

Syllabus & Scheme

of

ICD

**Integrated Certificate & Diploma
(3rd Semester)**

(Provisional: subject to conformation by concerned department)

**DIPLOMA IN COMPUTER SCIENCE AND ENGINEERING
&
CERTIFICATE IN DATA ENTRY & WORD PROCESSING (CDE)**

| Semester-III | | | | | | | |
|---------------------|-----------------|--|-----------|----------|-----------|-------------|----------------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | CS-211 | Internet & Web Technologies | 2 | 0 | 4 | 6 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamental of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | CS-214 | Computer Programming | 3 | 0 | 4 | 7 | 5 |
| 5 | CS-215 | Data Structures | 3 | 0 | 4 | 7 | 5 |
| 6 | MC-211 | Moral values and Professional ethics | 1 | 0 | 0 | 1 | 0 |
| Total | | | 15 | 0 | 16 | 31 | 22 |

**DIPLOMA IN CHEMICAL TECHNOLOGY
&
CERTIFICATE IN CHEMICAL TECHNOLOGY(CT)**

| Semester-III | | | | | | | |
|---------------------|-----------------|-------------------------------------|-----------|----------|----------|-------------|----------------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | CH-211 | Fluid Flow | 3 | 1 | 0 | 4 | 4 |
| 3 | CH-212 | Pulp Washing & Chemical Recovery | 3 | 1 | 4 | 8 | 6 |
| 4 | CH-214 | Paper Testing & Quality Control Lab | 0 | 0 | 4 | 4 | 2 |
| 5 | CH-215 | Chemical Engineering Thermodynamics | 3 | 2 | 0 | 5 | 5 |
| 6 | CH-216 | Mechanical Operations | 3 | 1 | 0 | 4 | 4 |
| Total | | | 15 | 6 | 8 | 29 | 25 |

**DIPLOMA IN CIVIL ENGINEERING
&
CERTIFICATE IN BUILDING MAINTENANCE (CBM)**

| Semester-III | | | | | | | |
|---------------------|-----------------|--|-----------|----------|-----------|-------------|----------------|
| S.No | Sub.Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamentals of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | CV-211 | Surveying-I | 2 | 0 | 2 | 4 | 3 |
| 5 | CV-212 | Building Construction and Drawing | 2 | 0 | 2 | 4 | 3 |
| 6 | CV-213 | Concrete Technology | 2 | 0 | 2 | 4 | 3 |
| 7 | CV-214 | Water Supply and Waste Water Engineering | 2 | 0 | 2 | 4 | 3 |
| Total | | | 17 | 1 | 12 | 30 | 24 |

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING
&
CERTIFICATE IN SERVICING & MAINTENANCE OF ELECTRONIC INSTRUMENTS (CSME)**

| Semester-III | | | | | | | |
|---------------------|-----------------|---|-----------|----------|-----------|-------------|----------------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | HU-211 | Communication Skills-II | 1 | 0 | 2 | 3 | 2 |
| 2 | CS-216 | Computer Fundamentals | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-213 | Electronics measurement & instrumentation | 3 | 1 | 2 | 6 | 5 |
| 4 | EC-214 | Analog Communication | 3 | 1 | 2 | 6 | 5 |
| 5 | EC-217 | Consumer Electronics | 3 | 1 | 0 | 4 | 4 |
| 6 | EC-218 | Troubleshooting of electronics equipments | 0 | 0 | 4 | 4 | 2 |
| 7 | MC-211 | Moral values and Professional ethics | 1 | 0 | 0 | 1 | 0 |
| Total | | | 14 | 3 | 12 | 29 | 22 |

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING
&
CERTIFICATE IN TELEVISION MECHANIC (CTV)**

| Semester-III | | | | | | | |
|--------------|----------|---|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | CS-216 | Computer Fundamentals | 3 | 0 | 2 | 5 | 4 |
| 2 | HU-211 | Communication Skills-II | 1 | 0 | 2 | 3 | 2 |
| 3 | EC-212 | Fundamental of television Engineering | 3 | 1 | 2 | 6 | 5 |
| 4 | EC-213 | Electronics measurement & instrumentation | 3 | 1 | 2 | 6 | 5 |
| 5 | EC-214 | Analog Communication | 3 | 1 | 2 | 6 | 5 |
| 6 | EC-216 | Maintenance & Repairing of Televisions | 0 | 0 | 4 | 4 | 2 |
| 7 | MC-211 | Moral values and Professional ethics | 1 | 0 | 0 | 1 | 0 |
| Total | | | 14 | 3 | 14 | 31 | 23 |

**DIPLOMA IN ELECTRICIAN ENGINEERING
&
CERTIFICATE IN ELECTRICIAN (CEN)**

| Semester-III | | | | | | | |
|--------------|----------|---|-----------|----------|----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | EE-212 | D.C. Machines and Transformers | 3 | 1 | 2 | 6 | 5 |
| 2 | EE-213 | Electrical Measurements | 3 | 0 | 2 | 5 | 4 |
| 3 | EE-214 | Transmission & Distribution of Power | 3 | 1 | 0 | 4 | 4 |
| 4 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 5 | EE-215 | Electrical Estimation & Costing | 3 | 1 | 0 | 4 | 4 |
| 6 | EE-216 | Maintenance & Repair of Electrical Equipments | 2 | 0 | 2 | 4 | 3 |
| 7 | MC-211 | Moral values and Professional Ethics | 1 | 0 | 0 | 1 | 0 |
| Total | | | 18 | 3 | 8 | 29 | 24 |

**DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING
&
CERTIFICATE IN INSTRUMENTATION AND CONTROL ENGINEERING (CSMM)**

| Semester-III | | | | | | | |
|--------------|----------|--|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | IE-211 | Electrical Measurements | 3 | 0 | 2 | 5 | 4 |
| 2 | IE-212 | Sensors and Transducers | 3 | 0 | 2 | 5 | 4 |
| 3 | IE-213 | Hydraulic and Pneumatic Instruments | 3 | 0 | 2 | 5 | 4 |
| 4 | IE-214 | Electrical and Instrumentation Drawing | 0 | 0 | 4 | 4 | 2 |
| 5 | IE-215 | Electromagnetic Energy Conversion | 3 | 0 | 2 | 5 | 4 |
| 6 | EC-211 | Fundamental of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 7 | MC-211 | Moral values and Professional ethics | 1 | 0 | 0 | 1 | 0 |
| Total | | | 16 | 0 | 14 | 30 | 22 |

**DIPLOMA IN FOOD TECHNOLOGY
&
CERTIFICATE IN FOOD PROCESSING & PRESERVATION (CFP)**

| Semester-III | | | | | | | |
|--------------|----------|--|-----------|----------|-----------|-----------|-----------|
| S.no | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | FT -211 | Food Microbiology | 3 | 0 | 2 | 5 | 4 |
| 5 | FT -212 | Food Chemistry | 3 | 0 | 2 | 5 | 4 |
| 6 | FT -213 | Principles of Food Processing and Preservation | 3 | 0 | 2 | 5 | 4 |
| Total | | | 18 | 1 | 10 | 29 | 24 |

**DIPLOMA IN MECHANICAL ENGINEERING
&
CERTIFICATE IN AIR CONDITIONING MECHANIC (CAC)**

| Semester-III | | | | | | | |
|--------------|----------|--|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | ME-211 | Manufacturing Process-I | 3 | 0 | 2 | 5 | 4 |
| 5 | ME-212 B | Refrigeration & Air Conditioning-I | 2 | 0 | 2 | 4 | 3 |
| 6 | ME-213 | Engineering Materials & Metallurgy | 2 | 0 | 2 | 4 | 3 |
| 7 | ME-214 B | Installation & Servicing of RAC equipments | 0 | 0 | 4 | 4 | 2 |
| Total | | | 16 | 1 | 14 | 31 | 24 |

**DIPLOMA IN MECHANICAL ENGINEERING
&
CERTIFICATE IN AUTO AND FARM EQUIPMENT MECHANIC (CAF)**

| Semester-III | | | | | | | |
|--------------|----------|--|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | ME-211 | Manufacturing Process-I | 3 | 0 | 2 | 5 | 4 |
| 5 | ME-212 C | Farm Machinery-I | 2 | 0 | 2 | 4 | 3 |
| 6 | ME-213 | Engineering Materials & Metallurgy | 2 | 0 | 2 | 4 | 3 |
| 7 | ME-214 C | Repair and Maintenance of Auto and Farm Equipments | 0 | 0 | 4 | 4 | 2 |
| Total | | | 16 | 1 | 14 | 31 | 24 |

**DIPLOMA IN MECHANICAL ENGINEERING
&
CERTIFICATE IN FOUNDRY AND FORGING (CFF)**

| Semester-III | | | | | | | |
|--------------|----------|---|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | ME-211 | Manufacturing Process-I | 3 | 0 | 2 | 5 | 4 |
| 5 | ME-212 E | Foundry Technology-I | 2 | 0 | 2 | 4 | 3 |
| 6 | ME-213 | Engineering Materials & Metallurgy | 2 | 0 | 2 | 4 | 3 |
| 7 | ME-214 E | Pattern Drawing | 0 | 0 | 4 | 4 | 2 |
| Total | | | 16 | 1 | 14 | 31 | 24 |

**DIPLOMA IN MECHANICAL ENGINEERING
&
CERTIFICATE IN TOOL AND DIE TECHNOLOGY (CTD)**

| Semester-III B (ICD) | | | | | | | |
|----------------------|----------|---|-----------|----------|-----------|-----------|-----------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | ME-211 | Manufacturing Process-I | 3 | 0 | 2 | 5 | 4 |
| 5 | ME-212 A | Tool Room Techniques-I | 2 | 0 | 2 | 4 | 3 |
| 6 | ME-213 | Engineering Materials & Metallurgy | 2 | 0 | 2 | 4 | 3 |
| 7 | ME-214 A | Tool Drawing | 0 | 0 | 4 | 4 | 2 |
| Total | | | 16 | 1 | 14 | 31 | 24 |

**DIPLOMA IN MECHANICAL ENGINEERING
&
CERTIFICATE IN WELDING TECHNOLOGY (CWG)**

| Semester-III B (ICD) | | | | | | | |
|-----------------------------|-----------------|---|-----------|----------|-----------|-------------|----------------|
| S.No | Sub Code | Subject Name | L | T | P | Hrs. | Credits |
| 1 | AM-211 | Applied Mathematics | 3 | 1 | 0 | 4 | 4 |
| 2 | EE-211 | Fundamental of Electrical Engineering | 3 | 0 | 2 | 5 | 4 |
| 3 | EC-211 | Fundamentals of Electronics Engineering | 3 | 0 | 2 | 5 | 4 |
| 4 | ME-211 | Manufacturing Processes-I | 3 | 0 | 2 | 5 | 4 |
| 5 | ME-212 D | Welding Technology-I | 2 | 0 | 2 | 4 | 3 |
| 6 | ME-213 | Engineering Materials & Metallurgy | 2 | 0 | 2 | 4 | 3 |
| 7 | ME-214 D | Welding Practices | 0 | 0 | 4 | 4 | 2 |
| | | Total | 16 | 1 | 14 | 31 | 24 |

Title of the course : **Applied Mathematics**
 Subject Code : **AM - 211/AM-221**
 Weekly load : 4 Hrs. LTP 3-1-0
 Credit : 4 (Lecture 3; Tutorial 1; Practical 0)

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Determinants Determinants, minors, cofactors, expansion of a determinant, properties of determinants, solution of linear simultaneous equations upto three variables by Cramer's rule. | 7 |
| | Matrices Introduction to matrices; addition; subtraction and multiplication of matrices. Inverse of a matrix by adjoint method. Solution of linear simultaneous equations upto three variables. | 7 |
| | Rank, eigenvalues Elementary transformations. Row reduced Echelon forms. Rank of a matrix. Normal form. Linearly dependent and independent vectors. System of linear equations. Linear transformations. Eigen values and eigenvectors. Properties of eigenvalues. Verification of Cayley-Hamilton Theorem and its use for finding inverse of a matrix. | 8 |
| Unit-2 | Solid Geometry Cartesian co-ordinate system. Distance formula. Section formulae. Direction ratios and direction cosines. Equation of a plane. Equations of a straight line. Condition for a line to lie in a plane. Coplanar lines. Shortest distance between two lines. Intersection of three planes. Equation of a sphere. Tangent plane to a sphere. | 14 |
| | Differential equations Ordinary differential equations, its order and degree. Linear and non-linear differential equations. Formation of differential equation. General and particular solution of a differential equation. Solution of a differential equation of first order and first degree - variable separable method, homogeneous differential equation, Solution of linear differential equation. | 9 |

Total=45

Recommended Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Thomas & Finney, Calculus, Pearson Education.
3. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill.

Title of the course : **Fluid Flow**
 Subject Code : **CH-211**
 Weekly load : 4 LTP 3-1-0
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Units and dimensions | 02 |
| | Fluid Properties Various types of flow, steady and unsteady flow, uniform and non-uniform flow, stream line flow, laminar and turbulent flow | 05 |
| | Classification of fluids Types of fluid, compressible and incompressible fluid, Newtonian and non-Newtonian fluid. Physical properties of fluids | 06 |
| | Dimensional analysis Dimensionless numbers and their physical significance | 03 |
| | Boundary Layer and equations Flow through the pipes and channels, concept of boundary layer. Continuity equation, Bernoulli's theorem and its application (without correction factor) and Reynolds number, Skin friction and form friction, Fanning factor, frictional losses in pipes and fittings. | 08 |
| Unit-2 | Fluid Meters & Flow Measurement Fluid pressure, various types of manometers, Pitot tube, Introduction to variable head meters and variable area meters. Wet gas meter, magnetic flow meter and anemometer, Simple numerical problems related to these topics. | 11 |
| | Fluid-Moving Machinery Pumps, construction and performance of centrifugal pump, reciprocating pump, rotary pump, characteristics curves of centrifugal pump, cavitations, Net positive suction Head & Priming. Selection and specification of pumps. Blowers and compressors. | 13 |

Total=48

Recommended Books:

1. Fluid Mechanics and its Applications by Gupta & Gupta, Wiley Eastern Publications.
2. Unit Operations of Chemical Engg. Vol. I by P. Chattopadhyay, Khanna Publishers.S. Kumar, S.K. Kataria & Sons, Heat & Mass Transfer
3. Chemical Engineering, Vol. I & II by Coulson and Richardson, Pergamon Press Publications.
4. Unit Operation of Chemical Engineering by McCabe & Smith, McGraw Hill Publications.
5. Introduction to Chemical Technology by Badger & Banchero, McGraw Hill Publications.

