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UNIVERSITY OF MUMBAI

Bachelor of Engineering

First Year Engineering (Semester I & II), Revised course (REV- 2012) from Academic Year 2012 -13, (Common for All Branches of Engineering)

(As per Credit Based Semester and Grading System with effect from the academic year 2012–2013)

First Year Engineering (Semester I & II), Revised course from Academic Year 2012 -13, (REV- 2012),

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 & Electronics 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

(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 and 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 & Electronics 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

First Year Engineering (Semester I & II), Revised course from Academic Year 2012 -13, (REV- 2012), (Common for all branches)

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC201	Applied Mathematics-II	04	-	01	04		01	05
FEC202	Applied Physics-II	03	01	-	03	0.5	-	3.5
FEC203	Applied Chemistry -II	03	01	-	03	0.5		3.5
FEC204	Engineering Drawing	03	04	-	03	02	-	05
FEC205	Structured Programming Approach	04	02	-	04	01	-	05
FEC206	Communication Skills	02	02	-	02	01	-	03
FEL201	Basic Workshop Practice -II	-	04	-	-	02	-	02
		19	14	01	19	07	01	27

Scheme for Semester - II

Sub. Code	Subject Name	Examination Scheme							
		Theory marks				Term Work	Pract.	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Av. of Test 1 & 2					
FEC201	Applied Mathematics-II	20	20	20	80	25	-	-	125
FEC202	Applied Physics-II	15	15	15	60	25	-	-	100
FEC203	Applied Chemistry -II	15	15	15	60	25	-	-	100
FEC204	Engineering Drawing	15	15	15	60	25	50	-	150
FEC205	Structured Programming Approach	20	20	20	80	25	25	-	150
FEC206	Communication Skills	10	10	10	40	25	-	-	75
FEL201	Basic Workshop Practice-II	-	-	-	-	50	-	-	50
				95	380	200	75		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

Sub. Code	Subject Name	Examination Scheme							
		Theory				Term Work	Prat.	Oral	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

Detailed Syllabus

Sr.No	Topics	Hrs
1	Pre-requisite: **Review on Complex Number-**Algebra of Complex Number, Different representations of a Complex number and other definitions, D'Moivre's Theorem. **Module-1**: Complex Numbers:- 1.1: Powers and Roots of Exponential and Trigonometric Functions. 1.2: Circular functions of complex number and Hyperbolic functions.Inverse Circular and Inverse Hyperbolic functions. Logarithmic functions. 1.3: Separation of real and Imaginary parts of all types of Functions. 1.4: Expansion of $\sin^n\theta, \cos^n\theta$ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ	**2hrs** **2 hrs** **6 hrs** **3 hrs** **2 hrs**

2	**Module-2**: Matrices and Numerical Methods:- 2.1: 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 forms, system of homogeneous and non –homogeneous equations, their consistency and solutions. Linear dependent and independent vectors. 2.2: Solution of system of linear algebraic equations, by (1) Gauss Elimination Method (Review) (2) Guass Jordan Method (3) Crouts Method (LU) (4) Gauss Seidal Method and (5) Jacobi iteration **(Scilab programming for above methods is to be taught during lecture hours)**	**9 hrs** **6 hrs**
3	**Module-3**:Differential Calculus:- 3.1: Successive differentiation: nth derivative of standard functions. Leibnitz's Thoerem (without proof) and problems. 3.2: Partial Differentiation: Partial derivatives of first and higher order, total differentials, differentiation of composite and implicit functions. 3.3: Euler's Theorem on Homogeneous functions with two and three independent variables (with proof).Deductions from Euler's Theorem.	5 **hrs** 7 **hrs** 3 **hrs**
4	**Module-4**: Application of Partial differentiation, Expansion of functions , Indeterminate forms and curve fitting:- 3.1.: Maxima and Minima of a function of two independent variables. Lagrange's method of undetermined multipliers with one constraint. Jacobian, Jacobian of implicit function. Partial derivative of implicit function using jacobian. 3.2: Taylor's Theorem(Statement only) and Taylor's series, Maclaurin's series (Statement only).Expansion of e^x, sinx, cosx, tanx, sinhx, coshx, tanhx, log(1+x), $\sin^{-1}x$, $\cos^{1}x$, Binomial series. Indeterminate forms, L-Hospital Rule, problems involving series also. 3.3: Fitting of curves by least square method for linear, parabolic, and exponential. Regression Analysis(to be introduced for estimation only) **(Scilab programming related to fitting of curves is to be taught during lecture hours)**	4 **hrs** 6 **hrs** 5 **hrs**

Recommended Books:

1: A text book of Applied Mathematics, P.N.Wartikar and J.N.Wartikar,Vol – I and –II by Pune Vidyarthi Graha.

2: Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication

3: Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited,9thEd.

4: Matrices by Shanti Narayan.

5: Numerical by S.S.Sastry, Prentice Hall

Theory Examination:

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

2. Total 4 questions need to be solved.

3: Question No.1 will be compulsory and 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.

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 practicals.

(2) Students must be encouraged to write Scilab Programs in tutorial class only. Each

Student has to write **at least 4 Scilab tutorials (including print out) and at least**

6 class tutorials on entire syllabus.

