CURRICULUM

FOR

SECOND SEMESTER

DIPLOMA

IN

ELECTRICAL ENGINEERING

SUBJECT STUDY SCHEME (2nd Semester: Electrical Engineering)

Course Code	Subjects	Time in Hours				CREDITS		
		Theory	Tutorial	Practical	Total	Theory	Practical	Total
BS201	Applied Mathematics-II	3	1	--------	4	4	--------	4
ES202	Introduction to Computers and Information Technology	---	---	4	4	----	2	2
EEPC201	Fundamental of Electrical Engineering	3	1	----	4	4	----	4
EEPC202	Fundamental of Electrical Engineering Lab	----	--------	2	2	---	1	1
EEPC203	Basic Electronics	3	--------	----	3	3	---	3
EEPC204	Basic Electronics Lab	-----	--------	2	2	----	1	1
EEPC205	Material Science	3		--------	3	3	--------	3
EEPC206	Electrical Workshop Practice – I	--------	--------	8	8	--------	4	4
	Total	**12**	**2**	**16**	**30**	**14**	**8**	**22**

PROGRAM: THREE YEAR DIPLOMA IN ENGINEERING AND TECHNOLOGY *	
Course Code: **BS201**	Course Title: **Applied Mathematics-II**
Semester: **2nd**	Credit: **4**
Periods Per Week: **4 (L: 03, T: 01, P: 0)**	

(* Common to Architecture Assistantship, Automobile, Civil, Civil(PHE), QSCM,Computer , Electrical , E&C,Medical Electronics, Food Technology, I&C,Leather Technology, Mechanical,Textile Technology, Wood Technology and IT)

COURSE OBJECTIVE:

This course is designed to develop an understanding of basic mathematical and statistical tools which include matrices, determinants, integral calculus and coordinate geometry and the applications of such tools in the field of engineering and technology

COURSE CONTENT

1. Integral Calculus

1.1 Integration as inverse operation of differentiation
1.2 Simple integration by substitution, by parts and by partial fractions (for Linear factors only)
1.3 Evaluation of definite integrals (simple problems)-

Evaluation of $\int_{0}^{\pi/2} Sin^n x \, dx$, $\int_{0}^{\pi/2} Cos^n x \, dx$, $\int_{0}^{\pi/2} Sin^m x \; Cos^n x \, dx$

Using formulae without proof (m and n being positive integers only)

2. Coordinate Geometry

1.1 Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

1.2 General equation of a circle and its characteristics. To find the equation of a circle, given: Centre and radius, three points lying on it and coordinates of end points of a diameter.

1.3 Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Basic problems on conics when their foci, directrices or vertices are given.

3. Matrices and Determinants

3.1 Definition of matrix and its types.
3.2 Addition, subtraction and multiplication of matrices.
3.3 Expansion of Determinants.

4. Statistics

4.1 Measures of Central Tendency: Mean, Median, Mode

4.2   Measures of Dispersion: Mean deviation, Standard deviation
4.3   Basic Concepts of Probability.

COURSE OUTCOME

After the completion of the course the student will be able to:

- evaluate both indefinite and definite integrals by various methods
- identify various points in a 2-D space along with formulation of equations and graphs for different types of lines, circles, ellipses, parabolas etc.
- find the sum, difference and product of two or more matrices,
- evaluate determinants and their relations to matrices
- find the mean, median, mode and other measures of central tendency.
- solve basic problems on probability.

RECOMMENDED BOOKS:

1. R.D Sharma, Applied Mathematics-II.
2. H.K Das, Applied Mathematics.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
4. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
6. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi
7. Applied Mathematics-II, Eagle Publications.

