

Programme Code: EC									
Course Code: EC 11 203				Course Title: Basic Electronics					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
4	--	2	6	80 (3 Hrs.)	20	25*	--	25 (PA)	150

Rationale:

It is necessary for the students of electronics and related branches to study and apply the basic principles, analyze and troubleshoot simple subsystems. To acquire this level of understanding, the basic knowledge of electronic devices and circuits is essential. This Course is one of the core subjects which is deals with construction, working principle, application of active components.

Objectives:

The students will be able to

- Understand principle and terminology of electronics.
- Draw symbol and characteristics of electronic devices.
- Analyze the characteristics of electronic devices.
- Understand the working of basic circuits such as rectifiers, amplifiers etc.
- Build and test simple circuit.

Section I		
Contents:	Hours	Marks
1. Semiconductor Theory: 1.1 Classification of component on the basis of energy band theory. Intrinsic and Extrinsic Semiconductors, majority and minority charge carriers. P-type and N-type Semiconductors. 1.2 P-N Junction formation, Concept of depletion layer and barrier potential. 1.3 Biased PN Junction, Forward and reverse biased V-I characteristics, Diode current Equation, Static and dynamic resistance of PN Diode. 1.4 Comparison of Si and Ge Diode. Packages of Diode. 1.5 Definition of following terms: Forward Voltage (VF), Maximum Forward Current (IF), PIV Rating, Power dissipation of diode, Junction Capacitance and Knee Voltage	10	10
2. Diode application: 2.1 Half wave rectifier: Circuit, waveform, working. 2.2 Full Wave rectifier (Centre Tapped): Circuit, waveform, working. 2.3 Bridge rectifier: Circuit, waveform, working. 2.4 Passive Filters: Waveform and working of Capacitor, Choke input and Π -type filter circuit. 2.5 Block diagram of regulated power supply: Definition of load regulation, line regulation. (Simple numerical on end expression, no derivation to be asked in the exam) 2.6 Diode as clipper and clamper: (A) Circuit diagram, waveform and working of positive, negative and biased	14	20

clipper. (B) Circuit diagram, waveform and working of positive, negative and biased clamper.		
3. Special Diode: Symbol, construction, characteristics, working and application of the following diodes. 3.1 Zener Diode 3.2 Schottky Diode 3.3 Light Emitting Diode 3.4 Photo Diode	08	10

Section II		
Contents:	Hours	Marks
4. Transistor Fundamentals: 4.1 Construction and working of PNP and NPN transistors. 4.2 Transistor configuration: Working and characteristics of transistors in CE, CB, CC modes; Expression of collector current, Relation between α and β , Concept of collector leakage current. 4.3 Biasing method of transistor: Need of biasing, circuit and analysis of biasing network such as Fixed bias, Collector feedback bias, Emitter Bias, Voltage divider bias. Concept of thermal stability. (No derivation to be asked in the examination. Simple numerical on the end expression such as stability factor, current gain is expected.)	10	12
5. Transistor as an amplifier: 5.1 Single stage Common Emitter (CE) amplifier: Working and frequency response, Concept of phase reversal, DC and AC equivalent circuit, Load line analysis, Calculation of Z_{in} , Z_o , A_v and β . Graphical representation of amplification. 5.2 Coupling Methods: Need and Types of Coupling RC Coupled amplifier: working and frequency response.	10	12
6. Field Effect Transistor: 6.1 Construction, working and characteristics of JFET and MOSFET (Depletion and enhancement Type) 6.2 JFET Parameters, relation between JFET parameters. 6.3 Comparison of FET with BJT.	06	08
7. Introduction to Power devices: Construction, working, symbol and characteristics of SCR, TRIAC, DIAC, UJT.	06	08

List of Practical:

1. To plot the V-I characteristic of semiconductor P-N diode. Find out static, dynamic resistance and knee voltage of P-N diode.
2. To construct and test half wave rectifier and draw i/p and o/p waveforms.
3. To construct and test full wave rectifier and draw i/p and o/p waveforms.
4. To construct and test bridge rectifier and draw i/p and o/p waveforms.
5. To construct and test power supply using full wave rectifier with capacitor input filter. Measure o/p voltage (DC) with and without filter.
6. To construct and test clipper circuit (Positive, negative and biased) Draw input and output waveform.
7. To construct and test clamper circuit (Positive, negative and biased) Draw input and output waveform.
8. To plot the V-I characteristics of LED. Find out static and dynamic resistance of LED.
9. Verify the characteristics of photo diode.
10. To plot regulation characteristics of zener diode. Find out load and line regulation.
11. To plot i/p and o/p characteristics of BJT and find out input resistance and o/p resistance of BJT in CE Mode
12. To plot i/p and o/p characteristics of BJT and find out input resistance and o/p resistance of BJT in CB mode.
13. To plot the frequency response of CE amplifier and find out gain bandwidth product of given circuit.
14. To plot frequency response of RC-coupled amplifier.
15. To plot the characteristic of FET. Label and interpret the various parameters on it.
16. To plot the V-I characteristics of UJT. Label and interpret the various regions on it.
17. To plot V-I characteristics of SCR and label various parameters on it.

