

**Branch:** Common to all branches

**Year:** First year

**Semester:** Second

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					
Theory			L	T	P	Internal Assessment			ESE	Subject Total	Credit
						TA	CT	Tot			
1	PH201	Engg. Physics-II	3	1		30	20	50	100	150	4
2	CY202	Engg. Chemistry -II	3	1		30	20	50	100	150	4
3	MA203	Mathematics-II	3	1		30	20	50	100	150	4
4	ME204	Engg. Mechanics-I	3	1		30	20	50	100	150	4
5	EE205	Basic Electrical Engg & Electronics	3	1		30	20	50	100	150	4
6	HU 206	Sociology	2			15	10	25	50	75	2
Practicals/Drawing/Design											
7	ME207	Engg. Graphics-II	3	1		30	20	50	100	150	4
8	PH201L	Engg. Physics-II Lab			3	10		10	40	50	1.5
9	CY202L	Engg. Chemistry-II Lab			3	10		10	40	50	1.5
10	ME204L	Engg Mech-I Lab			3	15	10	25		25	1.5
12	EE205L	Basic Electrical Engg & Electronics Lab			3	10		10	40	50	1.5
Total Marks: 1150											

**Total Marks: 1150**

**Total Credits: 32**

201  
**PH 102: Engineering Physics - II**

L T P  
(3 - 1 - 3)

Theory Marks = 100  
Sessional Marks = 50  
Laboratory Marks = 50

**I X-RAY AND NON-DESTRUCTIVE TESTING:** Excitation and Ionization Potential, Properties of X-rays, Hard X-rays and Soft X-rays, Continuous and Characteristic X-rays Spectrum, Origin of X-rays, Difference between X-ray spectra and Optical spectra, Moseley's Law, Non-Destructive Testing (continuous wave method & pulse method), X-ray Radiography.

**II ACOUSTICS AND ULTRASONICS:** Weber Fechner law, Units of Loudness- Decibel, Phone, Sone, Absorption coefficient, Reverberation & Reverberation time, Sabine's formula for reverberation time (Derivation not required), Factors affecting acoustics of buildings and their remedies, Design of a Good Acoustical Building, Properties of ultrasonic waves, Ultrasonic production (Magnetostriction and Piezoelectric method), Applications of Ultrasonics.

**III LASER AND FIBRE OPTICS:** Induced absorption, Spontaneous and Stimulated emission, Einstein's coefficients (A & B), Population Inversion, Pumping, Principle of Laser, Characteristics of a laser beam, Ruby and Semiconductor Laser, Application of Lasers. Optical fibre- Principles and Structure, Propagation of light in optical fibres, Numerical aperture and acceptance angle, Classification of optical fibres- Single and Multimode, Step Index and Graded Index fibres, Losses in fibres, Optical fibre communication system (Block diagram only).

**IV QUANTUM MECHANICS:** De-Broglie Hypothesis (concept of group velocity and phase velocity), Expression for de-Broglie wavelength in terms of group velocity and phase velocity, Properties of Matter Waves, Davisson and Germer Experiment, Heisenberg's Uncertainty Principle, Elementary Proof of Uncertainty Principle using De Broglie wave concept, Applications of Uncertainty Principle.

**V SOLID STATE ELECTRONICS AND PHOTOCONDUCTIVITY:** P-N Junction Diode, Biasing of P-N Junction Diode & its I-V Characteristics, Breakdown of a P-N Junction Diode (Avalanche and Zener breakdown), Zener Diode, LED, Photoconducting Materials, Photovoltaics & Photovoltaic Cell, Solar Cell.

**VI SUPERCONDUCTIVITY:** Physical Properties of Conventional Superconductors (Meissner Effect, Critical Magnetic Field, Isotope Effect, Persistent Current, Magnetic Levitation), Type-I and Type-II Superconductors and their comparison, BCS theory of Superconductivity (Qualitative only), SQUID.

**Text Books and Reference Books:**

1. Engineering Physics, Dutta R Joshi, Mc Graw Hill Education (India) Private Limited.
2. Textbook of Engineering Physics, S.O. Pillai & Sivakami, New Age International Publishers.
3. Applied Physics for Engineers, Neeraj Mehta, PHI Learning Private Limited, New Delhi.
4. Engineering Physics, Chaturvedi Pandey, Cengage India.

## SECOND SEMESTER

### CY202: Engineering Chemistry-II

Subject: Engineering Chemistry-II

Code: CY202

L-T-P-C: 3-1-0-3/week

Class hours: 4 hours/week

Total no. of classes: 40(approx)

L: Lectures T: Tutorials P: Practicals C: credits

#### Course content:

Unit I: Instrumental Methods of Chemical Analysis (Mark=20)

Data analysis: Types of errors, accuracy and precision, statistical tests of data-the F test and the T test, propagation of errors, significant figures.