UNIT WISE TIME AND MARKS DISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	16	35
2	10	20
3	12	25
4	10	20
Total	**48**	**100**

PROGRAM THREE YEAR DIPLOMA IN ENGINEERING AND TECHNOLOGY	
Course Code: **ES202**	Course Title: **Introduction to Computers and Information Technology**
Semester:**2ⁿᵈ**	Credit: **2**
Periods Per Week: **4 (L: 0 T: 0 P: 4)**	

(* Common to Architecture Assistantship, Automobile, Civil, Civil(PHE), QSCM,Computer , Electrical , E&C,Medical Electronics, Food Technology, Garment Technology, I&C,Leather Technology, Mechanical, Textile Design, Textile Technology, Travel and Tourism, MLT, Wood Technology and IT)

COURSE OBJECTIVE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

COURSE CONTENT

1. **Basics of Information Technology**
   1.1. Its concept and scope, applications of IT, ethics and future with information technology.
   1.2. Impact of computer and IT in society.
   1.3. Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more.

2. **Basic Components of Computer System**
   2.1. Block diagram of a computer System and Processing of Data.
   2.2. Demonstration of computer system viz., Hardware, Software
   2.3. Concept of Memory and its various types, Primary and secondary memories (RAM, ROM, Storage Devices etc).

3. **Internet and its Applications**
   3.1. Introduction to Internet, its basic working.
   3.2. Concept of Email, Social Media, Cloud Computing.
   3.3. Basic ideas about IP Address, DNS, URL, Server, Web Browser,LAN etc.

4. **Use of Various Basic Data Processing Softwares**
   4.1. *Word Processing (Microsoft Word & Google Docs.)*
       4.1.1. File Management:
           4.1.1.1. Opening, creating and saving a document, locating files, copying contents in some different file(s).
       4.1.2. Editing a document:
           4.1.2.1. Entering text, Cut, copy, paste using tool- bars
       4.1.3. Formatting a document:
           4.1.3.1. Using different fonts, changing font size and color, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
           4.1.3.2. Aligning of text in a document, justification of document, Inserting bullets and numbering
           4.1.3.3. Formatting paragraph, inserting page breaks and column breaks, line spacing
           4.1.3.4. Use of headers, footers: Inserting footnote, end note, use of comments
           4.1.3.5. Inserting date, time, special symbols, importing graphic images, drawing tools
       4.1.4. Tables and Borders:
           4.1.4.1. Creating a table,
           4.1.4.2. Formatting cells,
           4.1.4.3. Use of different border styles, shading in tables,
           4.1.4.4. Merging of cells, partition of cells, inserting and deleting a row in a table
       4.1.5. Print preview, zoom, page set up, printing options
       4.1.6. Using Find, Replace options
   4.2. *Microsoft-Excel and Google Sheets*
       4.2.1. Introduction to Spreadsheet Application-Workbook and Worksheets
       4.2.2. Working with data and formulas:
           4.2.2.1. Addition, subtraction, division, multiplication, percentage and autosum.
           4.2.2.2. Format data, create chart, printing chart, save worksheet, creating and formatting of charts and graphs
   4.3. *Presentation (Microsoft-PowerPoint and Google Slides)*
       4.3.1. Introduction to PowerPoint - How to start PowerPoint - Working environment: concept of toolbars, slide layout, templates etc. - Opening a new/existing presentation - Different views for viewing slides in a presentation: normal, slide sorter etc.
       4.3.2. Addition, deletion and saving of slides.
       4.3.3. Insertion of multimedia elements - Adding text boxes, importing pictures, movies and sound, tables and charts etc.
       4.3.4. Formatting slides - Text formatting, changing slide layout, changing slide color scheme - Changing background, Applying design

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template.

4.3.5. Viewing the presentation using slide navigator

COURSE OUTCOME

After the completion of the course the student will be able to:

- Identify the different hardware components and functional units of a Computer system.
- Explain basic concepts and working of internet.
- Create and format word documents by using different word processing software.
- Prepare the spread sheets and the presentation of data in different ways.
- Prepare power point presentations.