(3) SciLab Tutorials will be based on (1) Guass Jordan Method (2) Crouts

Method (LU) (3) Guass Seidal Method and (4) Jacobi iteration (5) Curve Fitting

for linear, parabolic and exponential functions

The distribution of marks for term work will be as follows,

Attendance (Theory and Tutorial) :05 marks

Class Tutorials on entire syllabus :10 marks

SciLab Tutorials :10

The final certification and acceptance of term-work ensures the satisfactory

Performance of laboratory work and minimum passing in the term work.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC102	**Applied Physics-I**	03	01	-	03	0.5	-	3.5

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					
FEC102	**Applied Physics-I**	15	15	15	60	25	-	-	100

Detailed Syllabus:

1. CRYSTAL STRUCTURE (15)

Crystallography: Space lattice, Unit Cell, Lattice parameters, Bravais lattices and Crystal systems, Cubic crystal system & lattices; Density & Packing Fraction; Miller indices of crystallographic planes & directions; interplanar distance; Diamond structure, NaCl structure, HCP structure, $BaTiO_3$ structure; Ligancy and Critical radius ratio; Determination of crystal structure using X-ray diffraction techniques viz. Laue method, rotating crystal method (Bragg method) & powder method; Real crystals & point-defects; photonic crystals; Liquid crystal phases and application in LCD (with brief introduction of optical polarization).

2. SEMICONDUCTOR PHYSICS (14)

Energy bands of solids and classification of solids; Concepts of holes, effective mass; drift mobility and conductivity in conductors, intrinsic semiconductors and extrinsic semiconductors; Fermi-Dirac distribution function and Fermi energy level in a conductor, insulator, intrinsic & extrinsic semiconductor; Effect of impurity concentration and temperature on the Fermi Level; Hall Effect (applied electric field along x-axis and applied magnetic field along z-axis) and its application.

Drift and Diffusion of charge carriers across the Energy band structure of P-N Junction leading to formation of depletion region and potential barrier; concept of carrier current densities in p-n junction in

equilibrium, forward bias and reverse bias; Uses of p-n junction in Light emitting diode (LED), photoconductors & photovoltaic solar cells.

3. DIELECTRICS & MAGNETIC MATERIALS (09)

Dielectric material, dielectric constant, polarization, polarizability & its types; relative permittivity; Piezoelectrics, Ferroelectrics, Applications of dielectric materials - Requirement of good insulating material, some important insulating material.

Origin of magnetization using Atomic Theory; classification of magnetic materials based on Susceptibility value; Qualitative treatment of Langevin's and Weiss equation for Dia, Para and Ferro magnetic materials (no derivation); Microstructure of ferromagnetic solids- Domains and Hysteresis loss; Soft & hard magnetic materials and their uses; Magnetic circuits and microscopic Ohm's Law.

4. ACOUSTICS & ULTRASONICS: (07)

Introduction to architectural acoustics; reverberation and Sabine's formula; Common Acoustic defects and Acoustic Design of a hall

Ultrasonic Waves and their applications; Methods of production of ultrasonic waves (Piezoelectric Oscillator & Magnetostriction Oscillator)

Books Recommended:

1. A Textbook of Engineering physics - Avadhanulu & Kshirsagar, S.Chand
2. Applied Solid State Physics - Rajnikant, Wiley india
3. Engineering Physics- Uma Mukherji (third edition), Narosa
4. Engineering Physics - R.K.Gaur & S.L. Gupta, Dhanpat Rai publications
5. Solid State physics - A.J. Dekker, Macmillan Student Edition
6. Modern Engineering Physics – Vasudeva, S.Chand
7. Solid State Physics- Charles kittle, EEE Pbl
8. Concepts of Modern Physics- Arther Beiser, Tata Mcgraw Hill

Suggested Experiments: (Any five)

1. Study of SC, BCC, FCC.
2. Study of Diamond, NaCl ,$BaTiO_3$.
3. Study of HCP structure.

4. Study of Miller Indices Plane and direction.
5. Study of Hall Effect.
6. Determination of energy band gap of semiconductor.
7. Determination of ‘h’ using photocell.
8. Study of Ultrasonic Distance Metre.
9. Determination of losses using hysteresis loop.
10. Study of I / V characteristics of semiconductor diode.

Note: Distribution of marks for term work

1. Laboratory work (Experiments and Journal): 15 marks
2. Assignments :05 marks
3. Attendance (Practical and Theory): 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.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC103	**Applied Chemistry - I**	03	01	-	03	0.5	-	3.5

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					
FEC103	**Applied Chemistry - I**	15	15	15	60	25	-	-	100

Details of the syllabus:-

Sr. No.	Details	Hrs
Module 1	**Water:** • Impurities in water, Hardness of water, Determination of Hardness of water by EDTA method and problems. Softening of water by Hot cold lime soda method and problems. Zeolite process and problems. Ion Exchange process and problems. • **Drinking water or Municipal water,** Treatments removal of microorganisms, by adding Bleaching powder, Chlorination (no breakpoint chlorination), Disinfection by Ozone, Electrodialysis and Reverse osmosis, ultra filtration. • **BOD, COD**(def,& significance), sewage treatments activated sludge process, numerical problems related to COD.	12