Reference Books:

1. A text book of APPLIED ELECTRONICS by R. S. Sedha, Publisher: S. Chand and Co. Ltd.
2. Principles of Electronics by V. K. Mehta, Publisher: S. Chand and Co. Ltd.
3. Electronic Device and circuit by G. K. Mitthal, Publisher: Khanna publishers
4. Electronic Principles by Malvino, Publisher: Tata McGraw Hill, Education
5. Basic Electronic and Linear circuit by N. N. Bhargava, S. C. Gupta, Publisher: Tata McGraw Hill, Education.

Programme Code: EC / IS / CO / IF									
Course Code: EE 11 211				Course Title: Fundamentals of Electrical Engineering					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	--	2	5	80 (3 Hrs.)	20	--	--	50 (PA)	150

Rationale:

This Course helps to understand the analysis of the electrical Engineering concepts, mainly involves the study of basic Electrical engineering concepts, principle and applications. Main stress is given on developing thinking ability, scientific attitude and application of principles in practical work. Basic knowledge of working principle, construction, operation and applications of the various electrical equipment along with supply system and wiring system is necessary for working in industry.

This subject will help the students to study, understand and comprehend the fundamentals of various facts, the basic concepts, rules and laws of electric and magnetic Circuits.

Objectives:

The students will be able to

- describe the electrical system.
- state the effects of electric current.
- apply the laws of Electrical circuits to analyze Electrical circuits (DC).
- state definitions and units of various quantities related to Magnetism and Electromagnetism.
- explain electromagnetic induction.
- define various terms related to a.c.
- state a.c. terminology.
- understand a.c. series circuits.
- explain basic transformer principle.
- understand electrical wiring.

Section I		
Contents:	Hours	Marks
1. Overview of Electrical System: 1.6 Electrical power and energy: importance, list of conventional and non-conventional energy sources, their comparison. 1.7 Power generating stations: types, list of power stations in Maharashtra state and their capacities, generating voltage levels. 1.8 Transmission and distribution system: concepts, components of transmission system and distribution system, voltage levels. 1.9 Single line diagram of electrical system. 1.10 Utilizations of electrical energy: domestic and industry. (Only introduction) 1.11 List of electrical machines and domestic appliances.	06	12
2. Basic Concepts: 2.1 Electric current, Potential, EMF and potential difference, Resistance. 2.2 Power and Energy. (Simple Numerical Problems) 2.3 Measurement of voltage, current, power and energy. 2.4 Conductors, semiconductors and insulators. 2.5 Classification of Electric Current: Direct current (DC) and Alternating current (AC).	05	08

2.6 Effect of Temperature on Resistance, Temperature co-efficient of Resistance. (Numerical Problems) 2.7 Effects of Electric Current: Heating Effect, Magnetic Effect and Chemical Effect. (Only Introduction)		
3. D.C. Circuits: 3.1 Kirchhoff's current Law 3.2 Kirchhoff's voltage law. 3.3 Illustrations of Kirchhoff's Laws. (Numerical Problems up to two loops)	03	04
4. Magnetism: 4.1 Concept of magnetism, magnetic materials, magnetic field, Absolute and relative permeability. 4.2 Magnetic field strength, magnetic flux, magnetic flux density, Magneto-Motive-Force (MMF), Reluctance, Reluctivity, Permeance, Ampere Turns (AT) etc. 4.3 Magnetic field due to a straight conductor, Right Hand Gripping Rule, Corkscrew Rule, Dot and Cross conventions. 4.4 Magnetic field due to a solenoid. 4.5 Force on a current carrying conductor in a magnetic field, Fleming's Left Hand Rule. 4.6 Magnetic circuit. (No numerical problems) 4.7 Comparison between Electric and Magnetic circuit. 4.8 Magnetisation Curve (B - H Curve), Magnetisation Curve for Magnetic and Non-Magnetic Materials, Magnetic Hysteresis, Hysteresis Loop, Hysteresis Loops for Hard & Soft Magnetic Materials, residual flux, retentivity, coercive force, Hysteresis loss.	10	16

Section II		
Contents:	Hours	Marks
5. Electromagnetic Induction: 5.1 Faraday's Laws of Electromagnetic Induction, (No Numerical Problems), Fleming's Right Hand Rule, Lenz's Law. 5.2 Types of induced E.M.F. - Dynamically Induced E.M.F. Statically Induced E.M.F., Self Induced E.M.F., Mutually Induced E.M.F. (No Numerical Problems) 5.3 Eddy current and eddy current loss.	05	08
6. A.C. Fundamentals: 6.1 Difference between a.c. and d.c. quantity. 6.2 Advantages of a.c. over d.c. 6.3 Generation of alternating voltages and currents. 6.4 Mathematical expression of alternating quantity. 6.5 Basic terms - Instantaneous value, Wave form, Cycle, Periodic time, Frequency, Amplitude, R.M.S. value, Average value, Peak factor, Form factor, Phase and Phase difference.	05	08

