2. Non-concurrent non-parallel (General).
3. Bell crank lever.
4. Support reaction for beam.
5. Simple/ compound pendulum.
6. Inclined plane (to determine coefficient of friction).
7. Collision of elastic bodies (Law of conservation of momentum).
8. Moment of inertia of fly wheel.
9. Screw friction by using screw jack.

Any other experiment based on above syllabus.

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract.	Tut.	Total
FEC105	**Basic Electrical Engineering**	**04**	**02**	**-**	**04**	**01**	**-**	**05**

Subject Code	Subject Name	Examination Scheme							
		Theory (out of 100 Marks)				Term Work (Marks)	Pract. (Marks)	Oral (Marks)	Total (Marks)
		Internal Assessment			End sem. Exam. of 3 Hrs. (Marks)				
		Class Test 1 (Marks)	Class Test 2 (Marks)	Average of Test 1 and 2 (Marks)					
FEC105	**Basic Electrical Engineering**	20	20	20	80	25	-	25	150

Prerequisite:

- Concept of electro motive force i.e. emf, potential difference, current, ohm's law, resistance, resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance
- Capacitors, with uniform and composite medium, energy stored in capacitor, R-C time constant.
- Magnetic field, Faraday's laws of Electromagnetic induction, Hysteresis and eddy current losses, energy stored in an inductor, time constant in R-L circuit.

Course Objectives:

1. To understand the fundamentals of DC circuits and its applications.
2. To learn the fundamentals of single phase AC circuits and its applications.
3. To understand the fundamentals of three phase AC circuits and its applications.
4. To learn the basic operation and analyse the performance of single phase transformer.
5. To understand the basic operation of DC machines.

Course Outcomes:

Learner will be able to

1. To understand fundamentals of DC circuits and apply knowledge for analysing network theorems in DC circuits.
2. To learn the fundamentals and analyse single phase AC circuits.
3. To learn the fundamentals and analyse three phase AC circuits.
4. To learn the basic operation and analyse the performance of single phase transformer.
5. To understand the construction and basic operation of DC motors and generators.

Module	Detailed Contents	Hrs.
01	**DC Circuits(Only Independent Sources):** Kirchhoff 's laws, Ideal and practical voltage and current source, Mesh and Nodal analysis, Supernode and Supermesh analysis, Source transformation, Star-delta transformation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, (Source transformation not allowed for Superposition theorem, Mesh and Nodal analysis).	18
02	**AC Circuits:** Generation of alternating voltage and currents, RMS and Average value, form factor, crest factor, AC through resistance, inductance and capacitance, R-L, R-C and R-L-C series and parallel circuits, phasor diagrams, power and power factor, series and parallel resonance, Q factor and bandwidth.	12
03	**Three Phase Circuits:** Three phase voltage and current generation, star and delta connections(balanced load only), relationship between phase and line currents and voltages, Phasor diagrams, Basic principle of wattmeter, measurement of power by one and two wattmeter methods.	06
04	**Single Phase Transformer:** Construction, working principle, emf equation, ideal and practical transformer, transformer on no load and on load, phasor diagrams, equivalent circuit, OC and SC test, regulation and efficiency.	12
05	**DC Machines:** Principle of operation of DC motors and DC generators, construction and classification of DC machines, emf equation.	04

Term work: Term work consists of performing minimum 06 practical mentioned as below. Final certification and acceptance of the term work ensures satisfactory performance of laboratory work.

List of laboratory experiments (Minimum Six):

1. Mesh and Nodal analysis.
2. Verification of Superposition Theorem.
3. Verification Thevenin's Theorem.
4. Study of R-L series and R-C series circuit.
5. R-L-C series resonance circuit
6. R-L-C parallel resonance circuit.
7. Relationship between phase and line currents and voltages in three phase system (star & delta)
8. Power and phase measurement in three phase system by one wattmeter method.
9. Power and phase measurement in three phase system by two wattmeter method.
10. OC and SC test on single phase transformer

Assessment:

Internal:

Assessment consists of two tests out of which; one should be compulsory class test and the other is either a class test or assignment on live problems.