RECOMMENDED BOOKS:

1. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd-Jungpura, New Delhi
2. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
3. Fundamentals of Information Technology by Leon and Leon;Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
4. Basics of Information Technology, by Ishan Publications, Ambala
5. Information Technology for Management by Henery Lucas, 7th edition, Tata McGraw Hill Education Pvt Ltd, New Delhi

UNIT WISE TIME AND MARKSDISTRIBUTION

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	10
2	13	20
3	13	20
4	32	50
Total	**64**	**100**

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**	
Course code : **EEPC201**	Course Title: **Fundamentals of Electrical Engineering**
Semester : **2ND**	Credit :**4**
Periods per week:**4**	**L : 3 T : 1 P: 0**

COURSE OBJECTIVE:

   To provide basic knowledge of the different elements and concepts of electrical engineering field and their applications to help students deal with electrical engineering principles and applications in industrial processes of different fields.

CONTENTS

1 BASIC CONCEPTS AND DC CIRCUITS   (12 Hours)

1.1   Different forms of energy , Advantages & Applications of electrical energy

1.2   Basic concept of charge, current, voltage, resistance, power, energy and their units , Conversion of units of work, power and energy from one form to another

1.3   Active and passive components

1.4   Concept of current and voltage sources, constant voltage and current sources, their graphical representation & Conversion, Difference between actual voltage source and constant voltage source

1.5   Ohm's law, resistances in series and in parallel ,Kirchhoff's laws and their applications in solving electrical network problems

2 ELECTROMAGNETISM AND ELECTROMAGNETIC INDUCTION
                                          (12   Hours)

2.1.   Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid. Methods to find its direction, force between two parallel current carrying conductors & Force on a current carrying conductor placed in the magnetic field.

2.2.   Magnetic circuits, Magnetic flux, mmf, Reluctance, Permeance, comparison between magnetic circuits and electrical circuits, Series and parallel magnetic circuits, simple problems , Importance of Air Gap, Concept of Leakage Flux , B- H Curve ,Magnetic Hysteresis, Hysteresis loss, importance of hysteresis loop.

2.3.   Basic concept of electromagnetic induction and Faraday's Laws of electromagnetic induction. Lenz's law, Fleming's Right and Left Hand Rule, Induced EMF and its types , Principle of self and mutually induced EMF, Coefficient of self and mutual induction and simple problems

,Inductances in series and in parallel , Energy stored in a magnetic field ,Concept of eddy currents, eddy current loss

3 ELECTROSTATICS   (7 Hours)

3.1 Coulombs law, electric potential and electric potential difference, Electric field, electric field intensity, electric lines of force, electric flux

3.2 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, dielectric break down

3.3 Application of electrostatics in electrostatic precipitator

4 BATTERIES   (12 Hours)

4.1 Basic idea about primary and secondary cells

4.2 Working principle, construction and applications of Lithium Ion, Lead acid, Nickel Cadmium and Silver Oxide Cells

4.3 Charging methods used for lead acid accumulator / Batteries ,Care and maintenance of a lead acid battery

4.4 Grouping of cells in series and parallel (simple numerical problems).

4.5 Testing of lead Acid battery for fully charged conditions and their specifications.

4.6 Advantages and disadvantages of Lithium Ion Batteries

5 AC FUNDAMENTALS   (5 Hours)

5.1 Concept of alternating current and voltage, sinusoidal current and voltage

5.2 Concept of important terms such as Wave form, Instantaneous value ,cycle, Alternation ,Time period , Frequency, peak value , Average Value , Effective value   etc   and equations of instantaneous values, average value, r.m.s value, form factor, power factor etc

5.3 Difference between a.c and d.c and Advantages of AC over DC and vice versa

COURSE OUTCOMES

After the completion of this course, the student will be able to
- explain the basic terminology used in electricity like charge, current, voltage , resistance etc.
- solve basic problems related to Capacitors.
- express electric current as flow of charge.
- solve various electric circuits for current, voltage or resistance.
- list the effects of an electric current and its common applications.
- determine the energy consumed by an appliance.
- state the laws of electromagnetic induction and describe the effect on a current-carrying conductor when placed in a magnetic field.

- explain the concept of batteries , their construction and their applications.
- Describe the various concepts associated with AC and will be also able to distinguish it with DC.