6.6 Vector representation of a.c. voltage and current. (No numerical problems)		
7. A.C. Series circuits: 7.1 Circuit diagram, phasor diagram and wave form of a.c. circuits through pure resistance (R), pure inductance (L) and pure capacitor (C). 7.2 Concept of Inductive reactance and capacitive reactance. 7.3 Study of R-L, R-C, and R-L-C series circuit. 7.4 Concept of Impedance, power and power factor.	03	06
8. Transformer: 8.1 Introduction. 8.2 Working Principle. 8.3 E.M.F. equation (No derivation) 8.4 Transformation ratio. (Simple numerical problems) 8.5 Transformer ratings. 8.6 Construction of transformer. 8.7 Types of transformer and their applications.	05	08
9. Electrical wiring: 9.1 Types of wiring for Domestic Installation. 9.2 Electric wiring - wiring accessories, switches, sockets, ICDP, ICTP etc. 9.3 Fuses, importance and types. 9.4 MCB, their ratings. 9.5 One lamp controlled by one switch. 9.6 Staircase and go-down wiring. 9.7 Earthing, necessity and types 9.8 Safety precautions in electrical indoor & outdoor installations.	06	10

List of Practical:

1. To know Basic Electrical Laboratory.
2. To draw single line diagram of electrical power system and to collect the data of power stations in the Maharashtra State along with their capacities.
3. To measure voltages and currents in resistive circuit.
4. To measure Power and Energy consumed by Resistive circuit.
5. To observe the effect of temperature on resistance and to determine temperature rise.
6. To verify Kirchhoff's current & voltage laws.
7. To plot B-H curve for magnetic material.
8. To observe that e.m.f. is induced in coil when magnetic lines of force move across winding and observe its polarity.
9. To observe AC waveform and measure AC voltage & DC voltage with oscilloscope.
10. To show phase relationship between voltage and current in R-L series circuit.
11. To identify different parts of transformers and know their functions.
12. To describe safety precautions to be observe for indoor and outdoor installations and know first aid practice, also refer artificial respiration chart.

Reference Books:

1. Electrical Technology (Volume I) by B. L. Thereja and A. K. Thereja, Publisher: S. Chand and Co. Ltd.
2. Basic Electrical Engineering by V. K. Mehta and Rohit Mehta, Publisher: S. Chand and Co. Ltd.
3. Electrical Technology by Edward Hughes, Publisher: ELBS Publications.

Programme Code : CO/EC/IS/IF/LT/LG											
Course Code : ME 11 201						Course Title : Engineering Graphics					
Prerequisite : NIL						C / O : Compulsory					
Credits				Duration of Written Examination		Examination Scheme					
TH	TU	PR	TOTAL	TH	TS	TH	TS	PR	OR	TW	TOTAL
-	-	4	4	-	-	-	-	-	-	50	50
(*) indicates assessment by Internal and External examiners.											

Rationale:

The fundamentals of engineering drawing presents technical information to all individual who works as manager, supplier designers, planners, supervisors and technician. Engineering drawing is the graphical language to express thoughts, ideas and concepts. The expression by drawing is very accurate, precise and brief.

This course is aimed at providing basic understanding of the fundamentals of Engineering Drawing; mainly visualization, graphics theory, standards & conventions of drawing, the tools of drawing and the use of Drawings in engineering applications. At a glance, one can understand detailed description of any part to be manufactured or an electric circuit details.

Objectives:

The students will be able to,

- Effectively use drawing instruments for enhancing speed and accuracy in drawing.
- Draw orthographic views of complicated components.
- Draw isometric view of components with taper and slots.
- Develop the imagination and importance of accuracy and precision.
- Appreciate use of computers in drafting.
- Revise AutoCAD commands learnt previously.

SECTION I		
Contents:	Hrs.	Marks
1. Introduction and demonstration of drawing instruments 1.1. Introduction and demonstration of Drawing instruments 1.2. Assignment on types of lines. 1.3. Assignment 1 on geometrical constructions: <ul style="list-style-type: none"> • To draw a perpendicular at the end of a given line • To bisect a given angle • To divide the given line into a number of equal parts • To construct a regular pentagon, given the length of side • To draw an arc of a given radius R touching two given straight lines at right angles to each other • To inscribe a circle in any triangle 	8	
2. Engineering Curves 2.1 Introduction of Engineering curves 2.2 Assignment 2 Drawing Engineering curves. <ul style="list-style-type: none"> • To Draw ellipse by Concentric Circles Method, Arcs of Circles Method and Oblong Method • To draw Parabola, Hyperbola by directrix -focus method. To draw of involutes of polygon and circle. 	8	
3. Orthographic Projection 3.1 Concept of first angle and third angle method of projection and Concept of dimensioning <ul style="list-style-type: none"> • Sheet no.1: orthographic projection of objects using first angle method of projection. Minimum 2 problems. • Sheet no.2: orthographic projection with section of objects using first angle method of projection. Minimum 2 problems.. 	12 4 4 4	

