MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION , MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : MECHANICAL ENGINEERING GROUP

COURSE CODE : ME / MH / MI

DURATION OF COURSE : 6 SEMESTERS for ME / 8 SEMESTER for MH /MI **WITH EFFECT FROM 2009-10**

SEMESTER : THIRD **DURATION : 16 WEEKS**

FULL TIME / PART TIME : FULL TIME **SCHEME : E**

SR. NO.	SUBJECT TITLE	Abbreviation	SUBJECT CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (1)		PR (4)		OR (8)		TW (9)		SW (16003)
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Applied Mathematics Ø	AMS	12035	03	--	--	03	100	40	--	--	--	--	--	--	50
2	Mechanical Engineering Drawing Ø	MED	12042	03	--	04	04	100	40	--	--	25#	10	25@	10	
3	Strength Of Materials Ø	SOM	12043	03	--	02	03	100	40	--	--	--	--	25@	10	
4	Mechanical Engineering Materials $	MEM	12044	03	--	--	03	100	40	--	--	--	--	--	--	
5	Electrical Engineering	EEG	12045	03	--	02	03	100	40	25@	10	--	--	--	--	
6	Manufacturing Technology	MTE	12046	02	--	04	--	--	--	50#	20	--	--	25@	10	
7	Development of Life Skills- II Ø	DLS	12041	01	--	02	--	--	--	--	--	25#	10	25@	10	
8	Professional Practices - III $	PPS	12047	--	--	03	--	--	--	--	--	--	--	50@	20	
			TOTAL	**18**	**--**	**17**	**--**	**500**	**--**	**75**	**--**	**50**	**--**	**150**	**--**	**50**

Student Contact Hours Per Week: **35 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 825**

@ Internal Assessment, # External Assessment, [ ] No Theory Examination, $- common to ME / PT, Ø - common to ME / PT / AE / PG

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Civil and Mechanical Engineering Group

Course Code : AE/CE/CS/CV/CR/PG/PT/ME/MH/MI/FE/CH/PS/PT

Semester : Third

Subject Title : Applied Mathematics

Subject Code : 12035

Teaching and examination scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

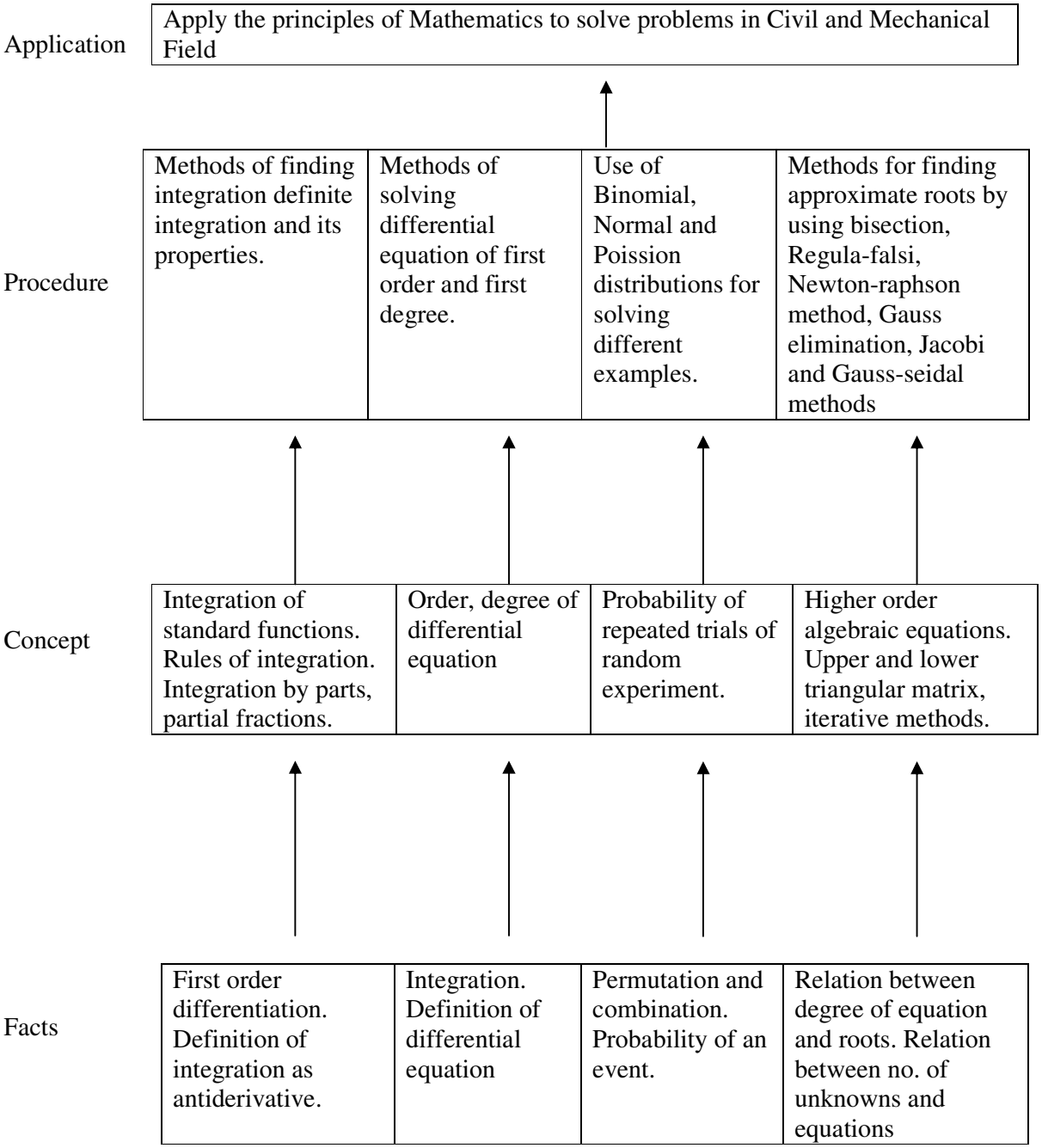
Rationale:

The study of mathematics is necessary to develop in the student the skills essential for studying new technological development. This subject introduces some applications of engineering, through which the student can understand the link of Mathematics with engineering principles.

Objective: The student will be able to**:**

1. Apply Mathematical term, concept, principles and different methods for studying engineering subjects
2. Apply Mathematical methods to solve technical problems,
3. Execute management plans with precision.
4. Use Mathematical techniques necessary for daily and practical problems.

Learning Structure:



CONTENTS: Theory

Chapter	NAME OF TOPIC	Hours	Marks
01	**Integration:** 1.1 Definition of integration as anti-derivative. Integration of standard function. 1.2 Rules of integration (Integrals of sum, difference, scalar multiplication). 1.3 Methods of Integration. 1.3.1 Integration by substitution 1.3.2 Integration of rational functions. 1.3.3 Integration by partial fractions. 1.3.4 Integration by trigonometric transformation. 1.3.5 Integration by parts.	10	18
	1.4 Definite Integration. 1.4.1 Definition of definite integral. 1.4.2 Properties of definite integral with simple problems.	04	08
	1.5 **Applications of definite integrals.** 1.5.1 Area under the curve. Area bounded by two curves, 1.5.2 Volume of revolution. 1.5.3 Centre of gravity of a rod, plane lamina.	06	10
02	**Differential Equation** 2.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant. 2.2 Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, Non homogeneous, Exact, Linear and Bernoulli equations.	08	18
	2.3 Applications of Differential equations. 2.3.1 Rectilinear motion (motion under constant and variable acceleration) 2.3.2 Simple Harmonic Motion	04	10
03	**3.1 Probability:** 3.1.1 Definition of random experiment, sample space, event occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely) 3.1.2 Definition of probability, addition and multiplication theorems of probability.	04	08
	3.2 Probability Distribution 3.2.1 Binomial distribution. 3.2.2 Poisson's distribution. 3.2.3 Normal distribution 3.2.4 Simple examples corresponding to production process.	04	12

04	**Numerical Methods** **4.1 Solution of algebraic equations** Bisection method, Regulafalsi method and Newton – Raphson method.	04	08
	4.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's methods.	04	08
	Total	**48**	**100**

Learning Resources:

Books:

Sr. No.	Title	Authors	Publications
01	Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
02	Calculus: Single variable	Robert T. Smith	Tata McGraw Hill
03	Advanced Mathematics for Engineers and Scientist	Murray R Spiegel	Schaum outline series McGraw Hill
04	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Dehli
06	Introductory Methods of Numerical analysis	S. S. Sastry	Prentice Hall Of India New Dehli
07	Numerical methods for Engg. 4th ed.	Chapra	Tata McGraw Hill
08	Numerical methods for scientific & engineering computations	M. K. Jain & others	Wiley Eastern Publication.