Module 2	**Polymers:** • Introduction to polymers, Thermoplastic and Thermosetting plastic. • Ingredients of the plastic (Compounding of plastic.) • Fabrication of plastic by Compression, Injection , Transfer, Extrusion molding. Preparation, properties and uses of Phenolformaldehyde, PMMA , Kevlar. • Effect of heat on the polymers (Glass transition temperatures) Polymers in medicine and surgery. • Conducting polymers, Industrial polymers. **Rubbers:** • Natural rubber (latex), Drawbacks of natural rubber, Compounding of rubber (vulcanization of rubber), Preparation, properties and uses of Buna-S, Silicone and Polyurethane rubber.	12
Module 3	**Lubricants** • Introduction , Definition, Mechanism of Lubrication, Classification of lubricants, Solid lubricants (graphite & Molybdenum disulphide) , Semisolid lubricants (greases Na base , Li base , Ca base, Axle greases.) , Liquid lubricants(blended oils). • Important properties of lubricants , definition and significance ,viscosity ,viscosity index, flash and fire points, cloud and pour points, oiliness, Emulsification, Acid value and problems, Saponification value and problems .	08
Module 4	**Phase Rule** • Gibb's Phase Rule, Explanation, One Component System (Water) , Reduced Phase Rule, Two Component System (Pb-Ag), Limitations of Phase Rule.	05
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**. Refractories** Preparation, properties and uses of Silica bricks, Dolomite bricks , Silicon Carbide (SiC). • **Nanomaterials** , preparation (Laser and CVD method), properties and uses of CNTS	08

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 2 to 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 3).

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 : 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 - Applied Chemistry I
1) To determine total, temporary and permanent hardness of water sample.
2) Removal of hardness using ion exchange column.
3) To determine Saponification value of a lubricating oil.
4) To determine acid value of a lubricating oil.
5) To determine free acid PH of different solutions using PH meter / Titration.
6) To determine metal ion concentration using colorimeter.
7) To determine flash point and fire point of a lubricating oil
8) To determine Chloride content of water by Mohr's Method.
9) To determine melting point and/or glass transition temperature of a polymer.

10) To determine conductance of polymer.
11) To determine the percentage of lime in cement.
12) Hardening and setting of cement using Vicat's apparatus
13) To determine the COD of the given water sample. / Dichromate method.
14) Viscosity by Redwood Viscometer.

Recommended Books:

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

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

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. Distributed Forces in plane. **1.2 Center of Gravity and Centroid** for plane Laminas.	**05** **04**
02	**2.1 Equilibrium of system of coplanar forces**:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. **2.2 Types of support**, loads, Beams, Determination of reactions at supports for various types of loads on beams. **2.3 Analysis of plane trusses** by using Method of joints and Method of sections.(Excluding pin jointed frames)	**06** **04** **04**
03	**3.1 Forces in space**: **Resultant of Noncoplanar force systems:** Resultant of Concurrent force system, Parallel force system and Nonconcurrent nonparallel force system.	**05**

	Equilibrium of Noncoplanar force systems: Equilibrium of Concurrent force system, Parallel force system and Nonconcurrent nonparallel 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.	**06**
04	**4.1 Kinematics of Particle**: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion, Relative velocities.	**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 2 linkage mechanism)	**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**

Theory Examination:

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

2. Total 4 questions need to be solved.

3: Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 3 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 15 marks each.

5. In question paper weightage of each module will be proportional to number of respective lecture hours 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, 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.

Recommended Books

1. Engineering Mechanics by Hibblar, McMillan.
2. Engineering Mechanics by Beer & Johnson, Tata McGraw Hill
3. Engineering Mechanics by Merium, Wiley.
4. Engineering Mechanics by F. L. Singer, Harper & Raw Publication
5. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill
6. Engineering Mechanics by Shaum Series,
7. Engineering Mechanics by Tayal, Umesh Publication.

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

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					
FEC105	**Basic Electrical & Electronics Engineering**	20	20	20	80	25	-	25	150

Detailed Syllabus:

Module	Content	Hours
Prerequisite	**A.** Concept of e.m.f, potential difference, current, ohm's law, resistance, resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance **B.** Capacitors, with uniform and composite medium, energy stored in capacitor, R-C time constant. **C.** Magnetic field, Faraday's laws of Electromagnetic induction, Hysterics and eddy current losses, energy stored in an inductor, time constant in R-L circuit.	No questions to be asked in Theory paper on Prerequisite 02
1	**D.C. circuits:** (only independent sources). Kirchhoff 's laws, Ideal and practical voltage and current source, Mesh and Nodal analysis (super node and super mesh excluded), 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)	20

2	**A.C 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
3	**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 two wattmeter method	10
4	**Single phase transformer :** Construction, working principle, Emf equation, ideal and practical transformer, transformer on no load and on load, phasor diagrams, equivalent circuit, O.C. and S.C test, Efficiency	10
5	**Electronics** (no numericals): Semiconductor diode, Diode rectifier with R load: Half wave, full wave– center tapped and bridge configuration, RMS value and average value of output voltage, ripple factor, rectification efficiency, introduction to C and L filter (no derivation). CE, CB, CC transistor configuration, CE input-output characteristics.	06

Theory Examination:

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

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.
6. Relationship between phase and line currents and voltages in 3 – phase System (star & delta)

7. Power and phase measurement in three phase system by two wattmeter method.
8. O.C. and S.C. test on single phase transformer
9. Half wave and full wave rectifier circuits

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. Electronics Devices & Circuit Theory" by Boylestad, Pearson Education India
4. Edward Hughes: Electrical and Electrical Technology, Pearson Education (Tenth edition)
5. 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
6	**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					
6	**Environmental studies**	15	15	15	60	-	-	-	75

Details of the syllabus:-

Sr. No.	Details	Hrs
Module 1	**Multidisciplinary Nature of Environmental Studies:** • Scope and Importance • Need for Public Awareness • Depleting Nature of Environmental resources such as Soil, Water, Minerals, and Forests. • Global Environmental Crisis related to Population, Water, Sanitation and Land. • Ecosystem: Concept, Classification, Structure of Ecosystem, overview of Food chain, Food web and Ecological Pyramid	04