SECTION II		
Contents:	Hrs.	Marks
4. Projection of lines, planes and solids.	12	
4.1 Introduction to Projections of points and lines Concept of projection of points.	4	
4.2 Concept of projection of lines. The line inclined to one of the reference plane and parallel to other,	4	
4.3 Assignment 3 Projections of lines (four problems).	4	
5. Isometric views	12	
Importance of Isometric Views	4	
<ul style="list-style-type: none"> • Concept of iso-scale and four centre method • Concept of isometric view and isometric projection. • Demonstration of drawing an isometric view and isometric projection with curved, inclined and sloped surface. • Isometric projection with holes and slots on inclined or sloped surface. • Sheet no 3: To draw Isometric view and, isometric projections.(one object each) • Sheet no 4:To draw Isometric views of objects including slots, holes on sloping surface two objects) 	4	
6. Freehand sketches	6	
Assignment 4 freehand sketches of thread profiles, nuts, bolts and screws..	4	
7. Introduction to AUTOCAD software	6	
Demonstration of AUTOCAD software	-	-
<ul style="list-style-type: none"> • 2D drawing commands 		

List of practicals:-

Sheet 1 :- orthographic projection of objects using first angle method of projection. Minimum

2 problems

Sheet 2 :- Orthographic projection with section of objects using first angle method of projection. Minimum 2 problems.

Sheet 3 :- To draw Isometric view and, isometric projections.(one object each)

Sheet 4 :- To draw Isometric views of objects including slots,holes on sloping surface (two objects)

REFERENCES:

Sr.No.	Author	Title	Publication
1	K. Venugopal	Engineering Drawing & Graphics	New age International (P) Pvt ltd Mumbai Maharashtra
2	P. J. Shah	Engineering Graphics	S. chand publication Mumbai Maharashtra
3	K. I. Narayanam and P. Kannanan	A text book of Engineering Graphics	Scitech Publication Pvt. (I) ltd Chennai Tamilnadu
4	N. D. Bhatt	Elementary Engineering Drawing	Charoter Publishing House Anand Gujrat

Course Code	Course Title	C/O	Credits				Examination Scheme					
			TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
HU 11 102	Communication Practice	C	-	2	-	2	--	--	--	---	50	50

Rationale:

The medium of instruction in the technological field is English, so it is necessary for the students of Engineering and Technology to learn and express through English language. These students are the future technicians, must be able to face the interview, handle the questions and present them in a proper way, acquire confidence to participate in the group discussion., introduced with the modern communication technology and be able to use these medias for effective communication. Besides ,the students should have the basic knowledge of phonetics and its correct use in the communication practice.

Objectives:

The students will be able to : 1) Acquire the practical knowledge of interview.

2) Speak in English with confidence.

3) Handle the new techniques of communication.

4) Participate in group discussion.

5) Learn phonetics, tone and intonation.

Topic No	Contents
1	<u>Interview Skills and Group Discussion :</u> 1.1. Introduction 1.2. Types of Interview 1.3. Preparing for an Interview 1.4. Mock Interview 1.5. Interview questions and handling technique
2	<u>Group Discussion</u> 2.1 Aspects of body language (Kinesics) 2.2 Preparing for group discussion 2.3 General Knowledge 2.4 Leadership qualities 2.5 Practice Session
3	<u>Role of Oral Presentation in the Career of an Engineer</u> 3.1 Use of facial expressions 3.2 Use of eye contact 3.3 Means to overcome stage fear 3.4 Preparing a speech 3.5 Pace, tone and intonation
4	<u>Introduction to Modern Communication :</u> 4.1 Technology based communication

	4.2 Telephone / Mobile and Voicemail 4.3 Computers and Internet 4.4 Positive and negative impact of technology enabled communication 4.5 Selection of appropriate communication technique
5	<u>Phonetics</u> 5.1 Speech organs and their functions 5.2 Basic Sounds of English 5.3 Vowels and Consonants 5.4 Intonation 5.5 Word Stress and Word Accent

Reference Books:

Sr.No.	Author	Title	Publication
1	Wendy Carter	Communication Skills	Hardridge Consulting Groups Ltd.
2	Barun K Mitra	Effective Technical Communication	Himalaya Publication House.
3	Meenakshi Raman Sangita Sharma	Communication Skills—Mumbai University	Oxford Higher Education

Programme Code: EC / IS / CO / IF / EE									
Course Code: SC 11 111				Course Title: Engineering Mathematics					
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	1	-	4	80 (3 Hrs.)	20	--	--	--	100

Rationale: The subject is intends to teach students basic facts, concepts, principle & procedure of mathematic as a tool to analyze Engineering problems & as such lays down foundation for understanding the engineering & core technology subjects

Objectives:

The Students will be able to ,

1. Understand basic facts of mathematics about the field analysis of any Engineering Problem.
2. Know the standard ways in which the problem can be approached.
3. Apply basic concepts to engineering problem.