Course Name : Mechanical Engineering Group

Course Code : AE/PG/PT/ME/MH/MI

Semester : Third

Subject Title : Mechanical Engineering Drawing

Subject Code : 12042

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	04	100	--	25#	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

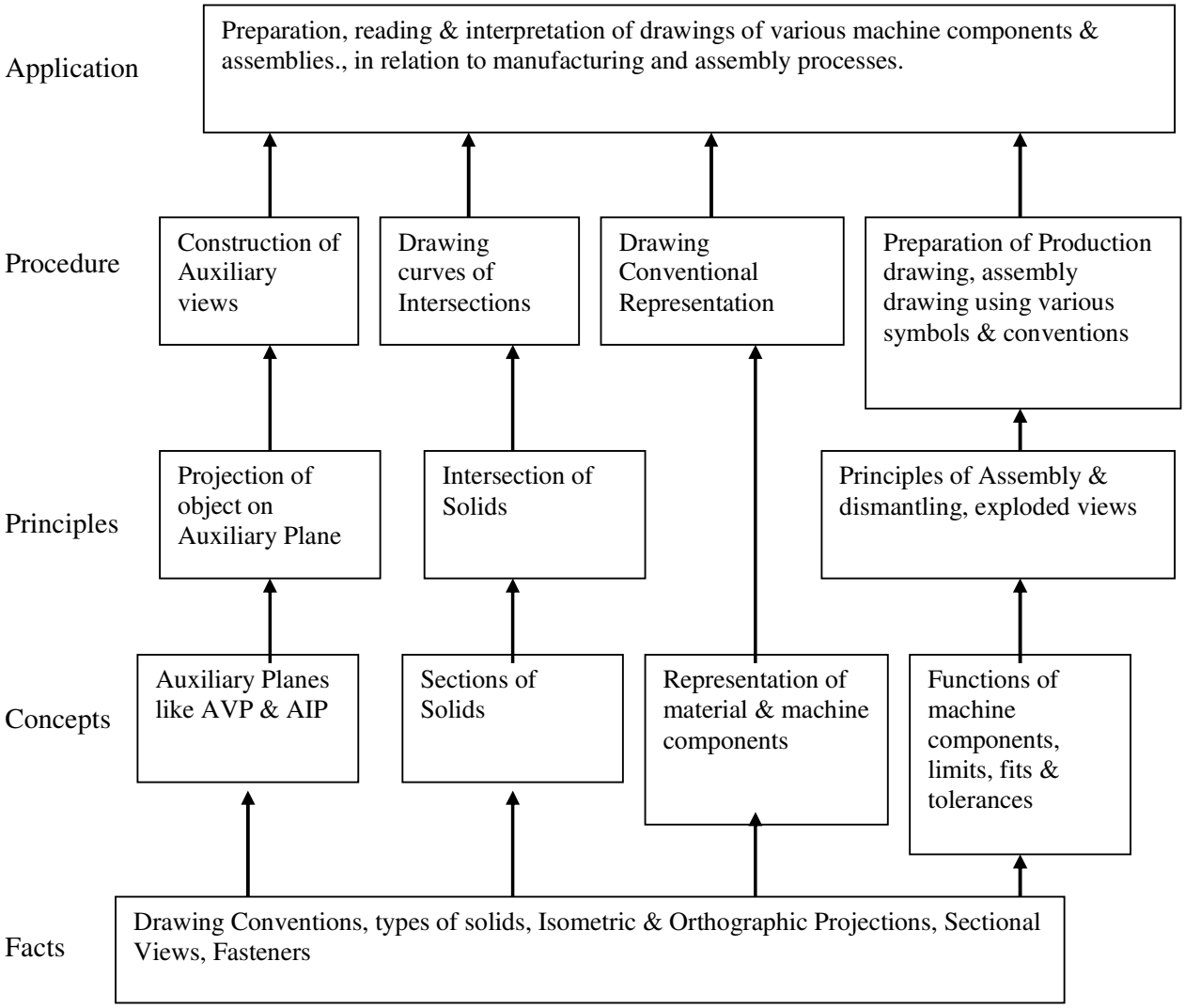
Rationale:

A Mechanical Engineering Diploma holder, irrespective of his field of operation in an industry, is expected to possess a thorough understanding of drawing, which includes clear spatial visualization of objects and the proficiency in reading and interpreting a wide variety of production drawings. Besides, he is also expected to possess certain degree of drafting skills depending upon his job function, to perform his day to day activity i.e. communicating and discussing ideas with his supervisors and passing instructions to his subordinates unambiguously. This course envisages reinforcing and enhancing the knowledge and skill acquired in the earlier two courses viz. Engineering Graphics & Engineering Drawing.

Objectives: The Student should be able to –

1. Interpret industrial drawings.
2. Interpret instructions related to manufacturing of components.
3. Use IS convention of representing various machine components.
4. Visualize the assembly of a given set of details of machine components.
5. Know the significance & use of tolerances of size, forms & positions.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Auxiliary views:** - Study of auxiliary planes, Projection of objects on auxiliary planes. Completing the regular views with the help of given auxiliary views (Use first angle method of projection)	08	12
02	**Intersection of solids:-** Curves of intersection of the surfaces of the solids in the following cases (a) Prism with prism, Cylinder with cylinder, Prism with Cylinder When (i) the axes are at 90° and intersecting (ii) The axes are at 90° and Offset (b) Cylinder with Cone When axis of cylinder is parallel to both the reference planes and cone resting on base on HP and with axis intersecting and offset from axis of cylinder	08	16
03	**Projection of straight lines & planes.** Line inclined to both the planes. Plane inclined to both the planes limited to triangular, quadrilateral , pentagonal , hexagonal and circular planes.	08	08
04	**Conventional Representation:-** 1. Standard convention using SP – 46 (1988) (a) Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber (b) Long and short break in pipe, rod and shaft. (c) Ball and Roller bearing, pipe joints, cocks, valves, internal / external threads. (d) Various sections- Half, removed, revolved, offset, partial and aligned sections. (e) Knurling, serrated shafts, splined shafts, and chain wheels. (f) Springs with square and flat ends, Gears, sprocket wheel (g) Countersunk & counter bore. (h) Tapers	04	12
05	**Limits, Fits and Tolerances:-** 1. Characteristics of surface roughness- Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods. 2. Introduction to ISO system of tolerencing, dimensional tolerances, elements of interchangeable system, hole & shaft based system, limits, fits & allowances. Selection of fit. 3. Geometrical tolerances, tolerances of form and position and its geometric representation. 4. General welding symbols, sectional representation and symbols used in Engineering practices	04	12

06	**Details to Assembly** 1. Introduction- 2. Couplings – Universal couplings & Oldham's Coupling 3. Bearing – Foot Step Bearing & Pedestal Bearing 4. Lathe tool Post 5. Machine vice & Pipe Vice 6. Screw Jack 7. Steam Stop Valve	**08**	**20**
07	**Assembly to Details** 1. Introduction – 2. Pedestal Bearing 3. Lathe Tail Stock 4. Drilling Jig 5. Piston & connecting rod 6. Gland and Stuffing box Assembly 7. Valve – Not more than eight parts 8. Fast & loose pulley	**08**	**20**
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Understand interpenetration of soil.
2. Interpret limits, fits and tolerances on a given drawing.
3. Visualize assembly of components from given details.
4. Interpret Conventional symbols as per IS code SP46.
5. Identify different materials and their properties.

Motor Skills:
Draw front view and top view of solids Penetrating one with other.

1. Conventionally represent limit, fits and tolerances on a given drawing as per the manufacturing processes.
2. Give surface roughness values and symbols on a part drawing..
3. Setting and use of different drawing equipments.
4. Record bill of materials in assembly drawing.
5. Use computer aided drafting package.