Module 2	**Sustainable Development** • Concept of sustainable development • Social, Economical and Environmental aspect of sustainable development. • Control Measures: 3R (Reuse, Recovery, Recycle), Appropriate Technology, Environmental education, Resource utilization as per the carrying capacity**.**	04
Module 3	**Environmental Pollution:** • Air Pollution: Sources, Effects of air pollution with respect to Global Warming, Ozone layer Depletion, Acid Rain, Photochemical smog, Two Control Measures- Bag house Filter, Venturi scrubber . Case Study: Bhopal Gas Tragedy • Water Pollution: Sources and Treatment, Concept of waste waters - Domestic &Industrial and treatment. Case Study: Minamata Disease. • Land Pollution: Solid waste, Solid waste Management by Land filling, Composting. • Noise Pollution; Sources and Effects • E-Pollution: Sources and Effects.	07
Module 4	**Environmental Legislation:** • Overview • Ministry of Environment and Forests (MoE&F). Organizational structure of MoE&F. • Functions and powers of Central Control Pollution Board. • Functions and powers of State Control Pollution Board. • Environmental Clearance, Consent and Authorization Mechanism. • Environmental Protection Act • Any two case studies pertaining to Environmental Legislation.	05
Module 5	**Renewable sources of Energy:** • Limitations of conventional sources of Energy. • Various renewable energy sources. • Solar Energy: Principle, Working of Flat plate collector & Photovoltaic cell. • Wind Energy: Principle, Wind Turbines.	05

	• Hydel Energy: Principle, Hydropower generation. • Geothermal Energy: Introduction, Steam Power Plant	
Module 6	**Environment and Technology** • Role of Technology in Environment and health • Concept of Green Buildings, Indoor air pollution • Carbon Credit: Introduction, General concept. • Disaster Management: Two Events: Tsunami, Earthquakes, Techniques of Disaster Management • Case Study: Earthquake in Japan	05

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. Textbook of Environmental studies by Erach Bharucha, University Press.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.
3. Essentials of Environmental Studies by Kurian Joseph &Nagendran, Pearson Education
4. Renewable Energy by Godfrey Boyle, Oxford Publications.
5. Perspective Of Environmental Studies, by Kaushik and Kaushik,New Age International
6. Environmental Studies by. Anandita Basak, Pearson Education
7. Textbook of Environmental Studies by Dave and Katewa, Cengage Learning
8. Environmental Studies by Benny Joseph, TataMcGraw Hill

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

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

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:

Term work shall consist of respective reports and jobs of the trades selected the distribution of marks for term work shall be as follows.

Laboratory work (Job and Journal) : 40 marks

Attendance (Practical and Theory) : 10 marks

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

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC201	**Applied Mathematics-II**	04	-	01	04	-	01	05

Sub. Code	Subject Name	Examination Scheme							
		Theory Marks				TW	Prat	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEC201	**Applied Mathematics-II**	20	20	20	80	25	-	-	125

Detailed Syllabus:

Sr.No.	Topic	Hrs
1	Prerequiste: Idea of Curve tracing in cartesian, parametric and polar forms. Straight lines, Circles, Parabolas, Hyperbola, Catenary, Cissoid, Astroid, Cycloid, Lemniscate of Bernoulli, Cardiode. Concept of Solid Geometry -Planes, Spheres, Cones, Cylinders, Paraboloids (Tracing of curves by using SciLab). **Module-1: Beta and Gamma functions, Differentiation under Integral sign and exact differential equation:** 1.1: Beta and Gamma functions and its properties. Differentiation under integral sign with constant limits of integration.	2 **hrs** 5 **hrs**

	1.2: Rectification of plane curves. 1.3: Differential Equation of first order and first degree-Exact differential equations, Equations reducible to exact equations by integrating factors.	**4hrs** 4 **hrs**
2	**Module-2**: **Differential Calculus** 2.1: Linear differential equations(Review), equation reducible to linear form, Bernoulli's equation. 2.2: Linear Differential Eqaution with constant coeffiecient- Complimentary function, particular integrals of differential equation of the type f(D)y = X where X is e^{ax}, sin (ax+b), cos (ax+b), x^n, $e^{ax}V$, xV. 2.3: Cauchy's homogeneous linear differential equation and Legendre's differential equation, Method of variation of parameters. 2.4: Simple application of differential equation of first order and second order to electrical and Mechanical Engineering problem (no formulation of differential equation)	 2 **hrs** 6 **hrs** 4 **hrs** 3 **hrs**
3	**Module-3: Numerical solution of ordinary differential equations of first order and first degree and Multiple Integrals-** 3.1 :(a)Taylor's series method (b)Euler's method (c) Modified Euler method (d) Runga-Kutta fourth order formula (SciLab programming is to be taught during lecture hours) 3.2:Multiple Integrals-Double integration-definition, Evaluation of Double Integrals, Change of order of integration, Evaluation of double integrals by changing the order of integration and changing to polar form (Examples on change of variables by using Jacobians only).	 5 **hrs** 10 **hrs**

4	**Module -4:Multiple Integrals with Application and Numerical Integration:-** 4.1: Triple integration –definition and evaluation (Cartesian, cylindrical and spherical polar coordinates). 4.2: Application to double integrals to compute Area, Mass, Volume. Application of triple integral to compute volume. 4.3: Numerical integration-Different type of operators such as shift, forward, backward difference and their relation. Interpolation, Newton iterpolation, Newton-Cotes formula(with proof). Integration by (a) Trapezoidal (b) Simpson's $1/3^{rd}$ (c) Simpson's $3/8^{th}$ rule (all with proof). (Scilab programming on (a) (b) (c) (d) is to be taught during lecture hours)	3 **hrs** 5 **hrs** 7 **hrs**

Recommended Books:

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

Pune Vidyarthi Graha.