Section I (40 marks)		
Contents:	Hours	Marks
1. Function 1.1 Concept of function, domain and range, type of functions (Only definitions). 1.2 Even & Odd functions. 1.3 Value of the function	03	06
2. Limit 2.1 Concept of limit 2.2 Limit of functions- i) Algebraic, ii) Trigonometric, iii) Logarithmic and iv) Exponential.	06	10
3. Derivatives 3.1 Definition of the derivative, 3.2 Derivatives of standard function. (No proof by first principle) 3.3 Differentiation of sum, difference, product and quotient of two or more functions 3.4 Differentiation of composite, inverse, implicit, parametric, exponential and logarithmic functions, 3.5 Second order derivative.	10	16
4 APPLICATION OF DERIVATIVES 4.1 Geometrical meaning of derivative	05	08

4.2 Tangents & Normals to the curve, 4.3 Maxima & minima of the functions 4.4 Velocity & acceleration 4.5 Radius of Curvature.		
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Section II (40 marks)		
Contents:	Hours	Marks
5. STATISTICS 5.1 Basic definitions-raw data, variate,frequency,cumulative frequency 5.2 Classification of data, class interval, mid value, length of the interval 5.3 Measure of central tendency – mean, median & mode 5.4 Mean deviation, Standard deviation, Coefficient of variance	10	16
6 Complex number 6.1 Definition & Algebra of complex numbers 6.2 Geometrical representation of complex number 6.3 Modulus & amplitude of complex number 6.4 Polar form of complex number 6.5 De moivre's theorem (no proof) , roots of complex number 6.6 Exponential form of complex number, Circular & Hyperbolic functions of complex numbers, relation between Circular & Hyperbolic functions, real & imaginary parts of Circular & Hyperbolic functions	08	12
7. Numerical Analysis 7.1 Solution of Algebraic equations using – i) Iterative methods , ii) Bisectional method iii) Regular – Falsi method , iv) Newton- Raphson method 7.2 Solution of simultaneous equation (i) Gauss elimination method (ii) Jacobi's method (iii) Gauss-Seidal method	06	12

References:

Sr.No.	Author	Title	Publication
1	Shri. S. P. Deshpande,	Mathematic for Polytechnic Students	Pune Vidyarthi Griha
2	H. K. Dass.	Mathematic for Engineers (Vol.-I)	S. Chand publication,Mumbai,Maharashtra
3	Shri Shantinakaran	Engg. Maths Vol I & II	S. Chand and Comp
4	B.S.Grewal	Higher Engineering Mathematics.	Khanna Publication

Programme Code: EE/EC/IF/IS/CO											
Course Code: SC 11 108				Course Title: Applied Chemistry							
Compulsory / Optional: Compulsory											
Teaching Scheme and Credits				Examination Scheme							
TH	TU	PR	Total	TH	TS	TH	TS	PR	OR	TW	Total
4	-	2	6	3 hrs	2 Tests Of one Hour each	80	20	--		50	150

RATIONALE:-The subject is included under the category of basic sciences. The role is to understand the fundamental concept and facts about infrastructures of physical matters and their inter relationships. This will provide input for better understanding of other foundation and technology subjects.

OBJECTIVES:- Students will be able to

1. Understand the chemical effects in the various materials that are used by the engineer
2. Understand the composition of material and its relation with one another.
3. Study the effect of impurities in the materials.
4. Understand the principle underneath the chemical reaction.
5. Adopt the methods of preventions with justification.
6. Select suitable metal or alloy for a particular use.
7. Select appropriate lubricants for various machines.
8. Select proper material for any assigned work.

Section I		
Contents:	Hours	Marks
1. Atomic Structure 1.1 Introduction of atom, Molecules, Fundamental Particles, Proton, Neutron, Electron. their mass, charge, location. Dalton's atomic theory, Thompsons atomic model, Rutherford's atomic model & its drawbacks Bohr's theory, Postulates, Structure of modern atom. 1.2 Atomic number and atomic mass number. Atomic weight Numerical based on atomic number & atomic mass number. Orbits, Orbital, quantum no. and their significance 1.3 Rules governing filling up of atomic orbitals Aufbau's Principle, Pauli's exclusion principle, Hund's rule. Electronic configuration of inert gases. Electronic configuration of atoms upto atomic number 30, Isotopes and isobars 1.4 Valency and chemical bonding. Valency : Definition, & examples. Types of valency : Electrovalency & co-valency Examples. 1.5 Electrovalent bond: Definition, Formation. Formation of NaCl, MgCl ₂ , MgO, CaCl ₂ , CaO, AlCl ₃ .	06	08