Title of the course : **Pulp Washing and Chemical Recovery**
 Subject Code : **CH-212**
 Weekly load : 8 LTP 3-1-4
 Credit : 6

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Brown Stock Washing: Study of pulp washing on multistage rotary vacuum filters. Construction and working of a rotary vacuum filter. Operating procedures, including startup and shutdown. Generation and maintenance of vacuum. Concept of dilution factor and elementary calculations. | 10 |
| | Washing Equipments Washing equipments other than rotary vacuum filters like horizontal belt washers and diffusion washers (only working principles and operational aspects). Black liquor as an asset rather than a liability, its importance as an energy source, overview of recovery process, Factors affecting brown stock washing and displacement efficiency, construction , working of 3-stage dilution/extraction pulp washing system. | 12 |
| Unit-2 | Black liquor concentration & incineration Introduction of chemical Recovery system, Classification of evaporators and their objectives in chemical recovery process, Introduction to multiple effect evaporations of | 16 |

| | | |
|--|--|----|
| | Black liquor, Brief description of type of evaporators, condensate systems, vacuum devices, feeding arrangement. Operation of evaporators and operational troubles, Introduction to direct contact evaporators. Description of Kraft Recovery Process. | |
| | Causticizing Operations The causticizing reaction. Operation of slakers, causticizers, mud washers and mud filters, Definitions of Kraft pulping terms: Total Alkali, Total Titrable Alkali, Active Alkali, Activity, Causticity, Sulphidity, Causticizing efficiency. | 10 |

Total=48

Recommended Books:

1. The causticizing reaction. Operation of slakers, causticizers, mud washers and mud filters.
2. Handbook of Pulp and Paper Technology by K.W. Britt
3. Handbook of Pulp and Paper Technology by C Biermann
4. Bleaching of Pulp by R.P. Singh

List of Practicals (Pulp Washing and Chemical Recovery)

1. Study of Rotary Drum Pulp Washer.
2. Laboratory washing of pulp.
3. Determination of specific gravity of Black liquor.
4. Measurement of degree twaddle (^oTW) of black liquor at different concentrations.
5. Determination of Total solids in black liquor.
6. Flow sheet of a Chemical Recovery System.
7. Determination of specific gravity of lime mud
8. Determination of moisture content in lime mud
9. Size reduction of lime in jaw crusher

Title of the course : **Paper Testing and Quality Control Lab**

Subject Code : **CH-214**

Weekly load : 4

LTP 0-0-4

Credit : 2

List of Experiments

1. Measurement of GSM and bulk of Paper.
2. Measurement of Caliper of Paper.
3. Determination of Burst strength of paper
4. Determination of Gurley porosity of paper
5. Determination of smoothness of paper
6. Determination of folding strength of paper
7. Measurement of brightness of paper
8. Measurement of opacity of paper
9. Measurement of cobb value of paper
10. Measurement of gloss of paper

Title of the course : **Chemical Engineering Thermodynamics**
 Subject Code : **CH-215**
 Weekly load : 5 LTP 3-2-0
 Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Basic Concept: Concept Of Enthalpy, Internal Energy, Entropy, Free Energy And Equilibrium. Laws Of Thermodynamics. Volumetric Properties Of Fluids, Heat Effects, Heat Conduction In Gases And Liquids. Thermal Conductivity Of Gases And Liquids. | 13 |
| | Thermodynamics Properties of Fluids Thermodynamics Properties of fluids: Properties of homogeneous mixtures; partial molar properties, fugacity, fugacity coefficient, chemical potential, activity coefficient. | 11 |
| Unit-2 | Phase Equilibria Phase Equilibria: Vapor liquid equilibria, dew point and bubble point and their calculations for two phase systems, Gibbs Duhem equation. Chemical Reaction Equilibria: Clausius-clapeyron equation. | 11 |
| | Refrigeration and Liquification Refrigeration and Liquification: Various cycles of refrigeration. Carnot vapor compression, vapor absorption, Concept of solar refrigeration. Liquification process cycles, coefficient of performance. Choice of refrigerant, properties of refrigerant. | 13 |

Total=48

Recommended Books:

1. Introduction to Chemical Engineering Thermodynamics by Smith & Van Ness, McGraw Hill Pub.
2. Chemical & Process Thermodynamics by Kyle, Prentice Hall Publications.
3. Chemical Engineering Thermodynamics by YVC Rao, Universities Press Publications.
4. Chemical Engineering Thermodynamics by Dodge, McGraw Hill Publications.

Title of the course : **Mechanical Operation**
 Subject Code : **CH-216**
 Weekly load : 4 LTP 3-1-0
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Introduction to mechanical operation | 03 |
| | Solid Handling Classification of solid particles, properties of particulate masses, storage of solids, transportation of solid materials, hydraulic and pneumatic conveying equipments | 08 |
| | Size reduction Principles of size reduction, determination of mean particles size, size distribution equations, laws of crushing and grinding, Kick's Law, Bond's Law and Rittinger's Law. | 08 |
| | Size Reduction Equipment Classification of industrial mills such as ball mill, fluid energy mill, jaw crusher and blake crusher; chippers, choppers and cutters. | 07 |
| Unit-2 | Separation techniques Industrial screening, effectiveness of screen, methods of solid, solid, solid-liquid, solid-gas separation, mixing of solids and pastes, filtration, centrifugation and cyclone separators. | 08 |
| | Settling Elutriation, classification and sedimentation, flow of fluids past solid; fluidization, Stoke's Law, free and hindered setting | 07 |
| | Thickeners Types of thickness; batch and continuous and their industrial applications. | 07 |

Total=48

Recommended Books:

1. Unit Operation of Chemical Engineering by McCabe & Smith & Harriott , McGraw Hill Publications
2. Chemical Engineering, Vol. I & II by Coulson and Richardson, Pergamon Press Publications.
3. Introduction to Chemical Technology by Badger & Banchemo, McGraw Hill Publications.
4. Fluid Mechanics and its Applications by Gupta & Gupta, Wiley Eastern Publications.
5. Principles of Unit Operations by Foust, John Wiley Publications

Title of the course : **Internet & Web Technologies**
 Subject Code : **CS-211**
 Weekly load : 2 LTP 2-0-4
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction World-Wide-Wed (WWW), Web fundamentals, basics of Internet Technology, IP addressing, type of domains, DNS, URL, Website Designing strategies, ISP, protocols – HTTP, TCP/IP, Telnet, FTP etc. | 06 |
| | HTML Understanding Structure of HTML program, working with text layout tags, working with page layout tags, working with images, hyperlinks, lists. | 06 |
| | Web page Interactivity Designing web-page with Tables, Forms, Frames and Cascading Style Sheets – Inline, Internal & external, XHTML. | 06 |
| Unit-2 | Internet Applications Video conferencing, NNTP, role of Firewalls in web technology, Paradigm of E-mail service, Website Registration process, New markup elements of DHTML, Audio & Video controls adding graphics, analysis & case study of different graphic formats. | 04 |
| | Power tools for Web site Basics of Java script & VB Script, HTML-editors, power tools – case study (jQuery). | 04 |
| | Client/Server- programming Introduction to Advanced Java Script, JDBC, web-page designing with database connectivity, JSP, PHP and web server. | 06 |

Total=32

Recommended Books:

1. Thomas A Powell, HTML the Complete Reference; Mc-Graw Hill
2. Michael Morrison, Head First Java Script; SPD-O'reilly.
3. Teodoru Gugoiu, HTML, XHTML, CSS & XML; Firewall Media.

Title of the course : **Internet & Web Technologies Lab**
 Subject Code : **CS-211**

List of Practical's

1. Study the overview of the HTML.
2. Introduction to various HTML tags.
3. Program to insert an image in HTML document.
4. Program to insert a table in HTML document.
5. Program to show linking of HTML pages.
6. Study the overview of the Frames.
7. Introduction to various frames.
8. Study the overview to Adobe Photoshop.
9. Study the overview to Macromedia Flash.
10. Program to develop Static page (using only HTML) of an online book store. The Pages should resemble: www.amazon.com. The website should consist the following pages:
 - Home Page
 - Registration and User Login
 - User Profile page
 - Books catalog
 - Shopping cart
 - Payment by credit card order conformation

Title of the course : **Computer Programming**
 Subject Code : **CS-214**
 Weekly load : 7 LTP 3-0-4
 Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Steps in development of a program, Flow charts, Algorithm and Program Debugging. | 06 |
| | Program Structure I/o statements, assign statements. Constants, variables and data types, Operators and Expressions, Standards and Formatted, Use of Header & Library files. | 06 |
| | Control Structures Introduction, Decision making with IF – statement, IF – Else and Nested IF, While and do-while, for loop, Break and switch statements. | 10 |
| | Functions Introduction to functions, Global and Local Variables, Function Declaration, Standard functions, Parameters and Parameter Passing, Call – by value/reference, Recursion. | 06 |
| Unit-2 | Arrays Introduction to Arrays, Array Declaration and Initialization, Single and Multidimensional Array. Arrays of characters. | 06 |
| | Structures and Unions Declaration of structures, Accessing structure members, Structure Initialization, Arrays of structures, Unions. | 04 |
| | Pointers Introduction to Pointers, Address operator and pointers, Declaring and Initializing pointers, Assignment through pointers, Pointers and Arrays. | 06 |
| | Files Introduction, File reading/writing in different modes, File manipulation using standard function types | 04 |

Total=48

Recommended Books:

1. Salaria RS, Application Programming in C, Khanna Book Publishing Co(P) Ltd. New Delhi.
2. Schaum Series, Programming in C, McGraw Hills Publishers, New York.
3. Yashwant Kanetkar, Exploring – BPB Publications, New Delhi.

Title of the course : **Computer Programming Lab**
 Subject Code : **CS-214**

List of practical's:

1. Write Codes to demonstrate the concept of Data Types and Operators.
2. Write Codes to demonstrate the concept of Variables, Constants and Keywords.
3. Write Codes to study the concept of Type Casting.
4. WAP to calculate temperature in Fahrenheit to Celsius using formula $C = (F - 32) / 1.8$.
5. WAP to calculate Sum and Average of N numbers using sequence of statements.
6. WAP to convert integer arithmetic to a given number of day and month using switch case.
7. WAP to find maximum out of 3 numbers a, b & c using Control Statements (if, else, nested if, nested else).
8. WAP to find minimum out of 3 numbers a, b & c using Control Statements (if, else, nested if, else)
9. WAP to find e^b using loops (for, while, do while).
10. WAP to find factorial of positive integer using for loop.
11. WAP to print all the number between 1 to 100 which are divisible by 7 using the concept of loops.
12. WAP to generate Fibonacci series up to n using loops.
13. Write a program to calculate area of circle using function.
14. Write an iterative function to calculate factorial of given number.
15. Write a recursive function to calculate factorial of given number
16. WAP to find even & odd up to a given limit using the concept of array and loops.

17. WAP to reverse a string.
18. WAP to find addition of two matrix of n*n order using the concept of 2 dimensional array
19. WAP to find multiplication of two matrix of n*n order using the concept of 2 dimensional array.
20. WAP program to study the concept of structure.
21. WAP to study the concept of switch and break statements.
22. WAP to study the concept of continues statements.
23. WAP to insert the element in file to study the concept of IFSTREAM.
24. WAP to read the contents of file to study the concept of OFSTREAM

Title of the course : **Data Structures**
 Subject Code : **CS-215**
 Weekly load : 7 LTP 3-0-4
 Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Data Representation, Abstract data Types, Data Structure and Structured Types, Atomic Type ,Difference between Abstract Data Types, Data Types And Data Structures, Data Types, Linear data type, Non- Linear data type, Primitive data type, Non primitive data type. | 05 |
| | Fundamental Notations Problem solving concept, top down and bottom up design, structured programming, Concept of data types, variables and constants, Concept of pointer variables and constants. | 05 |
| | Arrays Concept of Arrays, Single dimensional array, Two dimensional array storage strategies of multidimensional arrays. | 04 |
| | Linked Lists Introduction to linked list and double linked list, Representation of linked lists in Memory, Traversing a linked list, Searching linked list, Insertion and deletion into linked list | 07 |
| Unit-2 | Stacks Introduction to stacks, Representation of stacks, Implementation of stacks, Uses of stacks, | 04 |
| | Queues and Recursions Introduction to queues, Implementation of queues (with Algorithm), Circular Queues, De-queues, Recursion. | 07 |
| | Binary search tree Traversing Binary Trees (Pre order, Post order and In order), Searching, inserting and deleting binary search trees. | 08 |
| | Sorting and Searching Introduction, Search algorithm (Linear and Binary), Sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort, Heap Sort). | 08 |

Total=48

Recommended Books:

1. Lipschutz,Schaum Series, Data Structures, TMH
2. A.M. Tanenbaum, Data Structures using C and C++, Pearson Education

Title of the course : **Data Structures Lab**
 Subject Code : **CS-215**

List of Practical's

- 1) WAP to generate Fibonacci Series using recursion.
- 2) Write a function that interchanges the first element with last element, second element with second last element and so on.
- 3) WAP to multiply two Matrices.
- 4) Write a Function that removes all duplicate elements from an Array.
- 5) WAP that insert an element in beginning of Linear Link List.
- 6) WAP that delete an element from the beginning of the Linear Link List.
- 7) WAP that delete an element from the end of the Linear Link List.
- 8) WAP that delete an element after a given element of the given Linear Link List.
- 9) WAP that reverse the element of the Linear Link List.
- 10) WAP that concatenate two Linear Linked List.
- 11) WAP to remove the Top element of Stack.
- 12) WAP to insert (or push) an element at the Top of Stack.
- 13) WAP to insert an element at the end of queue.
- 14) WAP to remove the first element of the queue.
- 15) WAP to illustrate the implementation of Binary Search Tree.
- 16) WAP to sort an array of integer in Ascending Order using Bubble Sort.
- 17) WAP to sort an array of integer in Ascending Order using Insertion Sort.
- 18) WAP to sort an array of integer in Ascending Order using Quick Sort.
- 19) WAP to search an element using Linear Search Method.
- 20) WAP to search an element using Binary Search Method.