2: Higher Engineering Mathematics, Dr.B. S. Grewal, Khanna Publication

3: Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited,9^{th} Ed.

4: Numerical Analysis by S.S.Sastry, Prentice Hall

5: Differential Equations, Sheply Ross, Wiley India.

Theory Examination:

1. Question paper will comprise of 6questions, each carrying 20 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 should 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 practicals.

(2) Students must be encouraged to write Scilab Programs during the tutorials. Each student has to write **at least 5 Scilab tutorials (including print out) and at least 5 class tutorials on entire syllabus**.

(3) SciLab Tutorials will be based on (1)Curve Tracing (2) from module3 on (a)Taylor's series method (b)Euler's method (c) Modified Euler method (d) Runga-Kutta fourth order formula (4) ordinary differential equation and (5) Trapezoidal ,Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ rule.

The distribution of marks for term work will be as follows,

Attendance (Theory and Tutorial) : 05 marks

Class Tutorials on entire syllabus : 10 marks

SciLab Tutorials : 10

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	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC202	**Applied Physics - II**	03	01	-	03	0.5	-	3.5

Sub. Code	Subject Name	Examination Scheme							
		Theory				Term Work	Prat.	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEC202	**Applied Physics - II**	15	15	15	60	25	-	-	100

1. INTERFERENCE AND DIFFRACTION OF LIGHT (15)

Interference in thin film - Introduction, interference due to reflected and transmitted light by thin transparent parallel film; origin of colours in thin film; Wedge shaped thin film; Newton's rings;

Applications of interference - Determination of thickness of very thin wire or foil, determination of refractive index of liquid, wavelength of incident light , radius of curvature of lens, testing of surface flatness, non-reflecting films, Highly reflecting film

Diffraction of Light – Introduction; Fraunhoffer diffraction at single slit ; Fraunhoffer diffraction at ouble slit; diffraction due to N- slits (Diffraction Grating), missing orders, Highest possible orders; determination of wavelength of light with a plane transmission grating; resolving power of a grating; dispersive power of a grating.

2. FIBRE OPTICS AND LASERS: (09)

Fibre optics : Introduction, total internal reflection, basic construction, optical fibre as light guide and types of optical fibre; Numerical Aperture and maximum angle of acceptance, Numerical Aperture for graded index fibre; V-number, Maximum number of possible orders; Losses in optical fibre; Merits of optical fibre; Applications.

Lasers : Quantum processes as absorption, spontaneous emission and stimulated emission; metastable states, population inversion, pumping, resonance cavity, Einsteins's equations; Helium Neon laser; Nd:YAG laser; Semiconductor laser,

Applications of laser- Holography (construction and reconstruction of holograms) and other applications.

3. QUANTUM MECHANICS: (08)

Introduction, Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; properties of matter waves; wave packet, group velocity and phase velocity; Wave function, Physical interpretation of 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.

4. MOTION OF CHARGED PARTICLE IN ELECTRIC AND MAGNETIC FIELDS - (03)

Electrostatic focusing; Magnetostatic focusing; Cathode ray tube (CRT); Cathod ray Oscilloscope (CRO); Application of of CRO,

5. SUPERCONDUCTIVITY: (03)

Introduction, Meissner Effect; Type I and Type II superconductors; BCS Theory(concept of Cooper pair); Josephson effect; Applications of superconductors- SQUID, MAGLEV

6. NANOSCIENCE AND NANOTECHNOLOGY (07)

Introduction to nano-science and nanotechnology; Two main approaches in nanotechnology - Bottom up technique and top down technique; Tools used in nanotechnology such as Scanning electron microscope, Scanning Tunneling Microscope, Atomic Force Microscope.

Nano materials: Methods to produce nanomaterials; Applications of nanomaterials; Different forms of carbon nanoparticles, carbon nanotubes, properties and applications.

Books Recommended:

1. A Textbook of Engineering physics - Avadhanulu & Kshirsagar, S.Chand
2. Engineering Physics- Uma Mukherji (third edition), Narosa
3. Engineering Physics - R.K.Gaur & S.L. Gupta, Dhanpat Rai publications
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- Arther Beiser, Tata Mcgraw Hill
6. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
7. Optics - Ajay Ghatak, Tata Mc Graw Hill
8. Intoduction to Nanotechnology- Charles P. Poole, Jr., Frank J. Owens,Wiley India edition
9. Nano: The Essential – T. Pradeep, Mcgraw-Hill Education

Suggested Experiments: (Any five)

1. Determination of radius of curvature of a lens using Newton's ring set up
2. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
3. Determination of wavelength using Diffracion grating.(Hg/ Na source)
4. Determination of number of lines on the grating surface using Diffracion grating.
5. Determination of Numerical Aperture of an optical fibre.
6. Determination of wavelength using Diffracion grating.(Laser source)
7. Use of CRO for measurement of frequency and amplitude.
8. Use of CRO for measurement of phase angle.
9. Study of divergence of laser beam
10. Determination of width of a slit using single slit diffraction experiment(laser source)