End Semester Theory Examination:

Some guidelines for setting up the question paper. Minimum 80% syllabus should be covered in question papers of end semester examination. **In question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
3. Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only four questions need to be solved.

Recommended Books

Text Books

1. V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2. Electrical Engineering Fundamentals" by Vincent Del Toro, PHI Second edition, 2011
3. Edward Hughes: Electrical and Electrical Technology, Pearson Education (Tenth edition)
4. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13 th edition 2011.

Reference Books:

1. B.L.Theraja "Electrical Engineering " Vol-I and II,
2. S.N.Singh, "Basic Electrical Engineering" PHI , 2011

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract.	Tut.	Total
FEC106	**Environmental Studies**	02	-	-	02	-	-	02

Sub Code	Subject Name	Examination Scheme							
		Theory (out of 75)				Term Work	Pract.	Oral	Total
		Internal Assessment (out of 15)			End Sem. exam (out of 60)				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEC106	**Environmental Studies**	15	15	15	60	-	-	-	75

Details of the Syllabus:-

Sr. No.	Details	Hrs
Module 1	Overview of Environmental Aspects: • Definition, Scope and Importance of Environmental Study • Need for Public awareness of environmental education • Introduction to depletion of natural resources: Soil, Water, Minerals and Forests. • Global crisis related to – Population, water, sanitation & Land. Ecosystem: • Study of ecosystems: Forest, desert and aquatic (in brief). • Energy flow in Ecosystem, overview of Food Chain, Food Web and Ecological Pyramid. • Concept of ecological succession and its impact on human beings (in brief). Case Study on Chipko Movement (Uttarakhand, India), (began in 1973).	4
Module 2	Aspects of Sustainable Development: • Concept and Definition of Sustainable Development. • Social, Economical and Environmental aspects of sustainable development. • Control measures: 3R (Reuse, Recovery, Recycle), • Resource utilization as per the carrying capacity (in brief). Case Study on Narmada Bachao Andolan (Gujarat, India, in the mid and late 1980s).	2
Module 3	Types of Pollution: • Water pollution: Sources of water pollution and Treatment of Domestic and industrial waste water (with flow-diagram of the treatment), • Land Pollution: Solid waste, Solid waste management by land filling,	8

	composting and incineration • Air pollution: Sources of air pollution, Consequences of air pollution :- Greenhouse effect (Explanation with schematic diagram), Photochemical Smog (Explanation with chemical reaction). Cleaning of gaseous effluents to reduce air contaminants namely dust particle or particulate matters by using:- (i) Electrostatic precipitators (ii) Venturi scrubber (Schematic diagram and working). • Noise pollution: Sources, effects, threshold limit for different areas and control methods. • E-Pollution: Definition, Sources and effects. • Nuclear pollution: Sources and effects. Case study on Water Pollution of Ganga River. Case study on London smog (U. K.)(December, 1952). Case Study of Fukushima Disaster (March, 2011).	
Module 4	Pollution Control Legislation: • Functions and powers of Central and State Pollution Control Board. • Environmental Clearance, Consent and Authorization Mechanism. Case Study of Dombivali MIDC- Boiler Blast Tragedy (Thane, Maharashtra, India), (May, 2016).	3
Module 5	Renewable Sources of Energy: • Importance of renewable sources of energy. • Principle and working with schematic diagram of :- (i) Solar Energy: (a) Flat plate collector and (b) Photovoltaic cell. (ii) Wind Energy: Wind Turbines. (iii) Hydropower: Hydropower generation from water reservoir of the dam. (iv) Geothermal Energy: Utilisation of underground sources of steam for power generation.	4
Module 6	Technological Advances to overcome Environmental problems: • Concept of Green Buildings, • Various indoor air pollutants and their effects on health. • Carbon Credit: Introduction and general concept. • Disaster Management: Techniques of Disaster Management to cope up with (i) Earthquake and (ii) Flood. Case Study on Earthquake in Latur (Maharashtra, India), (September,1993). Case Study on Cloudburst and Landslides at Kedarnath (Uttarakhand, India), (June, 2013).	5

Tests 1 & 2

1. Each test will be of 15 marks.
2. At least one question will be based on case study. Candidate is expected to explain the salient features of the incident and suggest preventive measures.