Title of the course : **Computer Fundamentals**
 Subject Code : **CS-111/CS-121/CS-216**
 Weekly load : 5 LTP 3-0-2
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Definition of electronic Computer, Generations, Characteristic and Application of Computers, Block diagram of computer. | 06 |
| | Input/output Devices Various I/O devices like keyboard, mouse etc. Plotter, Scanner, Printer and its types (Inkjet, Dot matrix, Laser printer etc). | 04 |
| | Memory Primary and secondary memory, RAM, Types of RAM,ROM & types of ROM, cache, Registers ,Memory Hierarchy. | 06 |
| | Basics of Computer Bootling process, introduction to concepts-bit, nibble, byte, word, hardware, software, operating system, system software, application software. | 06 |
| Unit-2 | Computer Languages Generation of Language, Translators, Interpreters, Assemblers, Compilers. | 06 |
| | Number System Various codes, decimal, binary, octal, hexadecimal, conversion from one number system to another. | 06 |
| | Internet and its Applications Internet, Connecting to the internet, Internet services, Applications like E-commerce, entertainment, education etc Threats:- Firewall, Virus, Worm, Trojan Horses. | 06 |
| | Web Technologies World Wide Web, URL, Search engines, Web Browsers, Hypertext , Hypertext Marks Language, Gopher, FTP. | 08 |

Total=48

Recommended Books:

1. Yadav DS, Foundations of IT, New Age, Delhi.
2. Curtin, Information Technology: Breaking News, TMH
3. Rajaraman V, Introduction to Computers, Prentice-Hall India.

Title of the course : **Computer Fundamentals Lab**

Subject Code : **CS-111/CS-121/CS-216**

List of Practical's**Perform the following Practicals in MS-Word**

1. Create a document using functions: Save as, page number, Bullets and numbering.
2. Create a document using fonts, styles and Formatting options.
3. Create a document using Fill effects, Printed water mark under background option and also use Header and Footer.
4. Create a document, using the function page set up, page preview, and then print that document.
5. Use the concept of Mail Merge in MS Word.
6. Use the concept of Macro in MS Word
7. Create a document using table & perform various operations like Insert, delete, select and Table auto Format in it.

Perform the following Practicals in MS-Excel

8. Create Line, XY, Bar and Pie chart in excel sheet and compare the given data using these charts.
9. Implement all formula like addition, subtraction, Multiplication and division etc. in excel.
10. Use the concept of Macro in MS Excel.
11. Use the concept of Sorting, filter and hyperlink in Excel.
12. Use the concept of paste special and paste as hyperlink in Excel
13. Create a excel sheet using fonts, styles, Formatting options, Text wrap different row, column, and cell width.
14. Create a formulae using function to compare the values of two Rows or Columns.

Perform the following Practicals in MS-PowerPoint

15. Create a Power point presentation using slide designing and use Design Templates, Color schemes, and Animation schemes.
16. Create a Presentation using functions: Save as, page number, Bullets and numbering, page setup and take print in layout form.
17. Create a power point presentation using clipart, Word art gallery & then add transition & Animation effects.
18. Use the concept of Macro in Power Point.
19. Use chart, diagram and table in Power Point.
20. Create a Power point presentation and use View show, Setup show, rehearse timing in presentation.

Perform the following Practicals in MS-Access

21. Create forms in MS-ACCESS.
 22. Create reports in MS-ACCESS.
 23. Create table and queries in MS-ACCESS using design view.
 24. Create Data Access page in design view and by using wizard in MS-ACCESS.
- Apply different modification schemes using picture manager.
Organize different types of Data available using clip organizer.
Create Resume using various features of Microsoft Word

Title of the course : **Surveying-I**
Subject Code : **CV-211**
 Weekly load : 04
 Credit : 03

LTP 2-0-2

| Unit | Course outlines | Lecture(s) |
|--------|---|------------|
| Unit-1 | Introduction Basic principles of surveying, concept and purpose of surveying, measurements-linear and angular, units of measurements, instruments used for taking these measurements, classification of surveying instruments | 05 |
| | Chain surveying Introduction, advantages and disadvantages. Direct and indirect ranging offsets and recording of field notes. | 05 |
| | Compass surveying Purpose of compass surveying. Use of prismatic compass: setting and taking observations. Introduction to: Meridian - Magnetic and True, Bearing - Magnetic, True and Arbitrary, whole circle bearing and reduced bearing, fore and back bearing, magnetic dip and declination. Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse. | 06 |
| Unit-2 | Levelling Purpose of levelling, concept of a leveled surface, horizontal surface, vertical surface, datum, reduced level and bench marks. Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis. Levelling staff: single piece, folding, invar precision staff, telescopic. Temporary adjustment and permanent adjustment of dumpy level by two peg method. Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels. Level book and reduction of levels by Height of collimation method and Rise and fall method. Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems. Computations of areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas with numerical problems | 08 |
| | Plane Table Surveying Purpose of plane table surveying, equipment used in plane table survey: Setting of a plane table: Centering, levelling, orientation. Methods of plane table surveying: Radiation, Intersection, Traversing, Resection. Concept of two point and three point problems. Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidad | 08 |

Total = 32

Recommended Books

1. Hussain, SK and Nagraj, Text Book of Surveying, S Chand and Co Ltd.
2. Deshpande, A Text Book Surveying and Levelling, United Books Corporation
3. Kocher, Text Book of Surveying, Katson Publishing House
4. Kanetkar, TP and Kulkarni, Surveying and Leveling, AVG Parkashan

PRACTICAL EXERCISES

- I. Chain surveying:
 - i) a) Ranging a line
b) Chaining a line and recording in the field book
c) Taking offsets - perpendicular and oblique (with a tape only)
d) Setting out right angle with a tape
 - ii) a) Chaining of a line involving reciprocal ranging
 - iii) Chaining a line involving obstacles to ranging

- iv) Chain Survey of a small area.
- II. Compass Surveying:
 - i) a) Study of prismatic compass
 - b) Setting the compass and taking observations
 - c) Measuring angles between the lines meeting at a point
- III. Levelling:
 - i) a) Study of dumpy level and levelling staff
 - b) Temporary adjustments of various levels
 - c) Taking staff readings on different stations from the single setting and finding differences of level between them
 - ii) a) To find out difference of level between two distant points by shifting the instrument
 - iii) a) Longitudinal and cross sectioning of a road/railway/canal
 - iv) a) Setting a gradient by dumpy and auto-level
- IV. Plane Table Surveying:
 - i) a) Study of the plane table survey equipment
 - b) Setting the plane table
 - c) Marking the North direction
 - d) Plotting a few points by radiation method
 - ii) a) Orientation by
 - Trough compass
 - Back sighting
 - b) Plotting few points by intersection, radiation and resection method
 - iii) Traversing an area with a plane table (at least five lines)
- V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

Title of the course : Building Construction and Drawing

Subject Code : CV-212

Weekly load : 04

LTP 2-0-2

Credit : 03

| Unit | Course outlines | Lecture(s) |
|--------|---|------------|
| Unit-1 | Introduction Definition of a building, classification of buildings based on occupancy. Different parts of a building. | 02 |
| | Foundations Concept of foundation and its purpose. Types of foundation-shallow and deep: Shallow foundation - constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns. Earthwork: Layout/setting out for surface excavation, cutting and filling, Excavation of foundation, trenches, shoring, timbering and de- watering | 03 |
| | Walls Purpose of walls. Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls. Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls. Partition walls: Constructional details, suitability and uses of brick and wooden partition walls. | 03 |
| | Masonry Brick Masonry: Terminology, Bond – meaning and necessity; types of bonds, Construction of brick walls, Expansion and contraction joints, Stone Masonry: Glossary of terms, types of stone masonry, principles to be observed in construction of stone masonry walls. | 04 |
| | Arches and Lintels Meaning and use. Glossary of terms, Arches: Types of Arches and their | 04 |

| | | |
|---------------|--|----|
| | construction. Lintels: Purpose of lintel, Materials used for lintels, Cast-in-situ and pre-cast lintels, Lintel along with sun-shade | |
| Unit-2 | Doors Glossary of terms with neat sketches. Classification based on materials. Different type of doors and windows. Ventilators, sky light window, Louvres shutters, Door and window frames – materials and sections, door closures, hold fasts. | 02 |
| | Damp Proofing and Water Proofing Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, Damp proofing materials and their specifications. | 02 |
| | Floors Glossary of terms. Types of floor, description with sketches. The methods of construction of concrete, terrazzo and timber floors | 02 |
| | Roofs Types of roofs. False ceilings. Special emphasis on maintenance of slopes, overlaps of roofing materials, applicability and problems of wind ties, size of anchoring bolts | 02 |
| | Stairs Glossary of terms, Classification of staircase. Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc. Various types of layout. | 02 |
| | Surface Finishes Plastering, Pointing, Painting, Selection of appropriate paints/finishes for interior and exterior surfaces. Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes. | 02 |
| | Anti Termite Measures Anti-termite treatment of foundations, top surface of earth filling, junction of walls and floors, external perimeter of building and timber. Treatment in existing buildings | 02 |
| | Building Services Introduction to fire fighting systems, Ducting for Air-conditioning, service lines for cable telephone, and electrical wiring, garbage disposal systems. | 02 |

Total = 32

Recommended Books

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM, A Text Book of Building Construction, Katson Publishing House.
2. Rangwala, SC, Building Construction, Anand, Charotar Book.
3. Kulkarni, GJ, A Text Book of Building Construction, Ahmedabad Book Depot.
4. Arora, SP and Bindra, SP A Text Book of Building Construction, Dhanpt Rai

List of Practical's

1. Demonstration of tools and plants used in building construction
2. To prepare Layout of a building: two rooms building with front verandah
3. To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
4. Drawing No. 1: details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.
5. Drawing No. 2: Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond
6. Drawing No.3: Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door with wire gauge shutter.
7. Drawing No. 4: Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.
8. Drawing No.5: Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet.

Title of the course : **Concrete Technology**
 Subject Code : CV-213
 Weekly load : 04 LTP 2-0-2
 Credit : 03

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Definition of concrete, uses of concrete in comparison to other building materials | 02 |
| | Ingredients of Concrete Cement: Types and properties. Aggregates: Classification, Characteristics of aggregates: , Grading of aggregates: coarse aggregate, fine aggregate; All-in-aggregate; fineness modulus, Water: Quality requirements as per IS:456-2000. Water Cement Ratio: Hydration of cement & principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete. Admixtures. | 05 |
| | Properties of Concrete Properties in plastic state: Workability, factors affecting workability, measurement, & slumps for placement in various conditions, Segregation, Bleeding and Harshness. Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes; | 05 |
| | Proportioning for Normal Concrete Objectives of mix design, introduction to various grades , proportioning for nominal mix design as, Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability. Difference between nominal and controlled concrete. | 04 |
| Unit-2 | Special Concretes Concreting under special conditions, difficulties and precautions before, during and after concreting, Cold weather concreting, Under water concreting, Hot weather concreting. Ready mix concrete. Fibre reinforced concrete. Polymer Concrete. Fly ash concrete. Silica fume concrete | 08 |
| | Concreting Operations Storing of Cement,, Effect of storage on strength of cement, Determination of warehouse capacity for storage of Cement. Storing of Aggregate, Batching and mixing, selection of proper gauge box, Transportation of concrete, Placement of concrete, Compaction, Finishing concrete slabs, Curing: Objective & methods. Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location. Defects in concrete: Identification of and methods of repair | 08 |

Total = 32

Recommended Books

1. Kulkarni, PD; Ghosh, RK and Birinder Singh, Text Book of Concrete Technology, Oxford and IBH Publishing, New Delhi
2. Gupta BL and Gupta Amit ,Text Book of Concrete Technology, Standard Publishers Distributors, Delhi
3. Varshney, RS , Concrete Technology, Oxford and IBH, Publishing, New Delhi

PRACTICAL EXERCISES:

1. To determine flakiness and elongation index of coarse aggregates
2. To determine silt in fine aggregate
3. Determination of specific gravity and water absorption of aggregates
4. Determination of bulk density and voids of aggregates
5. To determine surface moisture in fine aggregate by displacement method
6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
7. To determine necessary adjustment for bulking of fine aggregate
8. To determine workability by slump test:

9. To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
10. Compaction factor test for workability
11. Non destructive test on concrete by Rebound Hammer Test
12. Tests for compressive strength of concrete cubes for different grades of concrete

Title of the course : **Water Supply and Waste Water Engineering**
Subject Code : **CV-214**
 Weekly load : 04 LTP 2-0-2
 Credit : 03

| Unit | Course outlines | Lecture(s) |
|--------|--|------------|
| Unit-1 | Introduction Necessity and brief description of water supply system. Quantity of Water: Quality of Water, Physical, Chemical and bacteriological tests and their significance. Standard of potable water as per Indian Standard. | 04 |
| | Water Treatment Sedimentation, Coagulation, flocculation. Filtration, Disinfection of water, forms of chlorination. Flow diagram of different treatment units | 06 |
| | Conveyance of Water Different types of pipes ,their suitability and uses, types of joints in different types of pipes. Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses. Systems of water, Wastage of water – preventive measures, Maintenance of distribution system, Leakage detection Water supply fixtures and installations and terminology related to plumbing. | 06 |
| Unit-2 | Introduction Purpose of sanitation. Necessity of systematic collection and disposal of waste. Collection and conveyance of sewage, Types of sewage: Domestic, industrial, storm water and its seasonal variation, Types of sewerage systems, Appurtenance, Manholes & ventilating shafts | 04 |
| | Laying and Construction of Sewers Setting out/alignment of sewers. Excavations, Construction of surface mains and different sections required. | 04 |
| | Sewage Treatment and disposal Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams. Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds ,Methods of Sewerage Disposal: General composition of sewage and disposal methods. Disposal by dilution. Self purification of stream. Disposal by land treatment. | 04 |
| | Building Drainage Aims of building drainage and its requirements. Different sanitary fittings and installations. Traps, seals, causes of breaking seals. | 03 |