RECOMMENDED BOOKS

1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Electrical Science by VK Mehta, S Chand and Co., New Delhi
4. Electrical Engineering by DR Arora, Ishan Publications, Ambala
5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi
6. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
9. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi
10. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT	TIME (Hrs)	MARKS (%age)
1	12	25
2	12	25
3	07	15
4	12	25
5	05	10
TOTAL	48	100

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**	
Course code : **EEPC202**	Course Title: **Fundamentals of Electrical Engineering LAB**
Semester : **2ND**	Credit : **1**
Periods per week : **2**	L : 0 T : 0 P: 2

COURSE OBJECTIVE:
To provide basic knowledge of the different elements and concepts of electrical Engineering field and their applications practically to help students deal with electrical engineering principles and applications in industrial processes of different fields.

LIST OF PRACTICALS

1. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law)
2. Filament lamp Measure the resistance of a cold lamp filament with the help of calculations. Measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage
3. a. Measurement of resistances using multimeter and their comparison with colour code values
   b. To verify that $R_t = R_1+R_2+....$ where R_1, R_2 etc. are resistances connected in series
   c. To verify
   $$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + - - - - - - \frac{1}{R_m}$$
   Where R_1, R_2 etc. are resistances connected in parallel
4. Verification of Kirchhoff's current and voltage laws applied to DC circuits
   a. To construct a circuit arrangement consisting of resistances in series, parallel and in combination
   b. Identification of node points in the circuit
   c. To see that algebraic sum of currents at node point is zero
   d. To see that algebraic sum of emfs and voltage drops in a closed loop is zero
5. To observe the a.c and d.c wave shapes on CRO
6. Conversion of Galvanometer into an Ammeter and voltmeter of given range.
7. To measure very low resistance and very high resistance using Wheat Stone bridge
8. To find the time constant of a capacitor
9. Study the charging and discharging characteristics of lead acid and lithium ion batteries.
10. Study the charging and discharging characteristics of battery management system.
11. To find ratio of inductance values of a coil having air /iron core respectively and to see the   effect of introduction of a magnetic core on coil inductance

Note: The results should be verified analytically also.

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**			
Course code :**EEPC203**	Course Title: **Basic Electronics**		
Semester : **2ND**	Credit : **3**		
Periods per week : **3**	**L : 3**	**T : 0**	**P: 0**

COURSE OBJECTIVE:

To provide basic knowledge of the different elements and concepts of electronic engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, to help students deal with electronics engineering principles and applications in industrial processes of different fields.

COURSE CONTENTS

1. SEMICONDUCTOR DIODES   (12Hours)

1.1   Concept of doping, Types of semiconductors and effect of temperature on semiconductors.

1.2   PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism

1.3   Ideal diode, Semiconductor diode characteristics, static and dynamic resistance

1.4   Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), relation between DC output and AC input   voltage,rectifier efficiency

1.5   Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie (π) filters and their applications

1.6   Diode ratings/specifications

1.7   Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; & working characteristics and applications of Zener and LED Diode only.

1.8   Concept of Wave-shaping: R-C differentiating and integrating circuits, Diode clipping circuits , Diode clamping circuits & Applications of wave-shaping circuits.

2   Transistors   (12Hours)

2.1   Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flowTransistor configurations: common base (CB), common emitter (CE) and common collector (CC) and their current relations comparison of the three configurations

2.2   Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point. Different biasing circuits

2.3   Working of Single stage transistor amplifier circuit in CE configuration, physical and graphical explanation, phase reversal DC and AC load line

2.4   Multi Stage Transistor Amplifiers : Need , Different types of coupled two-stage amplifiers, Their circuit details, working, frequency response, applications, limitations   voltage gain, current gain, power gain, frequency response, decibel gain and band width, Loading effect in multistage amplifiers

3   Audio Power Amplifier & Feedback in Amplifiers   (10   Hours   )

3.1   Difference between voltage and power amplifier, performance quantities in Power Amplifier, Classification of power amplifiers, collector efficiency, Impedance matching using transformer ,Heat sinks in power amplifiers