Spectroscopy: Principles of spectroscopy, the electromagnetic spectrum, absorption and emission of radiation, Spectral width and intensity.

Electronic (UV-Vis) Spectroscopy: The Beer-Lambert law of absorption, types of electronic transitions -  $n \rightarrow \pi^*$ ,  $\pi \rightarrow \pi^*$ , d-d, and charge-transfer, selection rules for electronic transitions, applications of electronic spectroscopy.

Infrared Spectroscopy: Molecular vibrations, vibrational spectrum, applications

NMR Spectroscopy: Basics and applications, brief introduction to MRI

Flame photometry: Theoretical principles, emission spectra, instrumentation, experimental procedure, applications.

Atomic absorption spectroscopy: Introduction, principles, applications

Electrochemical methods of analysis: Cyclic voltametry

Chromatography: Introduction to different types of chromatographic techniques

Introduction to Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM)



**Unit II: Nanochemistry** (Mark=10)

Definition of nanomaterials and nanotechnology, Nanostructures in nature, Quantum structures, Quantum confinement, Surface effects of nanomaterials, Properties and Synthesis of nanomaterials(brief ideas only), Nanocomposites, Applications of nanomaterials

Brief introduction to cement, ceramics, refractories, lubricants, soap and detergent and oils, dyes and pigments, adhesives, etc.

**Unit III: Catalysis and Catalytic materials** (Mark=20)

Homogenous and heterogenous catalysis, supported and unsupported metal catalysts, applications of zeolites and clays as heterogenous catalysts, manufacture and transformation of hydrocarbons- hydrogenation and isomerization of olefins, oxidation of olefins by Wacker process, catalyst for control of pollution from automobile exhaust, nano catalyst.

Co-ordination compounds, their role in catalysis and other applications.

**Unit IV: Non-Conventional Sources of Energy** (Mark=15)

Biofuels: Alcohol, hydrogen production technology, biofuels from Jatropha

Green Energy : Sources, efficiency and sustainability, energy from biomass and solid waste.

Renewable energy sources: solar, hydropower, wind energy.

**Unit V: Cosmetics and Textile Chemistry** (Mark=10)

Cosmetics: Introduction, types, chemical composition, merits and demerits, applications.

Textile chemistry: Natural and added impurities in textiles, Natural impurities in cotton, wood and silk. Chemistry of sizing agents, Mercerization and optical whitening of cotton. Chemistry and application of optical whitening agents

**Unit VI: Medicinal chemistry** (Mark=10)

Definition of drug. Factors affecting their bioactivity. Theoretical aspects of drug receptor interaction, QSAR, Lead compounds, Elementary idea of molecular modelling of drugs.

Sulpha-drugs: Historical significance of sulpha-drugs, Introduction to sulphanilamide and other important sulpha-drugs. Mode of action of sulpha-drugs

Drugs for the treatment of cancer and AIDS

**Unit VII: Advanced Materials Chemistry (Mark=5)**

Brief introduction to Optical fibres ,LCD, LED.

**Unit VIII: Industrial Chemistry (Mark=10)**

Brief introduction to cement, ceramics, refractories, lubricants, soap and detergents, fats and oils, dyes and pigments, adhesives, etc.

**Text Books/Reference books:**

1. Principles of Instrumental Analysis-D.A.Skoog and J.L.Loary, W.B.Saunders
2. Inorganic chemistry-Shriver,Atkins,Langford (ELBS)
3. Medicinal Chemistry-A.Kar(New Age International)
- 4.Nanomaterials-B.Viswanathan(Narosa Publishing House)
- 5.Fundamentals of Molecular Spectroscopy-Banwell & McCrash (Tata McGraw Hill)
6. Medicinal Chemistry-An introduction-Gareth Thomas(John Wiley & Sons)
7. Homogenous catalysis-Parshall and Ittel(Wiley)
- 8.Heterogenous catalysis-principles and applications- G.C.Bond
9. Catalysis-Science and Technology-J.R.anderson and M.Boudart
10. Food Chemistry-Chopra and Panesar(Narosa Publishing House)
11. Cosmetic Chemistry I by Dr. Kulkarni (Denett Publications)
12. Cosmetic Science and Technology Vol. I, II, III by Sagarin

16 (MA-203)

## Mathematics – II

Theory Marks – 100

Pass Marks – 30

Sessional Marks – 50

Time: 3 hours

### Unit 1: Linear Algebra:

40marks

Some special types of matrices such as symmetric and skew-symmetric, hermitian and skew-hermitian, orthogonal, unitary and their properties, triangular and echelon form, pivot elements; inverse of a matrix, elementary operations and elementary matrices, equivalent matrices, computation of inverse by elementary transformations, reduction of matrices to triangular form and normal form; rank of a matrix, evaluation of rank; vector spaces and sub-spaces, linear dependence and independence, basis and dimension; orthogonality: inner product of vectors, orthogonal vectors, orthogonal matrices; solution of a system of homogeneous and non-homogeneous linear equations, consistency of a system of linear equations; Eigen values and Eigen vectors of a matrix and their properties, Cayley-Hamilton's theorem, reduction of a matrix to diagonal form, necessary and sufficient condition for diagonalization.