Total =32

Recommended Books

1. Duggal, KN ,Elements of Public Health Engineering, S. Chand and Co
2. Rangwala, SC , Water Supply and Sanitary Engineering, Anand Charotar Books
3. Kshirsagar, SR ,Water Supply Engineering, Roorkee Publishing House
4. Hussain, SK , Text Book of Water Supply and Sanitary Engineering, Oxford and IBH Publishing Co

List of Practical's

- 1) To determine turbidity of water sample

- 2) To determine dissolved oxygen of given sample
- 3) To determine Ph value of water
- 4) To perform jar test for coagulation
- 5) To determine BOD of given sample
- 6) To determine residual chlorine in water
- 7) To determine conductivity of water and total dissolved solids
- 8) To study the installation of following:
 - a. Water meter
 - b. Connection of water supply of building with main
 - c. Pipe valves and bends
 - d. Water supply and sanitary fittings
- 9) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I.
- 10) pipes and PVC pipes.
- 11) To demonstrate the laying of SW pipes for sewers
- 12) Study of water purifying process by visiting a field lab.
- 13) To test house drainage

Title of the course : **Fundamentals of Electronics Engineering**
Subject Code : **EC-211/EC-221**
 Weekly load : 5 LTP 3-0-2
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Classification of materials into conducting and insulating materials through a brief reference to atomic structure, Conducting Materials, Insulating Materials, Semi-conductor Materials | 6 |
| | Active And Passive Components Introduction to active and passive components; fixed and variable resistances, their various types fixed and variable capacitors, their various types and important specifications and colour codes | 4 |
| | Voltage and current sources Concept of constant voltages and constant current sources, symbol and graphical representation, characteristics of ideal and practical sources. | 6 |
| | Semiconductor Diode Atomic structure of Germanium and Silicon semi-conductors; intrinsic and extrinsic semiconductors, PN junction, basic principles of operation and VI characteristics of PN junction diode, static and dynamic resistance of a diode. | 8 |
| Unit-2 | Applications of Diode Use of a diode in rectifiers, half wave, full wave and bridge rectifier with shunt capacitor filter, series inductor filter, zener diode and its applications, as a voltage regulator, light emitting diode (LED), liquid crystal display (LCD). | 6 |
| | Transistor Introduction to a transistor, working of a PNP and NPN transistor, input and output characteristics, transistor configurations | 6 |
| | Biasing and Configuration of Transistor Biasing of a transistor, amplifying action of a transistor, comparison of different configurations, | 6 |
| | Field effect transistor FET, JFET, MOSFET, their characteristics and applications, unijunction transistor (UJT) | 6 |

Total=48

RECOMMENDED BOOKS

1. Basic Electronics by: VK Mehta , S. Chand
2. Electronic Components and Materials by: Grover, Jamwal , Dhanpat Rai
3. Electronic Components & Materials by: SM Dhir , McGraw Hill
4. Electronic Devices & Linear Circuits by: Bhargava & Gupta , McGraw Hill

List of Experiments: (EC-211/EC-221)

1. To study the various passive components.
2. To study various active components.
3. To study the front panel control of CRO.
4. To test various electronic components using multimeter.
5. To find the value of a resistor using color coding scheme.
6. To plot the V-I characteristics of a diode.
7. To study zener diode as a voltage regulator.
8. To study the use of a diode as a half wave rectifier.
9. To study the use of a diode as a full wave rectifier.
10. To show the amplifying action of a transistor.

Title of the course : **Fundamentals of Television Engineering**
Subject Code : **EC-212**
 Weekly load :6 LTP 3-1-2
 Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Idea Of Modulation Concept of amplitude modulation (AM), frequency modulation (FM), Frequency spectrum of AM and FM, Idea of double side band and single side band for AM systems, Basic concepts of antenna, Yagi antenna. | 04 |
| | Transmitter And Receiver Block diagram of an AM transmitter and function of various blocks, Block diagram of an AM Receiver and function of various blocks | 04 |
| | Elements Of TV System TV transmission (video and audio), TV reception (video and audio), Synchronization, Scanning, Flicker, Interlaced scanning, Aspect ratio, Video and audio signals. | 07 |
| | Concept Of Composite Video Signal Video signal dimensions, Horizontal synchronous details, Vertical synchronous details, Scanning sequence details. | 05 |
| Unit-2 | Signal Transmission and Channel Bandwidth Channel bandwidth, Vestigial sideband transmission, Vestigial sideband reception, TV standards. | 04 |
| | Picture Tube and Camera Tube Monochrome picture tube construction, its characteristics and circuit control. Basic concepts of TV camera tubes for example image orthicon, vidicon, plumbicon, | 08 |
| | TV Receiver Block diagram of a TV receiver, Brief description of each stage, EHT | 06 |
| | Colour television Block diagram of colour TV camera, colour signal generation, compatibility of colour and black and white signal, natural light and three colors theory, the luminance signal, line saturation, band width requirement, modulation of color deference signal, weighing factors. Introduction to SECAM and NTSC system, PAL–TV system, PAL–D system, PAL colour receivers | 10 |

Total=48

Recommended Books:

1. Anokh Singh, Principles of Communication Engineering; S.Chand
2. R.R Gulati, Monochrome and Colour Television; New Age International
3. George Kennedy, Electronic Communication Systems; Tata McGraw Hill
4. R.P.Bali, Color Television, Theory and Practice; Tata McGraw-Hill

List of Experiments:

1. Draw the block diagram and observe working principle of B & W TV.
2. Observe the ICs used in different sections of B & W TV.
3. Observe the input/output signals of a 20” B & W receiver.
4. Observe the internal and external controls of B & W TV.
5. Observe the alignment and adjustment procedure of B & W TV receiver.
6. Observe the horizontal oscillator, vertical oscillator and sync separator sections.
7. Observe the EHT section of B & W TV.
8. Draw the block diagram and observe working principle of colour TV.
9. Observe the operating unit and tuner of colour TV.
10. Observe the audio and video IF section of colour TV.
11. Observe the EHT section of colour TV.
12. Observe the SMPS section of colour TV.

13. Observe the video amplifier section of colour TV
14. Detection of fault finding in IF, EHT and SMPS section.
15. Observe the various test points find the voltages.
16. Finding out fault in different sections of B & W and color T.V.

Title of the course : Electronic Measurements & Instrumentation

Subject Code : EC-213

Weekly load :6 LTP 3-1-2

Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Accuracy precision, sensitivity, static errors, range, span, repeatability linearity, hysteresis, types of errors, dynamic response, loading effect. | 07 |
| | Basic Indicating Instruments Classification of instruments, D-Arsonval movement, construction and principle of moving iron and moving coil instruments. | 05 |
| | Voltage, Current & Resistance Measurement Construction of dc ammeter, dc voltmeter, ac ammeter, ac voltmeter, ohm meter and analog multi-meter. | 03 |
| | Cathode Ray Oscilloscope Cathode ray tubes, construction, basic CRO circuit, measurement of voltage, current, phase, frequency, time period dual trace oscilloscope, specifications of a CRO and their significance, front panel controls. | 09 |
| Unit-2 | Impedance Bridges Block diagram, principle of operation and use of LCR meter. | 04 |
| | Digital Instruments digital multi-meter. | 02 |
| | Frequency & Time Measurement Frequency meter, frequency, period, ratio, time interval measurement. | 06 |
| | Signal Generators Standard Signal Generators, Square Wave Generators, Function Generators, and Spectrum Analyser: Waveforms, block diagrams and controls. | 12 |

Total=48

Recommended Books:

1. AK Sawhney, Electrical and Electronic Measurements & Instrumentation; Dhanpat Rai
2. HW Cooper, Electrical and Electronic Measurements & Instrumentation; Prentice Hall
3. Umesh Sinha, Electrical Measurements; Dhanpat Rai

List of experiments (EC-213)

1. To **observe** the waveform on a storage Oscilloscope.
2. To **observe** the dynamic recording of different signals on oscillographic recorders.
3. Measurement of Inductance by Maxwell's bridge.
4. Measurement of small resistance by the Kelvin's Bridge.
5. Measurement of Capacitance of the Schering Bridge.
6. Measurement of medium resistance with the help of Wheat stone bridge.
7. To find Q of a coil by a series resonance method and verify it by using Q-meter.
8. To study & **observe** the recording of different signals from sensors on magnetic tape recorder.
9. To study & **observe** the acquisition of data from strain gauge based transducer on data acquisition system.
10. Displacement measurement using LVDT, Inductive pick up and capacitive pick up.
11. To measuring the temperature of soldering by using thermocouple. Plot the variation of temperature with respect of voltage.

Title of the course : Analog Communication
Subject Code : EC-214
 Weekly load :6 LTP 3-1-2
 Credit : 5

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Communication, information, Message and Signals, Electromagnetic Spectrum, Classification of signal , Periodic and non-periodic signals Analog and digital signals, Deterministic and random signals, The elements of a communication system , Modulation, Definition, Types of modulation, Need for modulation. | 08 |
| | . Amplitude Modulation Definition, Expression of AM wave, modulation index, frequency, spectrum, bandwidth, power contents of sidebands and carrier | 06 |
| | Generation of Amplitude Modulation Generation of AM waves, DSB-SC, SSB-SC, ISB and VSB modulation, DSB-SC, SSB-SC, ISB and VSB modulation, their comparison and areas of applications, Generation of DSB and SSB signals. | 06 |
| | Frequency modulation Frequency modulation, Modulation index, frequency deviation, frequency spectrum and bandwidth of FM wave, Power contents in FM, Phase modulation, pre- emphasis and de-emphasis, | 08 |
| Unit-2 | Comparison between types of Modulation Comparison between AM, FM and PM, Need for amplitude limiter. | 03 |
| | Generation of Frequency Modulation Generation of FM waves, Varactor diode modulator, Armstrong method of FM generation. | 05 |
| | . Transmitters and Receiver Block diagram of AM and FM transmitter. Working principle with block diagram of AM and FM receivers.(Superhetrodyne) | 06 |
| | Demodulation AM diode detection, diagonal clipping, FM detection, Foster Seely discriminator, Ratio detector, Phase locked-loop FM demodulator | 06 |

Total=48

Recommended Books:

1. Electronic communication systems by: Kennedy , Mc Graw Hill
2. Electronic communications by: Roddy and Coolen , Prentice Hall of India
3. Principles of communication systems by: Taub and Schilling , Mc Graw Hill

List of Experiments: (EC-214)

1. To observe amplitude modulation and its waveform on CRO.
2. To obtain Amplitude modulated Envelop and determine depth of modulation.
3. To observe envelop detector for demodulation of AM signal.
4. Generation of DSB-SC signal using balanced modulator.
5. Generation of single side band signal.
6. To observe frequency modulation and its waveform on CRO.
7. To generate a FM Signal and measure depth of modulation.
8. To study super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity and selectivity.
9. To observe the waveform of demodulated FM signal with the help of ratio detector
10. To observe the waveform of demodulated FM signal with the help of Phase locked-loop detector.

Title of the course : **Maintenance & Repairing of Televisions**
Subject Code : **EC-216**
Weekly load : LTP 0-0-4
Credit : 2 (Lecture 0, Tutorial 0 , Practical 2)

List of Experiments

1. To study the block diagram and working principle of B & W TV.
2. To study the ICs used in different sections of B & W TV.
3. To study the input/output signals of a 20” B & W receiver.
4. To study the internal and external controls of B & W TV.
5. To study alignment and adjustment procedure of B & W TV receiver.
6. To study horizontal oscillator, vertical oscillator and sync separator section.
7. To study the EHT section of B & W TV.
8. To study the block diagram and working principle of colour TV.
9. To study the operating unit and tuner of colour TV.
10. To study the audio and video IF section of colour TV.
11. To study the EHT section of colour TV.
12. To study the SMPS section of colour TV.
13. To study the video amplifier section of colour TV
14. To study the fault finding in IF, EHT and SMPS section.
15. To study the various test point voltages.

Title of the course : **Consumer Electronics**
Subject Code : **EC-217**
Weekly load :4 LTP 3-1-0
Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Audio System Microphone, Construction, working, principles and application of microphone: carbon, moving coil. velocity, crystal, condenser type, cordless microphone, loud speakers, direct radiating ,horn loaded, woofer, tweeter, mid range, multi-speaker system, baffles and enclosures. | 12 |
| | Sound Recorder Introduction, legal status, present measurement system & its advantage over previous system, standard of length, mass, time, temp. etc. | 12 |
| Unit-2 | Satellite TV and Cable TV Principles of satellite TV system ,Frequency allocation of S,C and KV band ,up link and down link frequencies .Block diagram and working principle of TVRO receiver(TV receiving only), Cable TV networks, master distribution amplifier, line amplifier. Distribution component (Tap-off splitter, Termination etc.) | 12 |
| | VCR Principle of video recording on magnetic tape, block diagram of VCR, VHS tape, transport mechanism, Basic block diagram, working principles and application in Digital watch /clock, Calculator, Washing machine, Microwave ovens, Cordless telephones, Mobile handset, Digital camera, DTH, Electronic ignition system for automobiles. | 12 |

Total=48

Recommended Books:

1. Sanjay Attri., Audio Visual Systems, BPB Publishers New Delhi
2. R.G. Gupta, Audio Video Systems, TMH New Delhi India

| | |
|----------------------------|--|
| Title of the course | : Troubleshooting of Electronics Equipments |
| Subject Code | : EC-218 |
| Weekly load | : LTP 0-0-6 |
| Credit | : 3 (Practical=3) |

List of Experiments

1. To study the precautions commonly used in Electronics lab
2. To visualize the hand tools used in fault finding lab
3. To study and visualize the soldering kit
4. To study various soldering precautions
5. To observe the various electronic components and draw their symbols
6. To find the value of various resistances using color code method
7. To solder the two ends of a single strand wire
8. To solder the two ends of a multi strand wire
9. To solder the IC base on a general purpose PCB
10. To solder the given components in series combination
11. To solder the given components in parallel combination
12. To solder the given components according to circuit diagram
13. To find the range of various types of capacitors
14. To observe the Fault Diagnosis Tree

| | | | |
|----------------------------|---|---|--------------|
| Title of the course | : | Fundamentals of Electrical Engineering | |
| Subject Code | : | EE-211/EE-221 | |
| Weekly load | : | 5 | L T P: 3 0 2 |
| Credit | : | 4 | |