Note: Distribution of marks for term work

1. Laboratory work (Experiments and Journal) : 15 marks
2. Assignments : 05 marks

2. Attendance (Practical and Theory): 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	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC203	**Applied Chemistry -II**	03	01	-	03	0.5		3.5

Sub. Code	Subject Name	Examination Scheme							
		Theory Marks				TW	Prat	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 and Test 2					
FEC203	**Applied Chemistry -II**	15	15	15	60	25	-	-	100

Details of the syllabus:-

Details	**Hrs**
Module 1: **Corrosion :** • Introduction: Types of Corrosion (I) Dry or Chemical Corrosion i) Due to oxygen ii) due to other gases. (II) Wet or Electrochemical Corrosion :- Mechanism i) Evolution of hydrogen type ii) Absorption of oxygen. Types of Electro-Chemical Corrosion – Galvanic cell corrosion, Concentration cell corrosion (differential aeration), pitting corrosion, Intergranular corrosion, Stress Corrosion , Polarization. • Factors affecting the rate of corrosion :- Nature of metal, position in galvanic series, potential difference, overvoltage, relative area of the anodic and cathodic parts, purity of metal, nature of the corrosion product, temperature, moisture, influence of PH, concentrations of the electrolytes.	10

• Methods to Decrease the rate of Corrosion :- Proper designing, using pure metal, using metal alloys, Cathodic protection – i) Sacrificial anodic protection, ii) Impressed current method, Anodic protection method, Metallic coatings, hot dipping , galvanizing, tinning, metal cladding, metal spraying, Electroplating, Cementation, Organic Coatings ,Paints only constituents and their functions.	
Module 2 : **Alloys :** • Introduction, purpose of making alloys, Ferrous Alloys, plain carbon steel, heat resisting steels, stainless steels (corrosion resistant steels), effect of the alloying element, Ni, Cr, Co, Mg, Mo, W, and V. • Non-Ferrous Alloys- Alloys of Al – i) Duralumin ii) Magnalumin. **Alloys of Cu**-Brasses – i) Commercial brass ii) German Silver. Bronzes – i) Gun metal ii) High – phosphorus bronze. **Alloys of pb** – i) Wood's metal. ii) Tinman's solders. Their composition (Reference 1 by Jain & Jain), properties & uses. • **Powder Metallurgy** :- Introduction, methods of metal powder formation (1) (a) Mechanical pulverization (b) Atomization (c) Chemical reduction (d) Electrolytic process (e) Decomposition. (2) Mixing & blending (3) Sintering. (4) Compacting :- Various methods such as i) cold pressing. ii) Powder injection moulding. iii) Hot compaction. • **Applications of powder metallurgy**. • Manufacture of oxide & non-oxide ceramic powders only i) Alumina ii) Silicon Carbide	09
Module 3 : **Fuels** • Definition, Classification of fuels – solid, Liquid & Gaseous. Calorific value – def. Gross or Higher C.V. & Net or lower C.V. units of heat (no conversions). Dulong's formula & numericals for calculations of Gross & Net C.V. **Analysis of coal** – i) Proximate Analysis with numericals and its importance ii) Ultimate Analysis with numericals and its importance, Characteristic properties of the good fuel. • **Liquid Fuels** – Crude petroleum oil; its composition & classification & mining (in brief). **Refining of crude oil** i) separation of water ii) Separation of 'S' & iii) Fractional distillation with diagram & composition table. • **Cracking** – Definition; Types of cracking – I) **Thermal Cracking**– (a) Liquid phase thermal cracking b) Vapour phase thermal cracking. II) **Catalytic Cracking** – (a) Fixed – bed catalytic cracking (b) Moving – bed catalytic cracking. Advantages of Catalytic	12

Cracking. • **Petrol :** Refining of petrol, unleaded petrol (MTBE use of catalytic converter), power alcohol. Knocking, Octane number (antiknocking agents), Cetane number • **Combustion:** calculations for requirement of only oxygen & air (by weight & by volume only) for given solid, liquid & gaseous fuels. • **Bio-diesel,** Method to obtain Biodiesel from vegetable oils (Trans-esterification), advantages and disadvantages of Biodiesel. • **Propellants:** Definition, Characteristics of a good propellant, classification of propellants, Two examples each.	
Module 4 : **Composite Materials and Adhesives :** • **Introduction, Constitution** i) Matrix phase ii) Dispersed phase. Characteristic properties of composite materials Classification – A**) Particle** – reinforced composites i) Large – particle composites ii) Dispersion – strengthened Composites. B) **Fiber** – Reinforced Composites (i) Continuous aligned (ii) Discontinuous (short) (a) aligned (b) Randomly oriented. (C) **Structural Composites** – (i) Laminates (ii) Sandwich Panels. **Adhesives :** • Introduction, Adhesive action, Physical Factors Influencing Adhesive action, Chemical Factors Influencing, Adhesive action, Bonding Processes by adhesives.	10
Module 5 : **Green Chemistry:** • Introduction, Twelve Principles of Green chemistry, numericals on atom economy, synthesis , adipic acid and indigo. • Green solvents (ionic liquid supercritical CO_2), and products from natural materials.	04

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 2 to 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 3.