Theory Examination:

1. Question paper will comprise of total 6 questions, each of 15 marks.
2. Total four questions need to be solved.
3. Question Number One will be compulsory and it will be based on entire syllabus wherein sub-questions of 2 to 3 marks will be asked.
4. Remaining questions i.e. Q.2 to Q.6 will be mixed in nature and will be divided in three parts (a), (b) & (c) and they will belong to different modules.
5. In question paper, weight of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Recommended Books:

1. Environmental Studies by Benny Joseph, TataMcGraw Hill.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.
3. Environmental Studies by. AnanditaBasak, Pearson Education.
4. Essentials of Environmental Studies by Kurian Joseph &Nagendran, Pearson Education.
5. Fundamentals of Environmental Studies by Varadbal G. Mhatre, Himalaya Publication House.
6. Perspective of Environmental Studies, by Kaushik and Kaushik,New Age International.
7. Renewable Energy by Godfrey Boyle, Oxford Publications.
8. Textbook of Environmental Studies by Dave and Katewa, Cengage Learning.
9. Textbook of Environmental studies by ErachBharucha, University Press.
10. Environmental pollution control engineering by C.S. Rao, New Age International (P) Limited Publishers.

Sub. Code	Subject Name	Examination Scheme							
		Theory				Term Work	Pract.	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEL101	**Basic Workshop Practice-I**	-	-	-	-	50	-	-	50

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEL101	**Basic Workshop Practice - I**	-	04	-	-	02	-	02

Detailed Syllabus		Periods
Note:	The syllabus and the Term- work to be done during semester I and Semester II is given together. Individual Instructor for the course is to design the jobs for practice and demonstration and spread the work over entire two semesters. The objective is to impart training to help the students develop engineering skill sets. 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. No. 1- Fitting and 2 - Carpentry) shall be offered in separate semesters. Select any four trade topics (two per semester) out of the topic at Sr. n. 3 to 11. 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	
1.	**Fitting (compulsory)** • Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. • Term work to include one job involving following operations : filing to size, one simple male- female joint, drilling and tapping	30
2.	**Carpentry (compulsory)** • Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods. • Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning	30

3.	**Forging (Smithy)** • At least one workshop practice job (Lifting hook and handle) is to be demonstrated.	15
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.	15
5.	**Machine Shop** • At least one turning job is to be demonstrated.	15
6.	**Electrical board wiring** • House wiring, staircase wiring, wiring diagram for fluorescent tube light, Godown wiring and three phase wiring for electrical motors.	15
7.	**PCB Laboratory Exercises** Layout drawing, Positive and negative film making, PCB etching and drilling, Tinning and soldering technique.	15
8.	**Sheet metal working and Brazing** • Use of sheet metal, working hand tools, cutting , bending , spot welding	15
9.	**Plumbing** • Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc.	15
10.	**Masonry** • Use of masons tools like trowels, hammer, spirit level, square, plumb line and pins etc. demonstration of mortar making, single and one and half brick masonry , English and Flemish bonds, block masonry, pointing and plastering.	15
11	**Hardware and Networking:** • Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. • Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) • Basic troubleshooting and maintenance • Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping. **NOTE**: Hands on experience to be given in a group of not more than four students.	15

Term work:

1. Term work shall consist of respective reports and jobs of the trades selected the distribution of marks for term work shall be as follows.
2. Laboratory work (Job and Journal) : 40 marks
3. Attendance (Practical and Theory) : 10 marks

The final certification and acceptance of term – work ensures the satisfactory performance of laboratory work.