### Unit II: Vector Algebra & Vector Calculus:

35 marks

Vector triple products & applications.

Differentiation of vector functions, scalar and vector fields, gradient of a scalar function, directional derivatives, divergence and curl of a vector point function, properties of gradient, divergence and curl; repeated operations, integrations of vector functions, line, surface and volume integrals, theorems of Gauss, Stokes and Greens.

### Unit III: Differential Equations:

25 marks

Solution of ordinary first order and first degree differential equation of the following forms: linear, reducible to linear, exact, reducible to exact, ODEs of first order but not of first degree, higher order linear equations with constant coefficients, Cauchy's homogeneous linear equations, simultaneous linear equations with constant co-efficients.

### Text/references:

- |                                            |                                               |
|--------------------------------------------|-----------------------------------------------|
| 1. A Text book of Engineering Mathematics: | Bali & Goyal: Laxmi publication.              |
| 2. Higher Engineering Mathematics:         | B. S. Grewal: Khanna publication.             |
| 3. Differential Equations:                 | H.T.H. Piagio: CBS publishers & Distributors. |
| 4. Vector Calculus:                        | M.D.Raisinghania: S. Chand & co.              |
| 5. Theory and problems of Linear Algebra:  | S. Lipschutz: Mc Graw-Hill.                   |



TO BE FINALIZED

**ME 204 ENGINEERING MECHANICS I**

[L-T-P :: 3-1-3]

Theory: 100, Time 3 Hrs; Sessional (theory) = 50; Sessional (Lab) = 25

Content	Lecture Hours
<b>UNIT I: EQUILIBRIUM OF RIGID BODIES</b> Introduction, Free Body Diagram (FBD), Types of supports and their reactions. System of forces, Resultant of coplanar concurrent and non-concurrent force systems, Conditions of equilibrium (i) concurrent forces in space (ii) non-concurrent forces in space	6
<b>UNIT II: ANALYSIS OF STRUCTURES:</b> Method of joint, method of section, graphical methods	3
<b>UNIT III: FRICTION:</b> Introduction, laws of Coulombs friction, equilibrium of bodies involving dry friction, inclined plane, ladder friction, wedge friction.	3
<b>UNIT IV: CENTRE OF GRAVITY AND MOMENT OF INERTIA:</b> (i) Centre of gravity and centroid, location of centroid and centre of gravity (ii) Moment of inertia of plane area, Parallel axis theorem, perpendicular axis theorem, mass moment of inertia, polar moment of inertia	6
<b>UNIT V: LIFTING MACHINES:</b> Introduction, reversibility of machine, lever, pulley, simple wheel and axle	4
<b>UNIT VI: VIRTUAL WORK:</b> Introduction, virtual displacement, principle of virtual work, application of virtual work	4
<b>UNIT VII: RECTILINEAR AND CURVILINEAR MOTION:</b> Kinematics and kinetics of rectilinear motion, Newton's 2nd law of motion, D'Alembert's principles	6
<b>UNIT VIII: SHM AND VIBRATIONS:</b> Introduction, graphical representation of SHM, system executing SHM, simple, compound, torsional pendulum, vibration of structures	4
<b>UNIT IX: IMPULSE, MOMENTUM, WORK AND ENERGY:</b> Linear impulse and Momentum, Principle of work-energy conversion	4
<b>Total</b>	<b>40</b>

**Books:**

1. Engineering Mechanics by S Timoshenko & D H Young, McGraw Hill Int
2. Engineering Mechanics by R K Bansal, Laxmi Publication (P) Ltd
3. Engineering Mechanics by K L Kumar, McGraw Hill Publishing Co
4. Engineering Mechanics by Hibbler
5. Engineering mechanics by D P Sharma, Pearson
6. Engineering mechanics statics and dynamics by A Nelson McGraw Hill
7. Engineering mechanics by S. S. Bhavikatti, New Age International, Publishers



**1. DC networks:**

Definitions of active, passive, linear, nonlinear circuit elements and networks. Kirchoff's law, nodal & mesh analysis, voltage & current sources, network theorems- superposition, Thevenin's, Norton's and maximum power transfer theorem. Network analysis with and without dependent source.