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 : 10 marks

Total : 25marks

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

Suggested Experiments	**Applied Chemistry-II**
Estimation of Zn Complexometric titration.	
Estimation of Ni complexometric titration.	
Estimation of Al complexometric titration.	
Calorific value of solid or liquid fuel using Bomb Calorimeter.	
Preparation of membranes for filter any one Demon.	
CO_2 from air by Orsats method.	
Estimation of Fe from plain C steel.	
Estimation of Ni by gravimetric method.	
Estimation of Sn iodometrically.	
Preparation of Bio diesel from edible oil.	
Synthesis of simple layered materials and their characterization.	
Preparing simple composites and their characterization.	
Estimation of Cu iodometrically.	
Estimate % of Moisture from coal.	
To de4termine the E cell of Cu-Zn system by potentiometry.	

Recommended Books:

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

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC204	**Engineering Drawing**	03	04	-	03	02	-	05

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 and Test 2					
FEC204	**Engineering Drawing**	15	15	15	60	25	50	-	150

Preamble

Considering the recent practices in industries and easy availability of software this conventional drawing may be totally converted in to AutoCAD from the next revision.

Objective of the course

1) Students should be able to visualize the objects.
2) They should be able to understand and read drawing.
3) They should be able to present the same.

Module	Details	Hrs
1	Introduction to Engineering Drawing. Types of Lines, Dimensioning Systems as per IS conventions. Engineering Curves: Basic construction of Cycloid, Involutes and Helix(of cylinder) only ****Introduction to Auto CAD**:- Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing.	**3**
2	**Projection of Points and Lines:-**Lines inclined to both the Reference Planes. (Excluding Traces). **@Projection of Planes:** Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to either HP or VP only. (Exclude composite planes)	**6**

3	**Projection of Solids:** - (Prism, Pyramid, Cylinder, Cone only) Solid projection with the axis inclined to HP and VP. (Exclude Spheres , Composite and Hollow solids).. Use change of position or Auxiliary plane method Section of solids:- section of Prism, Pyramid, Cylinder, &Cone , cut by plane perpendicular to at least one reference plane.(Exclude Curved section Plane). Use change of position or Auxiliary plane method **Development of Surfaces:-** Lateral surface development of Prism, Pyramid, Cylinder, Cone with section plane inclined to HP or VP only. (Exclude Reverse Development)	**14**
4	**Orthographic projections:-** • Different views of a simple machine part as per the first angle projection method recommended by I.S. • Full or Half Sectional views of the Simple Machine parts. • ****Drawing of orthographic projections using Auto CAD.**	**12**
5	Isometric Projections: Isometric projection/Drawing of blocks (plain and cylindrical excluding spheres). • ****Drawing of Isometric projections using Auto CAD.** • **@**Reading of orthographic projections. **(Only for TW)** • ***Orthographic Reading using Auto CAD.** ****Introduction to 3D in AutoCAD** Working in 3-dimensions, Viewing 3D Objects, Basic wireframe models, Extruding, simple revolved objects. Boolean operations. Generation of orthographic projections from 3D drawing.	**10**

****Should be covered during Auto CAD practical.**

@ only in Term Work.(i.e:-Questions will not be asked for the examination.)

Term Work:

Component-1

Sheet-1: Projection of Solids (2 problems) + Section and Development of solid surfaces (2 problem)

Sheet -2: Orthographic projection without section (2 problems).

Sheet -3: Orthographic projection with section (2 problems).

Sheet- 4: Isometric Projections (3 problems).

Component -2

One A-3 size sketch book consisting of:-

1) 3 problems each from Projection of Curves, Lines, Planes and Solids.
2) 3 problems from Section and Development of Solids.
3) 2 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

Component-3

Printouts of minimum 2 problems **(preferably in A3 size sheet)** each from:

1) Simple Orthographic Projections.
2) Orthographic Projections – Section.
3) Isometric projections.
4) Reading of Orthographic Projections

Note:- 2 hrs /week Auto CAD Practical is essential for completing the Auto CAD Drawings and take required printouts.

AutoCAD Examination: (2hrs):

1) Minimum 1 problem from 1 or 2 or 4 of component-3 **and**
2) Minimum 1 problem from 3 of component-3.
3) Print out of the Answers have to be taken **preferably in A3 size sheets** and should be assessed by External examiner. Knowledge of concepts and accuracy of drawing should be considered during evaluation.

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 15 marks.

2. Only 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus.

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.

Text Books.

1) N.D. Bhatt, “Engineering Drawing (Plane and solid geometry)”, Charotar Publishing House Pvt. Ltd.

2) N.D. Bhatt & V.M. Panchal, “Machine Drawing”, Charotar Publishing House Pvt. Ltd.

References.

1) M.B Shah & B.C Rana, “Engineering Drawing”, Pearson Publications.

2) P.J. Shah, “Engineering Graphics”, S Chand Publications.

3) Dhananjay A Jolhe, “Engineering Drawing” Tata McGraw Hill

4) Prof. Sham Tickoo (Purdue University) & Gaurav Verma, “(CAD Soft Technologies) : Auto CAD 2012 (For engineers and Designers)”, Dreamtech Press NewDelhi.

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC205	**Structured Programming Approach**	04	02	-	04	01	-	05

Sub. Code	Subject Name	Examination Scheme							
		Theory Marks				TW	Prat	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Av. of Test 1 & Test 2					
FEC205	**Structured Programming Approach**	20	20	20	80	25	25	-	150

Primary Objectives of this subject

This subject aims to provide students with an understanding of the role computation can play in solving problems. The course will be taught using C programming language.