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Basic Concepts Electric Charge, Current and Electromotive force, Potential and Potential Difference; Conductor, Semiconductor Insulator and dielectric; Electrical Power and Energy; Ohm's Law, Resistance and color coding; Capacitance and Inductance, their ratings; Effects of Temperature on Resistance, Series and Parallel connection, Kirchoff's Laws and Their Applications | 06 |
| | AC Fundamentals Concept of Alternating Voltage and Alternating Current, Difference between AC and DC, Various Terms Related with AC Waves; RMS and Average Values, Concept of Phase and Phase Difference, Single Phase and Three Phase Supply; 3-ph Star-Delta connections, Inter-Relation between phase voltage/current & line voltage/current; Alternating Voltage applied to Pure Resistance, Pure Inductance, Pure Capacitance and their combinations, Concept of Power and Power Factor in AC Circuit. | 08 |
| | Measuring Instruments Principle and Construction of Instruments used for Measuring Current, Voltage, Power and Energy, Concept and applications of digital multimeters, oscilloscopes, signal generators | 03 |
| | Electrical Safety Electrical Shock, Safety practices to prevent Electric Shock; Concept of Fuses-Classification, Selection and Application; Concept of Earthing, Types of Earthing, MCBs, ELCBs and their Applications. | 04 |
| Unit-2 | Electromagnetic Induction Concept of Magnetic Field, Magnetic Flux, Reluctance, Magneto Motive Force (MMF), Permeability; Self and Mutual Induction, Basic Electromagnetic laws, Effects on a Conductor Moving in a Magnetic Field, various losses in magnetic circuits; | 04 |
| | Electrical Machines & Transformers Elementary concepts and classification of electrical machines, Common features of rotating electrical machines, Basic principle of a motor and a generator, Need of Starters and their classifications. Transformer- Classification, Principle of operation, Construction, Working and applications. | 10 |
| | Utilization of Electricity Concepts of Electricity for electrolysis process e.g., Electroplating, Electro refining etc., Electrochemical Cells & Batteries; Application of Electricity for Heating, Ventilating and air-conditioning, Welding and illumination. | 04 |
| | Basic Troubleshooting Basic Testing and faults diagnosis in electrical systems, various tools and their applications, replacement of different passive components e.g. fuses, lamps and lamp holders, switches, cables, cable connectors, electromagnetic relays. | 04 |

Total=43

Recommended Books:

1. Edward Hugh, Electrical Technology, Pearson Education.
2. D P Kothari & I J Nagrath, Basic Electrical Engineering, TMH.
3. D P Kothari & I J Nagrath, Electrical Machines, TMH.
4. S K Bhattacharya Electrical Machines, TMH.

List of Practical's (EE-211/EE-221)

1. Study of various passive components and measuring instruments and their connections in electrical circuits.
2. Verification of Ohm's Law.
3. Verification of Kirchoff's laws (KCL & KVL).
4. Verification of equivalent resistances in series and parallel connections.

5. Measurement of various characteristic values of a Sinusoidal waveform with the help of CRO.
6. Measurement of voltage, current and power in RL and RLC circuits and Verification of phase angle and power factor concept.
7. Study of various types of earthings.
8. Study of various types of protection devices e.g. fuses, MCBs and ELCBs
9. Verification of Faraday's laws and Lenz's law.
10. Study of various types of DC motors and their starters.
11. Study of various types of AC motors and their starters.
12. Study of various types of transformers and Verification of turns ratio.
13. Starting and reversing various AC and DC motors.
14. Fault diagnosis and removal in general electrical connection /apparatus.

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|----------------------------|---|-------------------------------------|-----------|
| Title of the course | : | DC Machines and Transformers | |
| Subject Code | : | EE-212 | |
| Weekly load | : | 6 | LTP-3 1 2 |
| Credit | : | 5 | |

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Transformers Working principle, construction of single phase transformer, EMF equation, phasor diagrams on no-load and on loaded conditions, open circuit and short circuit tests, equivalent circuit parameters estimation, voltage regulation and efficiency, back to back test. Effect of saturation on exciting current and in-rush current phenomenon. Parallel operation of single phase transformers. | 12 |
| | Auto transformers Principle of operation, equivalent circuit and phasor diagrams, comparison with two winding transformer. | 10 |
| Unit-2 | D.C. Generator Working principle, construction of DC Machines, Armature windings, single and double layer winding diagrams, E.M.F. and torque equations, armature reaction, effect of brush shift, compensating winding, commutation, causes of bad commutation, methods of improving commutation, methods of excitation of d.c. generators and their characteristics. | 12 |
| | D.C. Motor Working principle characteristics, starting of shunt and series motor, starters, speed control methods: field and armature control. Braking: plugging, dynamic and regenerative braking, Testing: Swinburn's test, Hopkinson test, Field test. Estimation of losses and efficiency | 12 |

Total=46

Recommended Books-

1. JB Gupta, *Electrical Engineering*, S.K.Kataria
2. Nagrath I.J. & Kothari D.P., *Electrical Machines*, Tata McGraw Hill
3. Edward Hughes, *Electrical Engineering*, Tata McGraw Hill
4. SK Sahdev, *Electrical Machines*, Unique publisher
5. S.K. Bhattacharya, *Electrical Machines*, Tata McGraw Hill

List of Practical's (EE-212)

1. Measurement of induced emf and magnetising current under open circuit condition in D.C. generators.
2. Determination of the relationship between terminal voltage and load current keeping speed constant for
 - (a) Separately excited generator keeping excitation constant
 - (b) D.C. shunt generator.
3. To measure the variation in no load speed of a separately excited d.c. motor for the variation in

- (a) Armature circuit resistance
 - (b) Field circuit resistance.
4. Measurement of the speed of a d.c. series motor as a function of the load torque.
5. (a) No-load and short circuit test on a single phase transformer.
(b) Determination of efficiency and regulation of transformer.
6. To determine the insulation resistance of a transformer at no load and at full load condition.

Title of the course : **Electrical Measurement**
Subject Code : **EE-213**
 Weekly load : 5 LTP-3 0 2
 Credit : 4

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Analog instruments Analog instruments, classification of analog instruments, Principles of operations, operating forces, constructional details, control systems, damping systems, Symbols used for analog instruments. | 08 |
| | Analog voltmeter, ammeter and ohmmeter Types of instruments, PMMC instruments, shunts and multipliers, ohmmeters-series and shunt type, torque equation moving iron instruments, torque equations, Advantages, disadvantages and their comparison, . | 08 |
| | Measurement of power and energy Electrodynamometer type of instruments, Power in ac and dc circuits, single phase wattmeter, measurement of power in single and three phase circuits. Energy meter for ac circuits, single phase induction type watt hour meter. | 08 |
| Unit-2 | Measurement of phase and frequency Single phase electro-dynamometer and moving iron power factor meters, Frequency meters and their types, phase sequence indicators. | 08 |
| | Measurement of resistance Classification of resistances, measurement of medium resistance with voltmeter-ammeter method, Wheatstone bridge and substitution method, measurement of low resistance with the Kelvin double bridge, Potentiometer method, Measurement of high resistance with the direct deflection method, Loss of charge method and megger. | 08 |
| | AC Bridges General form of ac bridge, Measurement of inductance, capacitance and frequency, Maxwell bridge, Hay bridge, De Sauty bridge, Schering bridge etc., sources of error and their minimization | 08 |

Total=48

Recommended Books-

1. A K Sawhney: A course on electrical and electronic measurements and instrumentation, Dhanpat
2. David A Bell: Electronic Instrumentation and measurement, Prentice Hall of India

List of Practical's (EE-213)

1. Use of multimeter for measuring voltage, current and resistance.
2. To calibrate 1-phase energy meter by direct loading method.
3. To measure the value of earth resistance.
4. To measure power, power factor in a 1-phase circuit, using wattmeter and power factor meter and verify results with calculations.
5. Measurement of power and power factor of a three-phase balance load by 2-wattmeter method.
6. Measurement of voltage, frequency of a Sinusoidal signal with CRO.
7. Measurement of power in a 3 phase circuit using CT,PT and 3 phase energy meter.

8. Connecting appropriate instruments at the supply of an installation to measure supply voltage, frequency, power, maximum demand, Phase sequence, energy consumed.
9. Use of LCR meter for measuring inductance, capacitance and resistance.
10. Connection of 3-phase energy meter in an electrical system for Measurement of energy.
11. To determine the input impedance of a multimeter.
12. To determine the error in Measurement in voltage when a multimeter is used and then DVM(VTVM) is used.

Title of the course : **Transmission and Distribution of Power**
Subject Code : **EE-214**
 Weekly load : 4 LTP-3 1 0
 Credit : 4

| Unit | Course Outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Basics Of Transmission Introduction to transmission, Necessity of transmission of electricity, Classification & comparison of different transmission systems. | 08 |
| | Transmission Line Components Introduction to line components, types of conductors-Copper, Aluminum & state their trade names, Solid, Stranded & bundled conductors, Line supports – requirements, types, and field of applications, Line insulators – requirements, types, and field of applications, Failure of insulator & reasons of Failure, Distribution of potential over a string of suspension insulators, Concept of string efficiency, Methods of improving string efficiency, Corona – corona formation, advantages & disadvantages, factors affecting corona, important terms related to corona, Spacing between Conductors, Calculation of Span length & sag | 08 |
| | Transmission Line Parameters R,L& C of 1-ph & 3-ph transmission line & their effects on line, Skin effect, proximity effect & Ferranti effect, Concept of transposition of conductors & necessity. | 08 |
| | Performance Of Transmission Line. Classification of transmission lines, Losses, Efficiency & Regulation of line, Performance of single phase short transmission line(Numerical based on it), Effect of load power factor on performance, Medium transmission lines-End condenser, Nominal T & Nominal, Network with vector diagram, General circuit & Generalised Circuit Constants (A, B, C, D) | 08 |
| Unit-2 | Extra High Voltage Transmission. Introduction & Requirement, EHVAC Transmission, Reasons for adoption & limitations, HVDC Transmission – Advantages, Limitations. | 08 |
| | Components Of Distribution System Introduction, Classification of distribution system, A.C distribution, Connection schemes of distribution system, Requirements of Distribution systems, Design consideration, A.C. distribution calculations, Methods of solving A.C.-1 phase & 3 Ø –phase connected (balanced) distribution system, (Numericals based on 1-ph & 3-ph balanced distribution system) | 08 |
| | Introduction & requirements, Classification of cables, Cable conductors, Cable construction, Cable insulation, Metallic sheathing & mechanical protection, Comparison with overhead lines, Cable laying | 08 |
| | Introduction, Classification of indoor & outdoor sub-stations, Advantages & Disadvantages, Selection & location of site, Main connection schemes, Equipment's circuit element of substations, In coming & outgoing lines, Transformers, CT&PT, Relays, CB's, fuses, Isolators, batteries, lightning | 08 |

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| arresters. Insulators, Bus bar's material, types in detail, Connection diagram and layout of sub-stations. | |
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Total=48

Recommended Books-

1. Soni-Gupta-Bhatnagar, A Course in electrical power, Dhanpat Rai
2. V. K. Mehta, Principles of power system, S. Chand & Company
3. S. L. Uppal., A Course in electrical power, S. K. Khanna
4. J. B. Gupta, Transmission & distribution of electrical energy
5. S. K. Khanna, A. T. Star, Generation & transmission of electrical energy, Pitman

Title of the course : **Electrical Estimation and Costing**
Subject Code : **EE-215**
 Weekly load : 4 LTP-3 1 0
 Credit : 4

| Unit | Course outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Estimating, Electrical schedules; Catalogues, Recording of estimates, Determination of required quantity of material, Determination of cost of material and labour, Contingencies, overhead charges, Profit, Tender form and Exercises | 2 |
| | Wiring Systems Introduction: Systems of distribution of electrical energy, Methods of wiring, Systems of wiring, Comparison between various systems of wiring, Choice of wiring system and exercises | 4 |
| | Wiring Material & Accessories Wire and cable : Conductor materials used in cables, Insulating material, mechanical protection, Types of cables, voltage grading of cables, General specification of cables, Main switch and distribution boards, Conduits, Conduit accessories and fittings, Lighting accessories and fitting, Fuse, Types of fuses, Important definitions, Determination of size of fuse wire, Fuse units, Earthing conductor, Energy meter and exercises. | 6 |
| | Earthing Systems Earthing: I.S. specifications regarding earthing of electrical installation, Points to be earthed, Factors influencing the earth resistance, Methods of reducing earth resistance of system, Earth electrode and earth lead, Types of earthing, Determination of size of earth wire and earth plate for domestic and motor installation, Material required for G.I pipe earthing, Specification of earth wire and earth plate, | 6 |
| | Testing of Installations Testing of wiring installation, Inspection of internal wiring installation, Reasons for excess recording of energy of energy consumption by energy meter. | 3 |
| | Lighting Sub-Circuits Circuits and sub-circuit, Types of lighting circuits, Various circuit diagrams: Two-way switching, bed room lighting, Fluorescent lamps and accessories and exercises | 3 |
| | Lighting Schemes & Calculations Lighting; Lighting Schemes , Electric lamps, Comparison between tungsten filament lamps and fluorescent tubes, Design of lighting schemes, Factory lighting, street lighting, Methods of lighting calculation, examples. | 4 |
| Unit-2 | | |

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| | Internal Wiring Estimation General rules for wiring; Determination of number of points, determination of total load, Determination of number of sub-circuits, Determination of rating of main switch and distribution board, Determination of size of conductor, layout , Specimen internal wiring estimates | 4 |
| | Electrical Installation for Power Circuits Introduction, Important points about motor installation wiring, Determination of input power, Determination of input current to the motors, Determination of rating of cables, Determination of rating of fuses, Determination of size of conduit, distribution boards, main switch and starter, Specimen estimates, Exercise and problems | 4 |
| | Overhead and Underground Transmission and Distribution Introduction: Main components of overhead line, Line supports, Clearance of conductor from ground, Spacing between conductors, Factors governing height of pole, Conductors: Determination of size of conductor for overhead line, Insulators; Cross arm, Clamps, Stay wire, Lighting arrestors, Phase plate, Danger plate, Earthing of transmission line, Important specifications, Underground cables: Method of laying underground cables, cable terminal box, specimen, | 5 |
| | Installation of Service Connections Service line: Methods of installation of service lines, Specimen estimates, Exercise and Problems | 2 |
| | Substations Introduction: Classification, Indoor substations, outdoor substations, Advantages and disadvantages of outdoor substations, Selection and location of site, Main connection schemes. Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram, Equipment for substations and switchgear installations, Substations auxiliaries supply, Specimen estimates, Exercises and Problems | 5 |