**2. Magnetic circuits:**

Definitions of MMF, flux, flux density & reluctance, Comparison between Electric & magnetic circuits, series, parallel & series parallel circuits & their solutions, energy stored in a magnetic circuits, lifting magnets, electromagnetic induction, self & mutual inductance, hysteresis & eddy current losses.

**3. Single phase AC circuits:**

Waveforms of alternating voltages and currents, instantaneous average and RMS values, form factor & peak factor, forms of representation of alternating quantities, concept of phasor & phasor diagrams, Concept of lead & lag, reactances & impedances, AC circuits-resistive, inductive, capacitive, RL, RC & RLC series, parallel and series parallel combination, impedance triangle, admittance, active & reactive power & power factor.

**4. 3 phase AC circuits:**

Concepts of 3 phase AC, connections, phase & line values in star & delta connections, solutions of simple 3 phase balanced circuits with resistive & reactive loads, 3 phase power, and phase sequence.

**5. Instruments:**

Classification of instruments, essentials of indicating type instruments- deflecting torque, controlling torque, damping, types of indicating instruments, MC & MI type ammeters & voltmeters, extension of range- use of shunt & multiplier, errors & compensation.

**6. Basics of electrical installations:**

Domestic wiring, types of cables (names only), types of wiring e.g. Cleat, CTS, Conduit, metal sheathed, casing & capping; circuit layouts- single phase AC mains to DB; 3 phase connections; accessories- main switch, ceiling rose, fuse, MCB etc. Testing of a wiring installation, Megger, Earthing- purpose & methods; lamps- filament, fluorescent tube & its



connection & operation, Indian electricity rules regarding electrical installation.

#### 7. **Electronics:**

P-N junction diode, VI characteristics under forward & reverse biased condition, avalanche breakdown, diode as a rectifier- half wave & full wave rectifier circuits, ripples in output waveforms, ripple factor, introduction to filters, Zener diode & its application as a voltage regulator.

#### **Books:**

1. Basic Electrical Engineering--- Nagraath.
2. Basic Electrical Engineering---Mittle.
3. B.E.E. Science—Sahadev & Rana.
4. Electro-Technology—H. Cotton.
5. A text book of Electro technology- B.L.Theraja.

## HU 206: SOCIOLOGY

L	T	P
2	0	0

Theory: 50 marks  
Sessional: 25 marks

### Unit 1: Introductory

Meaning and definition of sociology, nature and scope of sociology, importance of the study of sociology.

### Unit 2: The Society

Man and society, community and society, association and society, institution and society, elements of socialization, concept of interest and attitudes, social environment.

### Unit 3: The Social Group

The origin of family, forms of family, the modern family, meaning of social stratification, difference between caste and class, merit and demerit of caste system, modern trends of caste system in India, social mobility, meaning of role and status.

### Unit 4: Social Control

Meaning of norms and values, importance of norms and values, meaning of folkways and mores, custom and habit, crisis in Indian education.

### Unit 5: Social Change

Meaning of social change, factors of social change, culture and civilization, subculture, cultural diffusion, new information technology and culture, causes of social disorganization.

### Unit 6: Industrial Disputes

Meaning of industrial disputes, causes of industrial disputes, methods of settlement of industrial disputes, definition of trade union, functions of trade union, problems of trade union in India, Indian factories Act, 1948, payment of wages Act, 1923, workman compensation Act, 1923.

### Unit 7: Human Resources

Meaning of human resources, significance of human resources, shortcomings of human resources, composition of human investment, meaning of man power planning, its characteristics, types of man power planning, advantages of man power planning, concept of industrial productivity, factors affecting productivity, meaning of workers participation in management, pre-conditions and objectives of workers participation in management, unilateral and cooperative participation.

### Books Recommended:

1. Sociology by C. N. Sankara Rao
2. Principles of sociology by R.N. Sarma
3. Sociology by John J. Macionis
4. Labour Problems and Social Welfare by R. C. Saxena
5. Labour Problems and Social welfare by U. C. Kulshrestha



ME207 ENGINEERING GRAPHICS II [0-1-4]  
Practical 100, Sessional 50, Time 3 Hrs

Lecture  
Hours  
3 Hrs

## 9 Hrs

3 Hrs

## 3 Hrs

6 Hrs

## 6 Hrs

6 Hrs

## 6 Hrs

**Total 42 HRS**

Introduction to autocad

1. Engineering Drawing by N. D. Bhatt and V. M. Panchal, Charotar Publishing Ltd
2. Engineering Drawing by Basant Agarwal & C. M. Agrawal, The McGraw Hill Companies
3. Engineering drawing and graphics + Autocad by K Venugopal, New Age International Publishers