3.2   Circuit details, working and advantages of Push-pull amplifier and complementary symmetry push-pull amplifier (no mathematical derivations)

3.3   Feedback & its types , Voltage gain of an amplifier with negative feedback $A_{fb} = $ $A / (1 + \beta A)$, Effect of negative feedback on voltage gain, stability, distortion, band width, output and input impedance of an amplifier   (No mathematical derivation)

3.4   Typical feedback circuits, Effect of removing the emitter by-pass capacitor on a CE transistor amplifier, Emitter follower and its applications

4   SINUSOIDAL OSCILLATORS   (5 Hours)

4.1   Sinusoidal Oscillators – positive feedback in amplifiers
4.2   Difference between an oscillator and an alternator
4.3   Essentials of an oscillator
4.4   Circuit details and working of Different oscillators viz. Tuned Collector, Hartley and Colpitt's oscillators
4.5   Introduction to piezoelectric crystal and crystal oscillator circuit

5   FIELD EFFECT TRANSISTOR (FET)   (9 Hours)

5.1   Construction, operation, characteristics and applications of a JFET , JFET as an amplifier
5.2   Construction, working principle and applications of a MOSFET
5.3   Comparison between BJT, JFET and MOSFET

COURSE OUTCOMES
After completion of this course the student should be able to
- apply the knowledge of diodes in rectifiers, power adapters and various electronic circuits.
- apply the knowledge of semiconductors in various technical gadgets like mobile phones, computers ,LED, photocells, solar lights etc.
- apply the knowledge of transistors in amplifiers and Multistage amplifiers

- differentiate between voltage and power amplifiers.
- explain the advantages of feedback in amplifiers
- explain the applications of oscillators
- explain the working and applications of FET and MOSFET

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
3. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
5. Principles of Electronics by SK Bhattacharya and RenuVig, SK Kataria and Sons, Delhi
6. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
7. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd, New Delhi.
8. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Education Pvt Ltd, New Delhi.
9. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT	TIME(Hrs)	MARKS (%age)
1	12	25
2	12	25
3	10	20
4	5	10
5	9	20
TOTAL	48	100

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**			
Course code : **EEPC204**	Course Title: **Basic Electronics Lab**		
Semester : **2ND**	Credit : **1**		
Periods per week : **2**	**L : 0**	**T : 0**	**P: 2**

COURSE OBJECTIVE:

To provide basic knowledge of the different elements and concepts of electronic engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, to help students deal with electronics engineering principles and applications in industrial processes of different fields.

LIST OF PRACTICALS

1.   Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transistor and different types of switches used in Electronic circuits

2.   V-I characteristics of a Semiconductor diode and to calculate its static and dynamic resistance

3.   a)   V-I characteristics of a Zener diode and finding its reverse breakdown voltage

      b)   Fabrication of a Zener diode voltage stabilizer circuit using PCB

4.   Observation of input and output wave shapes of a half-wave and full – wave rectifier and verification of relationship between dc output and ac input voltage

5.   Observation of input and output wave shapes of a full wave rectifier with (i) shunt capacitor) (ii) series inductor (iii) Π filter circuits

6.   Plotting input and output characteristics of a transistor in CB configuration and CE configuration

7   Measurement of operating point in case of (i) fixed biased circuit (ii) potential divider biasing circuit and to observe the effect of temperature variation on the operating point.

8   To study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting frequency response curve of a two stage RC coupled amplifier

9   To observe the effect of negative current feedback on the voltage gain of a single stage transistor amplifier by removing emitter bye-pass capacitor.