<p>1.6 Co-valent bond : Definition & formation Formation of following molecules Single bond : Hydrogen,Chlorine,Water , Ammonia, Hydrogen Chloride,Methane. Double bond : Oxygen,Carbon di oxide,Ethylene, Triple Bond : Nitrogen,,Acetylene,</p> <p>1.7 Distinction between electrovalent and covalent compound.</p>		
<p>2. Electrochemistry 2.1 Definition of Electrochemistry,Electrolytes: Definition , Types. Differences between Atom and ion . Definition of ionization & electrolytic dissociation, Arrhenius theory , Degree of ionization with factors affecting it. 2.2 Terms related to Electrolysis Mechanism of electrolysis. Examples of: mechanism of electrolysis.of NaCl in fused & in aqueous state,electrolysis of CuSO₄ using Cu and Pt electrodes. 2.3 Faradays First law and its mathematical derivation. Faradays second law of electrolysis& its mathematical derivation, Numericals based on laws of Faraday. 2.4 Application of Electrolysis, electro- refining, Electroplating. Common ion effect and its applications. 2.5 Electric cells , Primary cells,secondary cells, dry cells Design working and applications.</p>	08	08
<p>3. Water 3.1 Sources of water, impurities present in water.(suspended,dissolved,colloidal,biological) Types of water:hard & soft Causes of hardness of water. Types of Hardness, Unit of hardness, Definition of hardness. 3.2 Bad effects of Hard Water for Domestic purposes.& Industrial purposes (Textile,Dyeing,Sugar industry, Bakeries) 3.3 Bad effects of hard water in Boiler , Scales and sludges,causes of their formation, their disadvantages and their removal. 3.4 Treatment of hard water for industrial purposes by Boiling ,Clark's process., Lime Soda, Zeolite & Ion Exchange process 3.5 Treatment of hard water for drinking purposes.(city water supply) Various steps: Screening,Sedimentation,Coagulation,Filteration, Sterilization Sterilization by boiling &.Chemical reactions of Chlorination (direct chlorination .Chlorination using Bleaching,by chloramines) 3.6 Sewage and itsTreatment, Definition of sewage,Characteristics of sewage,Components of sewage. Sewage Treatment:Definition,its significance,General reactions of sewage treatment,Aerobic &Anaerobic methods of sewage treatment 3.7 PH value :Definition ,Formula,PH scale,its salient features,Numericals based on PH,Applications of PH related to Engg.field (corrosion of bridges,Electroplating Sewage treatment, City water supply).</p>	08	08
<p>4. METALLURGY 4.1 Metals & their characteristics, (hardness, ductility, malleability, toughness,brittleness, tensile strength, weldability,casting, forging, soldering) Occurrence of metal, definition of Mineral, Ore, Gangue, Flux, Slag, Metallurgy. 4.2 Process of extraction of metal from ore i.e DIFFERENT STEPS OF METALLURGY.</p>	06	08

<p>Flowchart of metallurgy.</p> <p>A) <u>Physical Method</u></p> <ul style="list-style-type: none"> • Gravity Separation. • Magnetic Separation. • Froth Flotation <p>B) <u>Chemical Method</u></p> <ul style="list-style-type: none"> • Calcination • Roasting <p>C) <u>Reduction by</u></p> <ul style="list-style-type: none"> • Smelting (in detail) • Aluminothermic (only definition) • Electrolysis (only definition) <p>D) Refining:</p> <ul style="list-style-type: none"> • Name of different methods (Poling, Liquation, Distillation, electro-refining) <p>4.3 Metallurgy of a metal – Iron (Fe)</p> <p>A) Occurrence of ore of iron, Important ore of iron, Their formulae, % of Fe obtained from them,</p> <p>B) Method of concentration, physical & chemical methods,</p> <p>C) Extraction of Fe by Blast Furnace (diagram of blast furnace, different parts of it, different zones, products of blast furnace, their uses).</p> <p>4.4 Physical properties and uses of some metals along with chemical properties Ex :- Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W</p> <p>4.5 Steel, Definition and classification based on % of C (Mild carbon steel, medium carbon steel, high carbon steel, their properties & uses),</p> <p>4.6 Semiconductors: Definition properties & uses of semiconductor materials such as Silicon, germanium, indium etc. Graphite as an electrode.</p>		
<p>5. Alloys</p> <p>5.1 Definition of alloy: purposes of preparation of Alloy.</p> <p>5.2 Preparation of binary alloy by fusion method.</p> <p>5.3 Classification of alloy: Ferrous and non Ferrous Alloy.</p> <p>5.4 Alloy Steel and its application (Ferrous alloy)</p> <ul style="list-style-type: none"> • Heat resistant steel • Magnetic Steel. • Shock resisting steel • Stainless steel. • Non-Ferrous Alloys • Copper Alloys; Brass, Bronze • Aluminum Alloys: Duralumin • Solders (wood's metal) Bearing <p style="text-align: right;">Alloys (Babbitt metal)</p>	04	08