List of Practical:
(Use first angle method of projection)

1. Auxiliary Views
   One sheet containing two problems on Auxiliary views.

2. Intersection of Solids

   i) One Sheet containing atleast two problems.
   ii) Atleast four problems for home assignment in sketch book

3. Projection of lines & planes

i) One sheet containing two problems on lines & planes

ii) At least two problems as home assignment in sketch book

4. Conventional Representation as per SP – 46 (1988) - one sheet
5. Limit, Fit, Tolerances and Machining Symbols – one sheet
6. Assembly to detailed drawings of components including conventional representation of tolerances and surface finish symbols:

   One sheet covering any one assembly and its details

   At least two problems as home assignment in sketch book
7. Details to Assembly

   Draw One sheet covering any one assembly and its details.

   Solve at least two problems as home assignment in sketchbook.
8. Two problems on assembly drawings using any AutoCAD Package.

   (Assembly containing maximum 6 to 7 components-minimum 12 hours)

Learning Resources:

Books:

Sr. No.	Author	Title	Publication
01	N.D.Bhatt	Machine Drawing	Charotar Publication, Anand
02	IS Code SP 46 (1988)	Code of practice for general engineering drawing.	Engineering Drawing Practice for School and colleges
03	L.K.Narayanan, P.Kannaich, K.VenkatReddy	Production Drawing	New Age International Publication
04	P.S.Gill	Machine Drawing	S.K.Kataria and Sons
05	M.L.Dabhade	Engineering Graphics (For Topic on Auxiliary Views)	--
06	Sidheshwar	Machine Drawing	Tata McGraw Hill

Course Name : Mechanical Engineering Group

Course Code : ME/PG/PT/AE/MH/FE/MI/PS/PT

Semester : Third

Subject Title : Strength of Materials

Subject Code : 12043

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	---	---	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

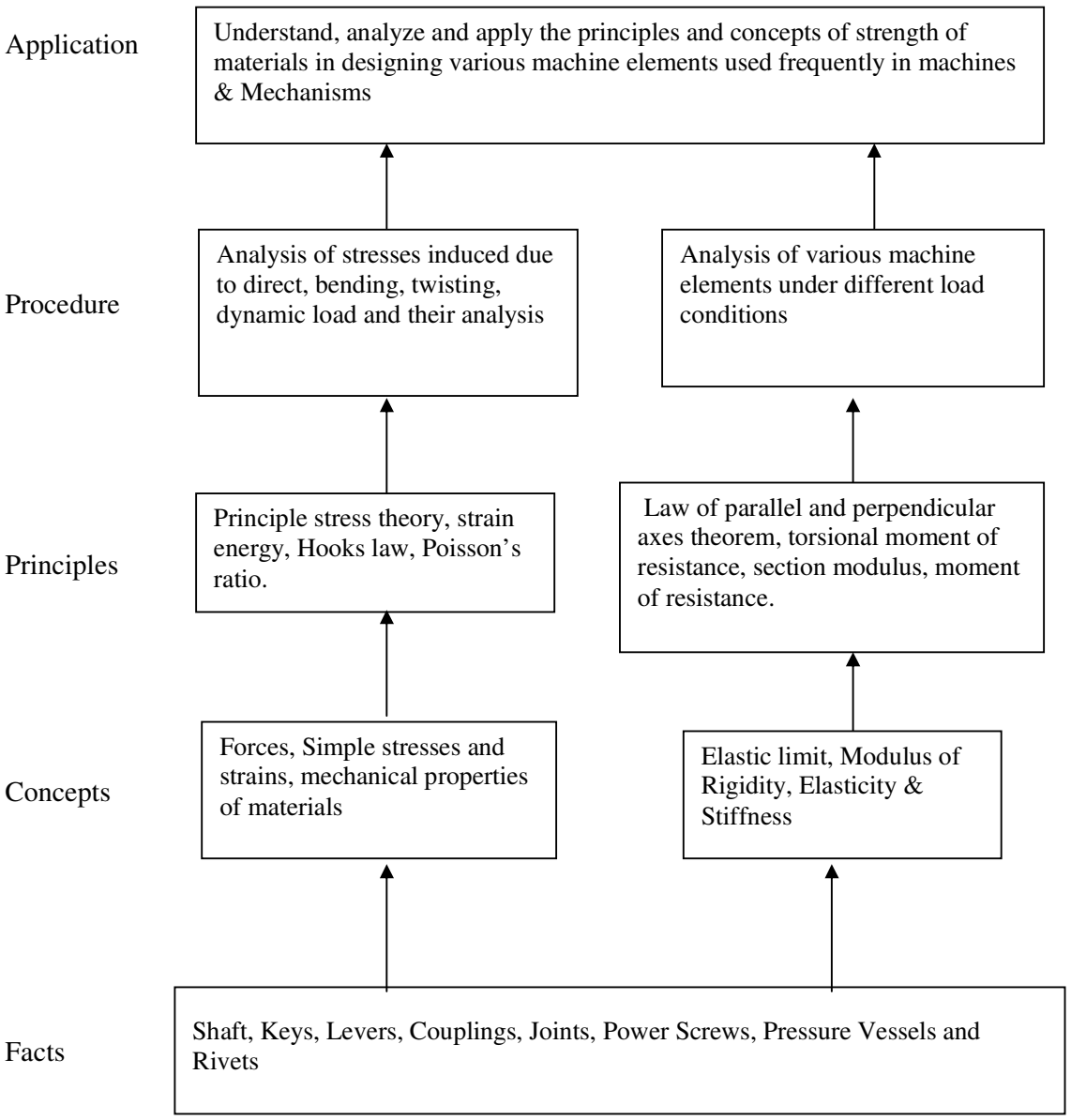
Strength of Material is a core technology subject. It aims at enabling the student to understand & analyze various types of loads, stresses & strains along with main causes of failure of machine parts. The subject is pre-requisite for understanding principles of machine design. Understanding mechanical properties of materials will help in selecting the suitable materials for various engineering applications.