10   To measure (a) voltage gain (b) input and output impedance for an emitter follower circuit

11   To measure frequency generation in (a) Hartley (b) R-C Phase Shift Oscillator

12   Clipping of both portion of sine-wave using:
      a. diode and dc source
      b. zener diodes Clamping a sine-wave to:
               i)Negative dc voltage   ii) Positive dc voltage

13.   To plot V-I characteristics of a FET

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**	
Course code : **EEPC205**	Course Title: **Material Science**
Semester : **2ND**	Credit :**3**
Periods per week :**3**	**L : 3 T : 0 P: 0**

COURSE OBJECTIVE:

A diploma holder in Electrical Engineering will be involved in maintenance, repair and production of electrical equipment and systems. In addition, he may be required to procure, inspect and test electrical and electronic engineering materials. Knowledge of various types of materials will be needed in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

1.   **Classification**   **(2 Hours)**

Classification of materials into conducting, semi conducting and insulating materials through a brief reference to their atomic structure and energy bands, energy band structure of semiconductor , generation and recombination of electron hole pairs. Energy band structure of Silicon and Germanium , Silicon versus Germanium for mobility and conductivity

2.   **Conducting Materials**   **(10 Hours)**

2.1   Introduction
2.2   Resistance and factors affecting it such as alloying and temperature etc
2.3   Classification of conducting material as low resistivity and high
         resistivity materials
        2.3.1 Low resistance materials
            Copper:
            General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard-drawn and annealed copper, corrosion, contact resistance. Application in the field of electrical engineering.
            Aluminium:
            General properties as conductor: Resistivity, temperaturecoefficient, density, Mechanical properties of hard and annealed aluminium, solderability, contact resistance. Applications of aluminium in the field of electrical engineering.
            Steel:
            General properties as conductor: Resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering.
            Bundle conductors and its applications.
            Low resistivity copper alloys: Brass, Bronze (cadmium and

Beryllium), and their practical applications with reasons for
the same
Applications of special metals e.g. Silver, Gold, Platinum etc.
  2.3.2 High resistivity materials and their applications e.g.,
    manganin, constantin, Nichrome, mercury, platinum, carbon and
    tungsten, Tantalum
2.4 Superconductors and their applications

3. INSULATING MATERIALS GENERAL PROPERTIES: (10 Hours)

  3.1 Electrical Properties:
    Volume resistivity, surface resistance, dielectric loss, dielectric strength
    (breakdown voltage) dielectric constant
  3.2 Physical Properties:
    Hygroscopicity, tensile and compressive strength, abrasive resistance,
    brittleness
  3.3 Thermal Properties:
    Heat resistance, classification according to permissible temperature rise.
    Effect of overloading on the life of an electrical appliance, increase in
    rating with the use of insulating materials having higher thermal
    stability, Thermal conductivity, Electro-thermal breakdown in solid
    dielectrics
  3.4 Chemical Properties: Solubility, chemical resistance, weatherability
  3.5 Mechanical properties , tensile structure

4. INSULATING MATERIALS AND THEIR APPLICATIONS: (7 Hours)

  4.1 Plastics
- Definition and classification
- Thermosetting and Thermo-plastic material and their applications
- Procedure of preparation of plastic (PVC)

  4.2 Natural insulating materials, properties and their applications
- Mica and Mica products
- Asbestos and asbestos products
- Ceramic materials (porcelain and steatite)
- Glass and glass products
- Cotton
- Silk
- Paper (dry and impregnated)
- Rubber, Bitumen
- Mineral and insulating oil for transformers switchgear capacitors, high voltage insulated cables, insulating varnishes for coating and impregnation

- Enamels for winding wires
- Glass fibre sleeves

4.3   Gaseous materials; Air, Hydrogen, Nitrogen, SF6 their properties and
applications

5.   MAGNETIC MATERIALS: (9 Hours)

5.1   Introduction - ferromagnetic materials, permeability, B-H curve,
magnetic saturation, hysteresis loop including coercive force and
residual magnetism, concept of eddy current and hysteresis loss, curie
temperature, magnetostriction effect, method of reduction of eddy
current loss and hysteresis loss.