Total=48

Recommended Books-

1. JB Gupta, Electrical Installation, Estimating and Costing, S.K. Kataria
2. Surjeet Singh, Estimating and Costing, Dhanpat Rai & Co
3. SL Uppal, Estimating and Costing, Khanna Publishers
4. N. Alagappan and B. Kambaram, Electrical Estimating and Costing, TMH
5. S.K. Bhattacharya, Estimating and Costing, Tata McGraw Hill

Title of the course : **Maintenance and Repair of Electrical equipment**
Subject Code : **EE-216**
 Weekly load : 4 LTP-2 0 2
 Credit : 3

| Unit | Course Outlines | Lecture(s) |
|--------|---|------------|
| Unit-1 | Introduction Principle different effects of electric currents, materials used in electrical equipments, tools / instruments necessary for repair works, jointing methods, soldering, testing of instruments, Interpretation, location & identification of faults, recording / estimation of materials / components required & their cost, approximate costing of repair of equipment. | 12 |
| | Trouble Shooting Domestic electrical equipment, Principle, types, construction, operation, testing, fault finding, dismantling, assembly & testing after repairs of following equipments electric Iron all types, electric ovens, electric fans & regulators, water heaters, geysers mixers, food processors, toasters. | 12 |
| Unit-2 | Misc. Circuits Circuits used for control & regulation of electronic circuits like rectifiers, | 12 |

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| | amplifier timer, oscillator, identification of component, component testing, with multimeters replacement of components, microwave & use microwave for heating, laser & laser equipment | |
| | Trouble Shooting of Advanced Equipments Advanced equipments principle, types, construction, operation, Testing, fault finding, dismantling, assembly & testing after repairs of following equipments- UPS / Inverters, battery chargers, microwaves, ovens, air coolers, Washing machines – semi automatic / fully automatic, remote controllers of different equipments, VCD / DVD / ACD players. | 12 |

Total=48

Recommended Books

1. K. S. Jamwal, Maintenance of Electronic Equipment, Dhanpat Rai.
2. RP Gupta, Maintenance of Electrical Equipments, Dhanpat Rai.
3. R. S. Khandpur, Modern Electronic Equipment, TMH.
4. B.L. Theraja, Electrical Technology, S.Chand.
5. P S Dhogal, Basic Electrical Engineering, TMH

List of Practical's (EE-216)

A) Laboratory Experiences:

Dismantling, assembly, testing, preparation of list of components, parts and their cost for:

- 1) Electric iron all types
- 2) Electric oven
- 3) Electric toasters
- 4) Electric fan (CF, TF, PF, & EF & regulators)
- 5) Water heaters & geysers
- 6) Mixer & food processors
- 7) UPS / Inverters / battery chargers
- 8) Air coolers (portable / desert type)
- 9) Semi automatic & fully automatic washing machine
- 10) VCD / DVD / AVD players
- 11) Microwave Ovens
- 12) All types remote controllers

B) Field work:

- 13) Visit servicing centers of manufacturing companies, write the procedure of servicing of any one of them
- 14) Visit a manufacturing unit & prepare a report based on it.

C) Mini project:

- 15) For given specific application of any two equipments collect literature of different manufacturing company & prepare a comparative chart
- 16) Prepare test reports & bills for servicing of above any two equipments.

Learning Resources:

1. Service Manuals of manufacturers

Title of the course : **Food Microbiology**
Subject Code : **FT-211**
 Weekly load : 5 LTP 3-0-2
 Credit : 4

| Unit | Detailed contents | Lectures |
|---------------|--|----------|
| Unit-1 | Introduction Definition; historical developments in food microbiology and their significance; concept of prokaryotes and eukaryotes. | 8 |
| | Morphology of bacteria and reproduction Morphology and Reproduction of Bacteria: cell structure, shapes, types, structure and chemical composition of cell wall; Gram staining: difference between Gram positive and Gram Negative bacteria; endospore formation; different methods of reproduction. | 12 |
| Unit-2 | Morphology of fungi and reproduction Types; cell structure; composition of cell wall; methods of reproduction: asexual and sexual, importance of fungi; comparative physiology of bacteria and fungi | 11 |
| | Microbiology of food and food products Incidence of micro-organisms on foods, factors affecting growth of microbes, microbiology of milk and milk products, fruit, vegetable and their products, meat, fish, and poultry products, cereals and cereal products | 12 |

Total=43

Recommended books

1. Michal J Pleczer, Basic Food Microbiology, Chapman and Hall.
2. W.C. Frazier, Food Microbiology, TMH.
3. James M. Jay, Modern Food Microbiology, CBS.
4. Casida, Industrial Microbiology, Wiley Eastern.

List of practical's (Food Microbiology Lab)

1. Study of different parts of microscope.
2. Study of different types of bacteria.
3. Study of structure of yeast and mold.
4. To observe the reproduction in yeast under microscope
5. To perform the simple staining techniques of bacteria
6. To perform the gram's staining of microorganisms.
7. To perform the capsule staining of bacteria.
8. To perform the spore staining of mold.
9. To carry the bacterial cell count using heamocytometer.
10. Study of growth of microorganism on the petri plates.
11. To study the microbiology of curd.
12. To measure the dimension of given microorganism.
13. Preservation of microbial culture by agar slant.
14. To determine the total cell count by plate method

Title of the course : Food Chemistry
 Subject Code : FT-212
 Weekly load : 5 LTP 3-0-2
 Credit : 4

| Unit | Detailed contents | Lectures |
|----------------|---|----------|
| Unit- 1 | Introduction Food Chemistry | 7 |
| | Water Structure, properties of water, water as reactant | 5 |
| | Carbohydrates Definition and classification; structure, physical and chemical properties of mono-saccharides, disaccharides and polysaccharides | 7 |
| | Proteins Definition, classification, structure, functions of amino acids, proteins and their importance in food | 8 |
| Unit- 2 | Lipids Definition, structure, classification, functions, physical and chemical properties, rancidity and reversion | 8 |
| | Pigments Their occurrence, importance, types | 5 |
| | Vitamins and minerals Classification and sources | 4 |

Total=44

Recommended books

1. A V. V. S Ramarao , A text book of biochemistry, AVI.
2. L. Mayor, Food Chemistry, CBS.

List of Practical's FT-212 (Food Chemistry Lab)

1. Preparation of standard solution for Acid base titration
2. Study of analytical equipments
3. Qualitative analysis of water sample
4. Determination of water hardness
5. Analysis of marketed samples for moisture
6. Analysis of market butter for its constituents
7. Analysis of flour for moisture/ash
8. Determination of moisture/volatile matter of given oil/fat
9. Cut out analysis of canned food
10. Determination of saponification value of fat sample
11. Determination of wet/dry/gluten in maida/whole wheat flour
12. Determination of starch content in maida
13. Determination of Vitamin C by titremetric method
14. Determination of protein content in milk by formal titration
15. Determination of water soluble/insoluble ash

Title of the course : **Principles of Food Processing and Preservation**
Subject Code : **FT-213**
 Weekly load : 5 LTP 3-0-2
 Credit : 4

| Unit | Detailed contents | Lectures |
|---------------|---|----------|
| Unit-1 | Introduction Importance of food processing and preservation; classification of foods on the basis of shelf life, pH, origin | 6 |
| | Food spoilage Different types of food spoilage viz. microbiological, enzymatic, chemical and physical and their effects on food quality | 6 |
| | Low Temperature Preservation Low temperature requirement for different foods — Refrigeration, slow and fast freezing, freezing process; Types of freezer, their advantages and limitations; Storage and thawing of frozen food | 8 |
| Unit-2 | High Temperature Preservation Canning: Definition, advantages and disadvantages; Can formation; Unit operations in canning: Selection of raw material, peeling/coring, blanching, filling, brining/syruping, exhausting, sealing, processing, cooling, labeling and storage | 8 |
| | Low Moisture preservation Drying and dehydration methods- Solar, cabinet, tray and drum | 6 |
| | Chemical preservation Introduction, classification and applications. | 4 |
| | Radiation preservation Introduction, sources, and applications. | 4 |

Total=42

Recommended books

1. Desrosier, Technology of food preservation, CBS.
2. Fennema. Karrel, Principles of Food Science Vol-I, AVI.

List of practical's FT-213 (Principles of Food Processing and Preservation Lab)

1. Proximate analysis of food products
2. Identification of foods based on pH
3. To perform can reforming.
4. To perform can flanging and seaming
5. To examine the can seam
6. Selection of raw material like fruits/vegetables for canning.
7. Preparation of brine and syrup for canning
8. Peeling of fruit and vegetables
9. Dehydration of onion, potato and bottle-gourd
10. Dehydration of apple and grapes
11. Examination of canned food
12. Chemical preservation of foods viz., preparation of squash, RTS
13. Visit to Fruits and Vegetable industry to see above operations

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|----------------------------|---|--------------------------------|-----------|
| Title of the course | : | Electrical Measurements | |
| Subject Code | : | IE-211 | |
| Weekly load | : | 5 | LTP-3 0 2 |
| Credit | : | 4 | |

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Analog instruments Analog instruments, classification of analog instruments, Principles of operations, operating forces, constructional details , control systems, damping systems, Symbols used for analog instruments. | 08 |
| | Analog voltmeter, ammeter and ohmmeter Types of instruments, PMMC instruments, shunts and multipliers, ohmmeters-series and shunt type, torque equation moving iron instruments, torque equations, Advantages , disadvantages and their comparison, . | 08 |
| | Measurement of power and energy Electrodynamometer type of instruments, Power in ac and dc circuits, single phase wattmeter, measurement of power in single and three phase circuits. Energy meter for ac circuits, single phase induction type watt hour meter. | 08 |
| Unit-2 | Measurement of phase and frequency Single phase electro-dynamometer and moving iron power factor meters, Frequency meters and their types , phase sequence indicators. | 06 |
| | Measurement of resistance Classification of resistances, measurement of medium resistance with voltmeter-ammeter method, Wheatstone bridge and substitution method, measurement of low resistance with the Kelvin double bridge, Potentiometer method, Measurement of high resistance with the direct deflection method, Loss of charge method and megger. | 08 |
| | AC Bridges General form of ac bridge, Measurement of inductance , capacitance and frequency, Maxwell bridge, Hay bridge, De Sauty bridge, Schering bridge etc., sources of error and their minimization | 08 |

Total=46

Recommended Books-

1. A K Sawhney: A course on electrical and electronic measurements and instrumentation, Dhanpat
2. David A Bell: Electronic Instrumentation and measurement, Prentice Hall of India

List of Practical's IE-211

1. Use of multimeter for measuring voltage, current and resistance.
2. To calibrate 1-phase energy meter by direct loading method.
3. To measure the value of earth resistance.
4. To measure power, power factor in a 1-phase circuit, using wattmeter and power factor meter and verify results with calculations.
5. Measurement of power and power factor of a three-phase balance load by 2-wattmeter method.
6. Measurement of voltage, frequency of a Sinusoidal signal with CRO.
7. Measurement of power in a 3 phase circuit using CT,PT and 3 phase energy meter.
8. Connecting appropriate instruments at the supply of an installation to measure supply voltage, frequency, power, maximum demand, Phase sequence, energy consumed.
9. Use of LCR meter for measuring inductance, capacitance and resistance.
10. Connection of 3-phase energy meter in an electrical system for Measurement of energy.
11. To determine the input impedance of a multimeter.
12. To determine the error in Measurement in voltage when a multimeter is used and then DVM(VTVM) is used.

Title of the course : **Sensors and Transducers**
Subject Code : **IE-212**
 Weekly load : 5 LTP-3 0 2
 Credit : 4

| Unit | Course Outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introductions Definitions and types of transducers, Characteristics And Choice Of Transducers, Factors Influencing The Choice Of Transducers | 03 |
| | Resistive Transducers Construction, working principles, types, applications, advantages and disadvantages of potentiometers and strain gauge, , Resistive temperature transducers(RTD), Thermocouples Thermistors | 09 |
| | Inductive Transducers Basic principles of Variable Inductance Transducers, Electromagnetic pick up, Induction potentiometer, Linear variable differential transformer (LVDT) Variable reluctance transducers. | 09 |
| | Piezoelectric Transducers Basic principle and uses of piezoelectric transducers, Piezoelectric crystals and their properties, General forms of piezoelectric transducers | 03 |
| Unit-2 | Capacitance Transducers Basic principles and types of Variable Capacitance Transducers, frequency response, advantaged disadvantages and uses of capacitive transducers Capacitance pick up, Condenser microphones, Differential capacitor pick up. | 08 |
| | Digital Encoding Transducers Definition , classification, construction of digital encoding transducers, optical displacement transducers, shaft encoders | 08 |
| | Photo electric devices Definitions and types photoemissive cells, Photovoltaic, photoconductive cells | 03 |
| | Other Transducers Load cell, strain gauge and inductive torque meter magnetostrictive transducers electrical tachometers (AC and DC both) | 06 |

Total=49

Recommended Books-

1. Rangam, Sarma & Mani , Instrumentation -Devices and Systems, TMH
2. A.K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai
3. E.O. Doebelin , Measurement Systems, McGraw Hill.
4. Nakra, Instrument Measurement & Analysis, PHI.
5. W.D. Cooper, A.D. Helfrick, Electronic instrumentation and measurement techniques, PHI.

List of Practical's IE-212

1. To study the characteristics of LVDT.
2. To study the characteristics of Variable Capacitor.
3. To study the characteristics of LDR.
4. To study the characteristics of Strain Gauge.
5. To study the characteristics of Crompton Potentiometer.
6. To study the characteristics of RTD.
7. To study the characteristics of Thermistor.
8. To study the characteristics of Thermocouple.