Section II		
Contents:	Hours	Marks
6. Corrosion. 6.1 Definition of corrosion, Types of corrosion, Atmosphere & Electrochemical Corrosion 6.2 Mechanism of atmospheric corrosion, types of oxides formed, (stable, unstable, volatile, with examples) 6.3 Electrochemical corrosion/immersed corrosion Definition, types of cells formed (galvanic cells & concentration cells, examples of both cell formation). Mechanism of immersed /electrochemical corrosion (hydrogen evolution mechanism & oxygen absorption mechanism, diagram, explanation and chemical equations of both mechanism). 6.4 Protection of metals from Corrosion:- i) purification of metals ii) alloy formation iii) cathodic protection iv) controlling external conditions v) protective coatings Protective coatings:- a) organic coating (by paints and varnishes), b) inorganic coating, c) metallic coating 6.5 Protective metallic coatings a) hot dipping (galvanizing & tinning) b) sherardizing c) metal spraying Electroplating	06	08
7. Lubricants lubricant, with example, various functions of a lubricant, classification of lubricants (solid, semi-solid and liquid) examples, conditions under which each lubricant is used. 7.2 Lubrication: definition and types and purposes of it. Types of lubrications, Fluid film, Boundary, Extreme pressure lubrication. Definition, diagram & description of each type. 7.3 Characteristic of good lubricant A) Physical Characteristics <ul style="list-style-type: none"> • Viscosity • Viscosity index • Oiliness • Volatility • Flash point & Fire Point • Cloud and Pour point B) Chemical Characteristics <ul style="list-style-type: none"> • Acidity /Neutralization no. • Emulsification • Saponification value 7.4 Selection of lubricant for a particular machine depending upon its working condition (Table showing machines, their working condition, nature of lubricant needed, type of lubrication used).	06	08

<p>8.Fuels</p> <p>8.1 Definition of fuel, Types of fuel(classification of fuels with Examples based on source and physical state)</p> <p>8.2 General characteristics of fuel (calorific value, ignition temperature and percentage of non combustible matter) Characteristics of an ideal fuel. Comparison between solid, liquid, and gaseous, Fuels based on their properties.</p> <p>8.3 Solid fuels, wood , coal , Coalification ,different varieties of coal(example: peat , lignite , bituminous & anthracite).comparison of wood and four varieties of coal with respect to</p> <ol style="list-style-type: none"> percentage of carbon percentage of moisture content percentage of calorific value Uses <p>8.4 Analysis of coal : Definition , two types</p> <ol style="list-style-type: none"> Proximate analysis definition, factors determined by It(%moisture content , %volatile matter , %ash content & % of fixed carbon). Significance of proximate analysis. Ultimate analysis definition factors determined by it (Chemical composition like %of carbon , hydrogen , oxygen, nitrogen & sulphur etc,.).Determination of each element, Significance of ultimate analysis. <p>8.5 Liquid fuel :petroleum , occurrence ,its importance and classification , Refining of petroleum by fractional distillation Diagram of fractionating column Comparison of various fractions depending upon the temperature at which they are separated , carbon chain calorific value and uses.</p> <p>8.6 Gaseous fuels : examples:CNG,LNG,PNG,LPG,Biogas etc. Biogas :structure and working of biogas plant. Advantages and disadvantages of biogas.</p>	08	10
<p>9. Nonmetallic Engg. Material</p> <p>9.1 Definition of non metallic engineering materials example plastic rubber , asbestous cork , thermocole , etc.,</p> <p>9.2 Plastic :definition , example</p> <p>Polymerization : definition different methods of Polymerization addition and condensation .Addition polymerization : definition formation of polyethylene , Polytetrafluoroethylene PVC , polystyrene etc.,</p> <p>Condensation-polymerization : definition and examples (formationOf Bakelite , nylon-66 etc).</p> <p>Types of plastic: thermo softening ,thermo setting plastics, Differences between them. Compounding of plastic , Materials needed for it (pigments,fillers,Plasticizers accelerators etc.,)Properties and engineering applications</p> <p>9.3 Rubber : definition of rubber (elastomer).</p> <p>Natural rubber : Basic unit in natural rubber(isoprene) Occurrence & Processing of Latex .Limitations of natural rubber,Vulcanisation Of rubber: Definition. process, Chemical reactions, Applications/uses, Synthetic rubber: Importance,basic unit,types(BuNa-S,BuNaN,Butyl rubber, Thiokol,Neoprene)Properties of rubber:Elasticity,Tack Resilience,Tensile strength,Shock absorbance etc. Uses of rubber</p>	06	08

9.4 Thermal insulating materials Definition, Examples Thermocole, Glasswool. Thermocole: Definition, Preparation, Properties & uses Glasswool: Definition, Preparation, Properties & uses Epoxy Glass: Definition, Preparation, Properties & uses Pollution & its control		
10. Pollution Definition of pollution and pollutants 10.1 Types of pollution Air & water pollution. 10.2 Air pollution; Definition, types of air pollutants, their sources & effects (Gases, particulates, radioactive gases) air pollution due to I.C. ENGINE & its control 10.3 Water pollution: Definition, causes of water pollution (domestic waste, industrial waste, their characteristics) Methods of preventing water pollution. 10.4 E-Waste: its origin, effect & control measures.	06	06

List of Practical:

1. Tour of chemistry laboratory & safety measures.
2. Volumetric analysis of strong acid Strong base
3. Volumetric analysis of Ferrous sulphate-Potassium permanganate-oxalic acid.
4. To find out the electrochemical equivalent of copper.
5. To find out the neutralization point of titration between a weak acid and weak base.
6. To find out the Chloride content from given sample of water.
7. Find out the total hardness from given sample of water.
8. Qualitative analysis of any three salt solutions.
Basic radicals : Cu^{++} , Fe^{++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Ni^{++} , Zn^{++} , Ca^{++} , Ba^{++} , Mg^{+} , NH_4^{+} Acidic radicals: Cl^{-} , Br^{-} , I^{-} , CO_3^{--} , SO_4^{--} , NO_3^{-}
9. Prepare a chart showing physical properties and uses of Metals.
10. Find out the percentage of iron from the given alloy sample.
11. To find out PH of different solutions using Lovibond comparator, PH paper, PH meter
12. Determination of viscosity of given Oil by Ostwald's viscometer
13. To find out the moisture content from given coal sample.
14. Preparation of phenol formaldehyde / urea formaldehyde plastic.

References:

Sr.No.	Author	Title	Publication
1.	V. P. Mehta	Polytechnic Chemistry	Jain Brothers, New Delhi
2.	P. C. Jain & Monica Jain	Applied Chemistry	Dhanpat Rai and Sons, New Delhi
3.	M. M. Uppal	Engineering Chemistry	Khanna Publisher, Delhi
4.	J. C. Kurlacose J. Jairam	Chemistry in Engineering and Technology Volume I and II	Tata Mc graw hill.

PROGRAMME CODE: ME/CE/EC/IS/EE													
Course Code	Course Title	C/O	Pre-requisite	Credits				Examination Scheme					
				TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
WS 11 201	Workshop Practice	C	Nil	--	--	4	4	--	--	--	--	50	50
1. Theory paper duration 3 hrs. 2. Theory paper assessment is internal and external. 3. The assessment of practical, oral, term, work is internal except mark (*). 4. (*) The assessment is internal and external. 5. C = Compulsory, O = Optional													
(*) indicates assessment by Internal and External examiners													

Rationale:

It is one of the important foundation courses. It describes facts, concepts and techniques of production. It gives knowledge about the various manufacturing processes such as smithy, forging, turning, carpentry, fitting, plumbing, sheet metal and joining. The demonstration of CNC machine will give fill of advancement in the industry. There is improvement of various skills while working on different machines. The understanding of these processes and skill is helpful to almost all the branches of Engineering.

Objectives:

The students will be able to

1. Know the working of various tools used in Carpentry, Smithy, Fitting, plumbing, welding and sheet metal work section.
2. Use the various tools used in the various sections.
3. Use these techniques in manufacturing various articles.

Topic No	Contents
1	SMITHY AND FORGING (Any One Job) <ol style="list-style-type: none"> One job involving bending and setting down operation. One job consisting of three operations bending, setting down, and upsetting. E.g. Pegs (Square, Round) Hook, Hammer tongue etc. One job consisting of above operations useful for the department or institute.
2	CARPENTRY SECTION. (Any one Job) <ol style="list-style-type: none"> One job involving two types of joints such as Tenon and Lap joint. One job on wood turning. E.g. Duster, square tool, Tee-poy, Chourang, Tray, Switch board, Pen stand etc. One job consisting of above operations useful for the department or institute. like desks, dies, black board, window, doors, stool tops etc
3	WELDING SECTION (Any One Job) <ol style="list-style-type: none"> One job on Electric Arc Welding consisting of Lap joint and Butt joint. One job on pipe joint. One job consisting of above operations useful for the department or institute. like Chairs, Table, garden racks, Window grills, tree guards ,stools, containers etc
4	FITTING SECTION (Any One Job) <ol style="list-style-type: none"> Any one job consisting of drilling and tapping operation. One job involving male and female joint. One job consisting of above operations useful for the department or institute. like paper weight, hand vice, grills fork spanner ,etc.
5	PLUMBING AND SHEET METAL WORKING (Any one Job) <ol style="list-style-type: none"> One job involving pipe threading. One job involving coupling and elbow. One job involving sheet cutting and sheet bending operations. E.g. Tray, cover of small electronic devices etc. One job consisting of above operations useful for the department or institute.
6	TURNING SECTION (DEMONSTRATION ONLY) Demonstration of working of Lathe Machine

	<p>(Group Demonstration)</p> <p>Term work- Student shall visit the turning section and see the working of Lathe Machine, and explain the working of Lathe Machine with simple diagram in Journal.</p>
7	<p>CNC SECTION (DEMONSTRATION ONLY)</p> <p>Demonstration of working of CNC Lathe or CNC Milling machine</p> <p>(Group Demonstration)</p> <p>Term work- Student shall visit the CNC Lab and see the working of CNC lathe or CNC milling machine, and explain the working of CNC machine with simple block diagram in Journal.</p>

Term Work:

At the beginning of the term respective instructors should show working of all the tools and equipments used in their section. Student should draw the sketches of all the tools used in the workshop in their journal and would write the description and applications of them. Journal should be submitted along with the other jobs for the final assessment at the end of the term.