Program Education Objectives

After completing this course, students will be able to:

- Understand classical problem solving strategies and use them in solving problems that can be implemented using a programming language.
- Identify a problem that requires a programmed solution.
- Use structured approach to describe the solution concept.
- Understand concept of data types and variables using C.
- Use common operators in C to solve a problem.
- Implement conditional statements in C .
- Implement looping constructs in C.
- Implement functions in C.
- Use simple and structured data types in C to solve given problem
- Implement simple problems using files and pointers

Detail Syllabus

Unit No	Unit	Number of Hours
1	**Problem definition**	02
2	**Algorithms**	
2.1	Developing Algorithms	05
2.2	Efficiency of Algorithms	01
3	**Expressing Algorithm – Sequence**	
3.1	Expressions in C; Arithmetic and Boolean expressions	03
3.2	Use of Standard functions	01
3.3	Assignment statement	01
3.4	Input and output	02
4	**Concept of scalar Data Types**	04
4.1	scalar data types in C , Scope and life time, type conversion	
5	**Expressing Algorithms – Iteration**	
5.1	Ordering a solution in a loop	02
5.2	C- Control structures for Iteration	06
6	**Expressing Algorithms – Selection**	01
6.1	C-Control structures for selection	02
7	**Decomposition of solution**	01
7.1	Defining Functions in C	02
7.2	Functions and parameters	02
7.3	Introduction to recursive functions	02
8	**Additional C data types**	
8.1	Arrays – single and multi dimensional	03
8.2	Strings	02
8.3	Structures	02
8.3	Files	02
8.4	Pointers	02

Books:

Text:

1. programming in C ; second edition; Pradeep Day and Manas Gosh ;Oxford University Press 2011

2. C Programming with Problem solving ; Jacqueline A. Jones & Keith Harrow – Dreamtech India– Scott Jones California USA

Reference

1. Introduction to Engineering programming – James Paul Hollowat – John Wiley ISBN 9812-53-022-3

2. Introduction to programming and problem solving ; G. Michael Schneider ; Wiley India edition;

Laboratory Assignments

1. Students are expected to solve and execute at least 20 programming problems based on above syllabus.

2. Journal work should comprise of writing the problem definition, solution of problem either as Algorithm or flow chart and source code in C (preferably hand written) for all the 20 problems.

Theory Examination:

1. Question paper will comprise of 6 questions, each carrying 20 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	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEC206	**Communication Skills**	02	02	-	02	01	-	03

Sub. Code	Subject Name	Examination Scheme							
		Theory				TW	Prat	Oral	Total
		Internal Assessment			End sem. exam				
		Test 1	Test 2	Average of Test 1 & 2					
FEC206	**Communication Skills**	10	10	10	40	25	-	-	75

S.No	**Topic**	**No. of lectures**
1.	Communication Theory: The communication process, objectives, barriers to communication, methods of communication, formal and informal channels of communication in a business organization, techniques to improve communication (Listening, speaking, reading, writing)	12
2.	Grammar and Vocabulary: Pairs of confused words, common errors, use of articles, prepositions, apostrophes, agreement of the verb with the subject, one-word substitution, synonyms and antonyms	3

3.	Business Correspondence: Principles of business correspondence, parts of a business letter, formats (Full-block/Complete block, Modified block, Semi-block), types of letters: Enquiry letters and replies to enquiry (enquiry about a product, service or information, asking for a quotation, placing an order and replies to the same) letters of Claim and Adjustment.	9
4.	Summarization and Comprehension: Technical and industry-oriented passages (not less than 400 words)	3
5.	Technical writing : Framing definitions, writing instructions, language exercises based on types of expositions (description of an object, explanation of a process)	3

Note: Two tests are prescribed for internal assessment. The first test should be conducted in the form of a three-minute public speech. The second test should be based on theory and application exercises based on the syllabus.

Term work: 25 marks
Assignments: 20 marks
Attendance: 05 marks

List of assignments:
Summarization & Comprehension
Grammar practice
Communication theory: Application exercises
Barriers to Communication
Principles of Business Correspondence
Formats of business letters
Types of letters
Technical writing

Recommended reference books for Communication Skills:
Business Communication by Urmila Rai & S.M. Rai, Himalaya Publishing House
Communication Skills by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
Business Correspondence & Report-writing by R.C.Sharma & Krishna Mohan, Tata McGraw-Hill Education
Effective Technical Communication by Ashraf Rizvi, Tata McGraw-Hill
Technical Writing & Professional Communication for non-native speakers of English by Thomas N.Huckin & Leslie A.Olsen, McGraw-Hill
Mastering Communication by Nicky Stanton, Palgrave Master Series

Paper pattern
Total Marks: 40, Duration : 2 hours
Distribution of marks and weightage:
The paper will comprise 6 questions of 10 marks each out of which 4 need to be attempted.
The first question is compulsory and will be a combination of all modules.
Students can attempt any 3 out of the remaining 5 questions.
The first module (Communication theory) will carry 40 % weightage.
Questions 2, 3, 4, 5 and 6 will be based on combinations of two or more modules.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total
FEL201	**Basic Workshop Practice-II**	-	04	-	-	02	-	02

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 & Test 2					
FEL201	**Basic Workshop Practice-II**	-	-	-	-	50	-	-	50

<u>Detailed Syllabus is given in Basic Workshop Practice-I</u>

Term work:

Term work shall consist of respective reports and jobs of the trades selected the distribution of marks for term work shall be as follows:

Laboratory work (Job and Journal) : 40 marks

Attendance (Practical and Theory) : 10 marks

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