Title of the course : **Hydraulic and Pneumatic Instruments**
Subject Code : **IE-213**
 Weekly load : 5 LTP-3 0 2
 Credit : 4

| Unit | Course Outlines | Lecture(s) |
|--------|---|------------|
| Unit-1 | Fluid Power Systems and Fundamentals Introduction to fluid power, Advantages of fluid power, Application of fluid power systems, Properties of hydraulic fluids, General types of fluids, Fluid power symbols, Basics of Hydraulics, Application of Pascal laws- Laminar and turbulent flow, Reynolds Number , Darcy equation, Losses in pipe, valves and fittings | 04 |
| | Hydraulic System & Components Sources of hydraulic power, Pumping theory, Pump classification, Gear pump, vane pump, piston pump, construction and working of pumps, pump performance, variable displacement pumps, Fluid power actuators, Linear hydraulic actuators, Types of hydraulic cylinders: single acting, double acting, special cylinders like tanden, rodless, telescopic, cushioning mechanism, construction of double acting cylinder, Rotary actuators, fluid motors, gear, vane and piston motors | 10 |
| | Design of Hydraulic Circuits Construction of control components, directional control valve: 3/2 valve, 4/2 valve, shuttle valve, check valve, pressure control valve, pressure reducing valve, sequence valve, flow control valves ,fixed and adjustable,electrical control solenoid valve, relays, ladder diagram, accumulators and intensifiers | 10 |
| Unit-2 | Pneumatic Systems and Components Pneumatic Components, Properties of air, compressors, filter , regulator, lubricant unit, air control valves, quick exhaust valves, pneumatic actuators, fluid power circuit design, pneumo-hydraulic circuits, sequential circuits for simple applications | 12 |
| | Design of Pneumatic Circuits Servo systems, hydro mechanical servo systems and proportional valves, Fluidics: Introduction to fluidic devices, simple circuits, Introduction to electro hydraulic pneumatic logic circuits, ladder diagrams, | 12 |

Total=48

Recommended Books-

1. Hydraulics and Pneumatics, **Andrew Parr**
2. Pneumatic and Hydraulic control Srinivasan .R
3. Hydraulics and Pneumatic controls Shanmugasundaram k
4. Pneumatic Systems-Principles and maintenance: Majumdar S.R. , Tata McgrawHill
5. Practical Guide to fluid power Harry L.Stewart

List of Practical's: IE-213

1. Familiarization with pneumatic system's various parts such as compressor, regulator and lubricator.
2. To study 3/2 valve & 5/2 valve.
3. To study single acting & doubling acting cylinder and Flow restriction valve.
4. To study the Pneumatic Logic Circuit.
5. To study the use of Pneumatic Limit Switch.
6. To study the Hydraulic Trainer Kit.
7. To study the use of Hydraulic valve.
8. To study hydraulic system using single acting and double acting cylinder.
9. To study the practical application of Hydraulic system in stamping device.

| | | | |
|----------------------------|---|---|------------------|
| Title of the course | : | Electrical and Instrumentation Drawing | |
| Subject Code | : | IE-214 | |
| Weekly load | : | 4 | LTP-0 0 4 |
| Credit | : | 2 | |

List of Practical's: IE-214

1. **P&ID diagrams and Instrument symbols**
 - a) General rules to be followed in drawing a flow sheets and symbols in a typical process industry.
 - b) Meanings of functional instrumentation-identification letters.
 - c) Relay function symbols.
 - d) Interlock logic symbols.
 - e) Graphic symbols
2. **Process Flow diagrams**
 - a) PFDs of processes like power plant, fertilizer plants, cement plants etc.
3. **Binary logic diagrams**
 - a) Symbols, flow diagrams, logic diagrams.
4. **Electrical drawings**
 - a) Electrical symbols, ground symbols, resistor, inductive and capacitor symbols, meter and power supply symbols, miscellaneous symbols.
5. **Panel wiring diagrams**
 - a) Symbols and wiring diagrams
6. **Pneumatic and hydraulic diagrams**
 - a) Basic symbols, pumps and compressor, motors, cylinders, control valves, control methods, check valves, exhaust valves etc.

Recommended Books-

1. Instrument Handbook vol.2 by Liptak
2. Electrical Engineering Drawing By Dr. S.K.Bhattacharya

| | | | |
|----------------------------|---|--|------------------|
| Title of the course | : | Electromagnetic Energy Conversion | |
| Subject Code | : | IE-215 | |
| Weekly load | : | 5 | LTP-3 0 2 |
| Credit | : | 4 | |

| Unit | Course Outlines | Lecture(s) |
|---------------|--|-------------------|
| Unit-1 | Introduction Basic Principle, Types and constructional features of electrical machines, torque, torque angle, basic electromagnetic laws, Induced EMF. Review of electromagnetism, Magnetic field strength, Magnetic force. Energy stored in electric and magnetic fields, energy conversion in singly and multiple excited systems, reluctance torque, reluctance and hysteresis motors. | 08 |
| | Magnetic circuits Magneto motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, magnetic leakage and fringing, hysteresis and eddy current losses. Faraday's laws, Lenz's law, statically and dynamically induced E.M.F., Energy stored in magnetic field. | 08 |
| | Transformers Introduction, Principle of working, construction of single phase transformer, EMF equation, phasor diagram on no-load, leakage reactance, transformer on load, equivalent circuit, voltage regulation, power and energy efficiency, open circuit and short circuit tests, equivalent circuit parameters estimation. Effect of saturation on exciting current, in-rush current phenomenon. Parallel operation of single phase transformer. | 08 |
| Unit-2 | D.c. Machine Construction of D.C. machines – theory of operation of D.C. generator – characteristics of D.C. generators – armature reaction – commutation – principle of operation of D.C. motor – voltage equation – type of D.C. motor and their characteristics – speed control of D.C. motors. | 10 |
| | Synchronous machine Principle of alternators – construction details – equation of induced EMF – vector diagram – | 08 |

| | | |
|--|--|----|
| | method of starting of synchronous motor – torque developed by the motor – V curves – speed control. | |
| | Induction machines Construction and principle of operation – classification of induction motor – relation between torque and rotor power factor – starting and running condition – condition for maximum torque – comparison between synchronous motor and induction motors – speed control of induction motors. | 06 |

Total=48

Recommended Books-

1. Performance design & Testing of A.C. Machines ---- M.G. Say
2. Magnetic Circuits and Transformers---- MIT staff
3. Electrical Machines---- Nagrath& Kothari
4. B L Thareja Electrical Machines, VOL II S.Chand

List of Practical's IE-215

1. Measurement of active and reactive power and phase-shift in AC circuits.
2. Series and parallel resonant circuits.
3. Measurement of time constants (RC/RL)
4. Verification of Network theorems (Superposition, Thevenin, Maximum power transfer)
5. Predetermination of efficiency and regulation of single-phase transformers
6. Load test on single phase/three phase transformers
7. Load characteristics of DC motors (shunt, series and compound)
8. Load characteristics of DC shunt/compound generators.
9. Load test on alternators
10. Synchronous motor characteristics
11. Load test on three phase induction motors
12. Load characteristics of a single phase induction motors.
13. House wiring and earthing.
14. Speed control of DC shunt motor using (a) armature control (b) field control
15. Swinburne's test

Title of the course : **Communication Skills-II**
 Subject Code : **HU-121/ HU-211**
 Weekly load : 3 LTP 1-0-2
 Credit : 2

| Unit | Course Outlines | Lecture(s) |
|--------|---|------------|
| Unit-1 | Business Communication Inviting Quotations, Letters of placing an order, Letters of cancelling an order, Letters of complaint, Drafting an application for job along with a Resume. | 08 |
| Unit-2 | Composition Writing Paragraph Writing, Précis Writing, Reporting events | 04 |
| | Correspondence Writing Personal Letters, Official Letters, Invitations-Formal and Informal, Acceptance and Refusal | 04 |

Total=16

Recommended Books:

1. Sinclair, John. *Collins Cobuild English Grammar*. Collins.
2. Allan, W. Stannard. *Living English Structure*. Orient Longman.
3. Ghosh, R.N., K.W. Moody & S. R. Inthira. *A Course in Written English*. NCERT.
4. Bhatnagar, Nitin and Mamta Bhatnagar. *Communicative English for Engineers and Professionals*. Pearson.

List of Practical's

1. Introducing yourself.
2. Observing and analyzing your environment/ surroundings.
3. Paper Reading on a general topic.
4. Declamation/ Debates.
5. Learning Etiquettes in Social and Official Settings.
6. Summarizing newspaper reports.
7. Preparing a wall newspaper.
8. English Conversation Skills.
9. Translation from English to Vernacular.
10. Dialogue writing and delivery for the given situation.
11. Role Plays.
12. Grammar exercises.
13. Building of Vocabulary.
14. Watching videos/ movies and writing, presenting their summaries.

Title of the course : **Moral Values and Professional Ethics**
 Subject Code : **MC-211/ MC-221**
 Weekly load : 01 Hr LTP 1-0-0
 Credit : 0

| Unit | Course Outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Moral Values and Self Development Social values and individual attitudes, Work ethics, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline. | 04 |
| | Personality and Behavior Development Soul and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Happiness vs. suffering , Aware of self destructive habits, Association and cooperation, Doing best, Saving nature. | 04 |
| Unit-2 | Character and Competence Science vs. God, Holy books vs. blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively. | 04 |
| | Competence in professional ethics Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems | 04 |

Total=16

Recommended Books:

- 1) M Govindrajran, S Natrajan, V.S. Senthil Kumar, Engineering Ethics(including Human Values); Eastern Economy Edition, Prentice Hall of India Ltd.
- 2) S.K.Chakraborty, Values and Ethics for Organizations Theory and Practice; Oxford University Press, New Delhi,2001.
- 3) S.K. Kapoor, Human rights under International Law and Indian Law; Prentice Hall of India, New Delhi, 2002.
- 4) D.D. Basu, Indian Constitution; Oxford University Press, New Delhi, 2002.
- 5) R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education. 2009,

Title of the course : **Manufacturing Processes-I**

Subject Code : **ME- 211**

Weekly load : 05

LTP 3-0-2

Credit : 04

| Unit | Course Outlines | Lecture(s) |
|--------|--|------------|
| Unit-1 | Foundry Introduction to casting, advantages & limitations, sand moulding- materials, properties of moulding sand, sand moulding procedure, Pattern- types & materials, pattern allowances, core prints, cores, elementary & brief description of various melting furnaces, melting of metals, metal solidification, casting defects and their remedies, introduction about moulding processes. | 12 |
| | Welding Welding processes - classification of welding processes, gas welding - tools & equipment, types of flames, arc welding - procedure, equipment, applications, type of electrodes, specification of electrodes, selection of electrodes, welding parameters & equipments. Introduction to submerged arc welding, resistance welding, spot, seam, projection & percussion, pressure, friction welding, soldering and brazing. | 12 |
| Unit-2 | Turning, Shaping & Planning Principle, description & operations performed on lathe machines, specifications, work holding devices, cutting tools & operations; working principle of shaper, planer and slotter; quick return mechanism, types of tools speed and feed used in above processes, Commonly used cutting tool materials. | 06 |
| | Milling & Drilling Milling principle, types of milling machines, specifications of milling machine, indexing head, types of milling cutters, Principles of drilling operation, cutting parameters, classification of drilling machines, different operations done on drilling machines. | 05 |
| | Boring Principle of boring, classification of boring machines, specification of boring machines, boring tools, boring bars & boring heads. | 04 |
| | Broaching Principles of broaching operation, broach nomenclature, cutting action of broach, Broaching operations and applications. | 04 |
| | Grinding Types and working of cylindrical, surface, centreless grinding. Tool and cutter grinder, various elements of grinding wheel abrasive, grade, structure, bond, codification of grinding wheel, selection of grinding wheel, dressing. | 05 |

Total = 48

Recommended Books

1. Hazra Chowdhry , Workshop Technology Vol. I & II, Media Promoters.
2. Lindberg , Manufacturing materials & process, Prentice Hall.
3. Begeman , Manufacturing processes, John Wiley.
4. S.K. Garg , Workshop Technology, Laxmi Publications.

List of Practical's (ME-211)

1. Introduction to electric arc welding (AC &DC), practice in setting current and voltage for striking proper arc, practice electric arc welding application.
2. Introduction to gas welding, study the equipment and tools used in it, practice gas welding application.
3. Study of a lathe machine and its important parts; cutting tools used and different operations performed on it, practice step turning, taper turning and boring operation using lathe.
4. Study of a drilling machine and its important parts; cutting tools used and different operations performed on it, practice drilling and counter boring using drilling machine.
5. Study of a milling machine and its important parts; types of milling cutters used and different operations performed on it, practice milling operations using helical slab milling cutter, end milling cutter.
6. Study of a grinder and its important parts; grinding wheel used and different operations performed on it, practice surface and cylindrical grinding operations.

Note: Two exercises have to be done on each above mentioned experiments.

Title of the course : TOOL ROOM TECHNIQUES -I

Subject Code : ME-212 A

Weekly load : 4

LTP 2-0-2

Credit : 3

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Jigs & Fixtures Introduction to jigs & fixtures. Principles of jigs & fixtures design, Location & principles of location, different elements of a jig, locating devices. Clamping, devices. Jig bushes, drilling jigs. Milling fixtures. Turning fixtures. | 08 |
| | Broaching Introduction, types of broaches, classification, pull type & push type, horizontal & vertical pull type broaching machines. | 08 |
| Unit-2 | Powder Metallurgy Introduction, process of powder metallurgy, advantages & applications of powder metallurgy. | 08 |
| | Fitting Practice Metal chipping & cutting, chipping tools, chipping techniques, Scrapping, filing Operations, cutting of external threads. | 08 |

Total=32

Recommended Books:

1. Chapman ' Workshop Technology(Vol-1), CBS
2. R. K. Jain mProduction Technology, Khanna
3. Gant , Jigs & Fixtures, TMH
4. Hajra Choudhary ,Workshop Technology Vol.I & II, Media Promoters
5. B. S. Raghuvanshi , Workshop Technology Vol.I & II, Dhanpat Rai

List of practical's (ME-212 A)

1. Study of different type of jigs
2. To study the working of milling fixtures.
3. To study the working of turning fixture.
4. To study the different type of broaches.
5. To study the pressing or compacting of metal powders.
6. To study the construction and working of vertical pull type broaching machine.
7. To practise the cutting of external threads.