5.2   Soft Magnetic Materials:
- Alloyed steels with silicon: High silicon, alloy steel for transformers,
low silicon alloy steel for electric rotating machines
- Cold rolled grain oriented steels for transformer, Non-oriented steels
for rotating machine
- Nickel-iron alloys
- Soft Ferrites

5.3   Hard magnetic materials
Tungsten steel, chrome steel, hard ferrites and cobalt steel, their
applications

6.   SPECIAL MATERIALS   (10 Hours)

Thermocouple, bimetals, leads soldering and fuses   material, mention their
applications

Brief introduction to Various engineering materials necessary for fabrication of
electrical machines such   as   motors, generators, transformers etc .

The teacher should bring different materials, electronic components and
devices in the class while taking lectures and explain and make students familiar
with them. Also he may give emphasis on practical applications of these devices
and components in the field. In addition, the students should be given exercises
on identification of materials used in various electronic gadgets etc .and be
encouraged to do practical work independently and confidently.

COURSE OUTCOMES:

After completion of this course the students will be able to
- differentiate between conductors , semiconductors and insulators
- enumerate the Properties of different insulating and conducting Materials
- list the various applications of insulating materials
- list the Magnetic Materials and their applications

RECOMMENDED BOOKS

1   Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna
Publishers, New Delhi

2 Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi

3. Electrical Engineering Materials by Sahdev, Uneek International Publications

4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi

5. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi

6. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi

7. Electrical and Electronics Engineering Materials DR Arora, Ishan Publications, Ambala City

8. Electrical Engineering Materials by Rakesh Dogra, SK Kataria and Sons, NEW Delhi

UNIT WISE TIME AND MARKS DISTRIBUTION

UNIT	TIME(Hrs)	MARKS (%age)
1	02	5
2	10	20
3	10	20
4	7	15
5	9	20
6	10	20
TOTAL	**48**	**100**

PROGRAM : **THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING**		
Course code: EEPC206	Course Title: **Electrical Workshop Practice – I**	
Semester: 2ND	Credit : 4	
Periods per week :8	**L : 0 T : 0 P: 8**	

COURSE OBJECTIVE: :

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers working under him. In addition, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, fault finding, wiring in electrical appliances and installations.

LIST OF PRACTICALS

1. Various Electrical Symbols used in Domestic and Industrial Installation and Power System as per BIS.
2. Study of electrical safety measures as mentioned in the Electricity Rules and shock treatment including first aid
3. Wire jointing
   Straight married joint   , Technology-joint , Western union joint   , Britania joint   , Twist sleeve joint & Bolted type joint
4. Types of wiring and to make different light control circuits in the following types of wiring.
   i. Casing and capping (PVC) wiring
   ii. ii Conduit wiring (surface / concealed)
5. Filling and crimping of thimbles (using hydraulic and hand crimping tool)
6. Study of ISI standard for MCBs and Conduct one test on MCB on above basis
7. Construction /assembly of Distribution Board and Extension Board
   a.   Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)
   b.   Assembly of distribution board panel using MCB, main switch, change over switch, ELCB and RCCB
   c.   Construction of an extension board with two 5A sockets and one I5A Socket controlled by their respective switches, a fuse and indicator with series test lamp provision.
8. Simple light and Alarm Circuits
   a. One lamp controlled by two switches (staircase circuit)
   b. Two lamps controlled by three switches (double staircase circuit)
   c. Two ordinary bells (for day and night) used at a distant residence
   d. Bell response circuit using one bell and one relay

    e. Bell response circuit of an office (for three rooms)

    f. Traffic light control system for two roads crossing.

9. Testing of domestic wiring installation using megger
10. Fault finding and repair of a LED lamp
11. Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)

RECOMMENDED BOOKS

1. A Text book of Electrical Workshop Practices By Dr. Umesh Rathore and Naresh Kumar Sharma   Katson Publications
2. Electrical Workshop   safety , Commissioning , Maintenance and testing of Electrical Equipment   By R P Singh   Wiley Publications
3. Electrical Workshop   and wiring practice   By D Jayachandra Falcon Publishers
4. Electrical Workshop A TEXT BOOK 2ND Edition   by R P Singh   I K International
5. Electrical Wiring an introduction   2ND Edition by Satheesh Kumar, Ane Book Pvt Ltd.