Title of the course : Refrigeration and Air Conditioning-I

Subject Code : ME-212 B

Weekly load : 4

LTP 2-0-2

Credit : 3

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Air Refrigeration Systems Introduction, concept of refrigeration, units of refrigeration, air refrigeration systems, reversed control cycle, Bell Coleman air refrigerator. | 08 |
| | Refrigeration Systems Vapor compression refrigeration system, COP. Performance of VCR, advantages and disadvantages, Methods for improving COP. Introduction, aqua ammonia absorption system | 08 |
| Unit-2 | Refrigerants Classifications of refrigerants, properties of ideal refrigerants, anti-freeze solutions, selection of refrigerants, nomenclature of refrigerants. Ozone layer depletion, eco-friendly refrigerants. | 08 |
| | Psychrometry and Air Conditioning Systems Psychrometry, Psychrometric charts, Psychrometry Process, Simple numerical problem. Types of air-conditioning systems, central AC, unitary AC load circulation load calculation. | 08 |

Total-32

Recommended Books

1. C. P. Arora, , TMH.
2. Domkundwar ,Refrigeration and Air conditioning, Khanna.
3. Balleney, Refrigeration and Air conditioning, Khanna
4. Gupta & Prakash, Refrigeration and Air conditioning, New Chand.

List of Practical's (ME-212 B)

1. Study of different type of tools and equipments used in refrigeration and air-conditioning lab.
2. Practice in cutting bending, flaring, swaging and Brazing of copper tube.
4. To demonstrate the working of domestic refrigerator.
5. Study of window-type air-conditioner.
6. Study of split type air-conditioner.
7. Locating leaks in refrigeration system.

Title of the course : Farm Machinery-I
Subject Code : ME-212 C
Weekly load : 4
Credit : 3

LTP 2-0-2

| Unit | Course Outlines | Lecture(s) |
|--------|--|------------|
| Unit-1 | Introduction Status of farm power in India, sources of farm power, Farm mechanization and its importance in the advancement of agriculture engineering/ technology, Categorization of farm machinery and equipment. | 04 |
| | Shaping and leveling equipments: Introduction, types, working principle, construction, material adjustment, mode of operation, specifications of scraper, riddger, leveller, bund former. | 07 |
| | Ploughing & Tillage equipments: Primary tillage, introduction, types, working, principle, construction, mode of operation, specifications of mould board plough, disc plough, Secondary tillage, Introduction, types, working principle, construction, mode of operation, specifications of Cultivator, Disc Harrow, rotovator. | 07 |
| Unit-2 | Equipments for land development Mechanical working of soil, mechanical methods land grading, shaping & leveling, planning of operation, earth moving equipments, computerized land leveler | 07 |
| | Seeding equipments Introduction, types, working principle, construction, material adjustment, mode of operation, specifications of: Indigenous plough, furrow opener, calibration of seed cum fertilizer drill, specification of different types of metering devices. | 07 |

Total= 32

Recommended Books

1. Kepner , Principles of Farm Machinery, C. B. S.
2. Abdullah, Hydraulic Machinery, Dhanpat Rai.
3. O.P. Singhal, Farm mechanism & Farm Machinery & Power, Orient Offset Printers

List of Practical's Farm Machinery Lab-I (ME-212C)

1. Study, operation and maintenance of Land Shaping Equipments.
2. Study, operation and maintenance of Mould Board Plough.
3. Study, operation and maintenance of Disc Plough.
4. Study, operation and maintenance of Disc Harrow.
5. Study, maintenance & field operation of a Cultivator.
6. Study about different types of Intercultural Equipment.
7. Study, operation and maintenance of Seed cum Fertilizer Drill.
8. Study and operation of Paddy Peddling Equipment's.
9. Calibration & field operation of seed cum Fertilizer Drill.

Title of the course : **WELDING TECHNOLOGY I**
 Subject Code : **ME-212D**
 Weekly load : 4
 Credit : 3

LTP 2-0-2

| Unit | Course Outlines | Lecture(s) |
|---------------|---|------------|
| Unit-1 | Introduction Introduction to various fabrication processes, definition of welding, importance of welding as compared to other fabrication techniques, classification of welding and allied processes | 04 |
| | Types of welded joints Concept of edge preparation & different types of groove design, role of thickness in edge preparation, types of welds and welded joints for various welding processes, welding positions. | 06 |
| | Shielded metal arc welding Principle of SMAW, welding arc and its initiation, static arc characteristics, power sources for SMAW, equipment and accessories required for SMAW process, welding parameters and their effect on weld bead geometry, classification of electrodes and electrode coatings, AWS and BIS codes for the electrodes | 06 |
| Unit-2 | Gas welding Principle of gas welding, types of the fuel gases and their properties, equipment detail, cylinders torches and regulators, their constructional features and operational details, types of flames and their characteristics, gas welding techniques, filler material and fluxes. | 06 |
| | Soldering and brazing Basic principle of soldering & brazing, types of solders, soldering and brazing techniques, role of flux and the types of fluxes, applications of soldering and brazing, braze welding. Advantages and limitations of each. | 06 |
| | Welding of Plastics Types of plastics, use of plastic in the fabrication industry, introduction to various techniques used for welding the plastics. | 04 |

Total=32

Recommended Books

1. RS Parmar, Welding processes & technology, Khanna Publishers.
2. LM Gour, Principles of welding technology, Edward Arnol.
3. OP Khanna, Welding technology, Dhanpat Rai.
4. SV Nadkarni, Modern arc welding, Oxford & IBH

List of oractical's (ME-212 D)

8-10 experiments from following list

1. To study the effect of welding current on bead geometry.
2. To study the effect of welding speed on bead geometry.
3. To study the effect of welding open circuit/arc voltage on bead profile.
4. To study the effect of polarity on bead geometry
5. To measure moisture contents of electrode coating.
6. To identify various gas flames used in welding.
7. Practice of gas welding in flat position
8. To braze tungsten carbide tip on a single point cutting tool.
9. Practice of soldering of thin sheet/rods
10. Practice of plastic welding

Title of the course : **Foundry Technology-I**
 Subject Code : **ME-212 E**
 Weekly load : 4 LTP 2-0-2
 Credit : 3

| Unit | Course Outlines | Lecture(s) |
|--------|--|------------|
| Unit-1 | Introduction Various foundry processes their capabilities and safety requirements in foundry, concept of mould, constituents of flask equipments, risers, runners , pouring basins, sketching of mould along with its components, type of mould, molding methods, type of patterns, BIS color coding, materials and allowances | 10 |
| | Mould Materials Properties of moulding sand, additives, natural and synthetic binding agents, | 04 |
| Unit-2 | Mould Assemblies Assembly of cope and drag, chaplets, mould sealing, preservation of assembles mould, bench life | 06 |
| | Core making Definition and preparation of cores, type of cores, setting of cores, core making and baking, reinforcement of core, painting and venting of cores, core boxes and core prints. | 07 |
| | Gates and risers Introduction to gating systems and their functions, different types of different risers and their functions. | 05 |

Total=32

Recommended Books:

1. PL Jain , Principle of foundry technology , Khanna Publishers.
2. O P Khanna , Foundry Technology, Dhanpat rai.
3. Srinivasan , Foundry Technology, Khanna Publishers.
4. Richard W Heine , Principles of metal casting, TMH Publishers.

List of practical's (ME-212 E)

1. Familiarisation with different patterns, hand tools and safety aspects of foundry shop.
2. To perform various steps of sand conditioning (lump breaking, mulling, water addition and mixing of additives).
3. To find out the permeability of a given sand sample.
4. Find the grain fineness number of given sand sample.
5. To find out the moisture content of given sand sample.
6. To find out the clay content of given sand sample.
7. Study the working and constructional details of Cupola furnace.
8. Study the working and constructional details of Pit furnace.
9. Preparation of green sand mould using single piece pattern, two-three exercise.

Title of the course : **Engineering Materials and Metallurgy**
 Subject Code : **ME-213**
 Weekly load : 4
 Credit : 3

LTP 2-0-2

| Unit | Course Outlines | Lecture(s) |
|---------------|--|------------|
| Unit-1 | Introduction Introduction to engineering materials, physical metallurgy and basic concepts of heat treatment. Industrial importance of common engineering materials-metals, non-metals and alloys, their properties (physical and mechanical) and applications | 04 |
| | Ferrous metals and non ferrous metals Classification of iron and steel; cast iron, alloy steel, stainless steel and carbon steels. Aluminium and its alloys; copper and its alloys; nickel and its alloys; their physical and mechanical properties and applications. | 08 |
| | Engineering plastics: Thermosetting and thermo plastics, fabrication techniques of engineering plastics, their properties and applications. | 04 |
| Unit-2 | Crystallography Crystalline nature of solids, Structure of atom, types of solids, space lattice arrangement of atoms in BCC, FCC and HCP crystals, plastic deformation of metals, strengthening mechanism of metals and their effect on mechanical properties: | 05 |
| | Phase diagrams Phases in metal system, solid solution, Hume-Rothery rules, solidification of pure metals and alloys, phase rule, equilibrium diagrams, Iron-carbon equilibrium diagram and effect of carbon on properties of steel. | 06 |
| | Heat treatment processes Principle of heat treatment of steels, TTT curves, annealing, normalizing, hardening, Case hardening, tempering, austempering, martempering, flame hardening, induction hardening, carburizing, nitriding, cyaniding of steels, Precipitation hardening with reference to Copper and Aluminum | 05 |

Total=32

Recommended Books:

1. OP Khanna, Materials and metallurgy by, Published, Dhanpat Rai.
2. Rajan and Sharma , Heat treatment principles and techniques, Published by PHI.
3. Sidney H Avner, Introduction to physical metallurgy, Published by TMH.

List of practical's (ME-213)

1. Visual inspection of various types of engineering materials.
2. Iron carbon equilibrium diagram.
3. To study BCC, FCC and HCP crystals.
4. Specimen preparation for tensile strength testing (round).
5. Specimen preparation for tensile strength testing (flat).
6. Specimen preparation for Izod testing.
7. Specimen preparation for Charpy V-notch testing.
8. Demonstration on universal testing machine (UTM) for tensile test.
9. Demonstration on universal testing machine (UTM) for U-bend test.
10. Demonstration on Impact strength testing machine.
11. To study muffle furnace and carryout hardening and annealing.

Title of the course : **Tool Drawing-I**
Subject Code : **ME-214 A**
Weekly load : 4 LTP 0-0-4
Credit : 2

List of practical's

1. To draw the geometry of single point cutting tool and its related angles.
2. To draw the geometry of twist drill with its components.
3. To draw various milling cutters.
4. To draw the three and four jaw chucks.
5. To draw the various lathe accessories.
6. To draw the turret and capson head.
7. To draw the various job holding device of drilling machine.
8. To draw the milling arbor, adapter and collets.
9. To draw the various milling cutters.
10. To draw the different types of grinding wheel shapes.
11. To draw various boring and reaming tools.
12. To draw the geometry of broach.

Title of the course : **Installation and Servicing of RAC Equipments**
Subject Code : **ME-214 B**
Weekly load : 4 LTP 0-0-4
Credit : 2

List of practical's

1. To perform the installation of an window type Air- conditioner.
2. To perform the of installation of an Refrigerator.
3. To perform the heat load calculation for a given room.
4. Performing servicing of the Domestic Refrigerator.
5. Performing servicing Window type Air-conditioner.
6. Overhauling of reciprocating compressor.
7. To add oil to compressor.
8. Servicing and installation of Solenoid valve.
9. Understand the points to installation a split type Air-conditioner.

Title of the course : **Repair and maintenance of Auto and Farm Equipments**
Subject Code : **ME-214 C**
Weekly load : 4 LTP 0 -0- 4
Credit : 2

List of practical's

1. To study about the basic components of an internal combustion Engine.
2. To dismantle, clean and reassemble a dry type of air cleaner.
3. To dismantle, clean and reassemble a wet type air cleaner.
4. Study of fuel supply system and service the fuel tank and fuel lines of an automobile.
5. Greasing the front and rear wheel of an automobile
6. Study and servicing of a carburettor.
7. General check up of electrical/lighting/horn system of an automobile.
8. To repair a punctured tube of an automobile
9. Study about the wheel replacing and wheel rotation of a car.
10. Routine servicing of the tractor.
11. To remove, inspect and reinstall clutch assembly of an automobile.
12. To study the various methods of changing the tines of the cultivator.
13. Method for oiling/greasing of the bearing of a disc harrow
14. . To arrange the Industrial visit of an automobile shop/ farm equipments industry time to time.

Title of the course : **WELDING PRACTICES**
Subject Code : **ME-214 D**
Weekly load : 4 LTP 0-0-4
Credit : 2

List of practical's

10 – 14 Jobs from following list

1. Practice of laying stringer beads on plate in flat position.
2. Practice of welding in vertical position using shielded metal arc welding process.
3. Practice of under water welding process.
4. Practice of joining strips in flat position using butt joint
5. Practice of laying bead on plate using submerged arc welding process.
6. Practice of operating tungsten inert gas welding machine.
7. Practice of MIG/MAG process.
8. Practice of spot welding process
9. Practice of projection welding
10. Practice of flash butt welding
11. Practice of gas welding in flat position
12. Practice of brazing
13. Practice of soldering
14. Practice of forge welding

Title of the course : **Pattern Drawing**
Subject Code : **ME 214 E**
Weekly load : 4 LTP 0-0-4
Credit : 2

List of practical's

1. Introduction
 - a. Types of Patterns
 - b. Pattern allowances
 - c. Pattern colour code
2. Pattern drawing for Duck foot Bend
3. Pattern drawing for DF Taper
4. Pattern drawing for DF Taper $\frac{1}{8}$ "
5. Pattern drawing for Air Radius Arm
6. Pattern drawing for Bearing Bracket
7. Pattern drawing for Stop Valve Body
8. Pattern drawing for Pump End Cover
9. Pattern drawing for Master Rod
10. Pattern drawing for Valve Body