Objectives:

The Student should be able to:

1. Understand the fundamentals of solid mechanics.
2. Acquire elementary knowledge of stresses, strains & material properties.
3. Understand & analyze the basic principles involved in the behavior of machine parts under load in the context of designing it.
4. Understand & analyze the mechanical properties of the various materials.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Mechanical Properties of Materials, Simple stresses & Strains** 1.1 Mechanical properties – Elasticity, Plasticity, Rigidity, Ductility, Malleability, Toughness, Hardness, Brittleness, Creep, Fatigue. 1.2 Concept & Definition of Simple stresses & strains Types - tensile, compressive, Shear, single & double shear, Punching shear, Thermal stresses, Hoop stresses & corresponding strains. Hooke's law, Young's modulus, Modulus of Rigidity, Change in length of the bar having uniform & stepped cross section stress-strain curves for ductile & brittle materials. 1.3 Volumetric Strain, Bulk modulus, Poisson's ratio. Bi-axial & Tri-axial stresses & strains. Relationship among E, G, & K. 1.4 Stresses & strains in bars of uniformly varying section subjected to axial load at ends only, Composite sections having same length 1.5 Temperature stresses & strains of uniform & composite sections.	12	24
02	**Bending Moment & Shear Force** 2.1 Concept & definition of Shear force & bending moment. Relation between rate of loading, shear force & bending moment. 2.2 Shear force & bending moment diagrams for cantilevers, simply supported beam & over hanging beam subjected to point loads & Uniformly distributed load. 2.3 Location of point of contraflexure.	08	16
03	**Moment of Inertia** 3.1 Concept & definition of Moment of inertia, radius of gyration. Parallel & perpendicular axes theorem. (No derivation) 3.2 Moment of inertia of square, rectangular, circular, semicircular, Triangular, Hollow square, Rectangular & circular only. 3.3 MI of angle section, Channel section, Tee- section, I section about centroidal axis & any other axis parallel to centroidal axis. 3.4 Polar moment of inertia.	06	16

04	**Bending stresses** 4.1 Theory of simple bending, Assumptions in the theory of bending, moment of resistance, section modulus & neutral axis. Stress distribution diagram for Cantilever & simply supported beam. 4.2 Equation of bending(No derivation) 4.3 Simple numeral problem. 4.4 Concept of direct & transverse shear stress. 4.5 Shear stress equation (No derivation) 4.6 Shear stress distribution diagrams Average shear stress & Maximum shear stress for rectangular & circular section.	06	12
05	**Direct and Bending stresses** 5.1 Concept of Axial load, eccentric load, direct stresses, bending stresses, maximum & minimum stresses. 5.2 Stress distribution diagram. 5.3 Condition for no tension in the section. 5.4 Problems on the above concepts for machine parts such as offset links, C-clamp, Bench vice, Drilling machine frame etc.	08	16
06	**Torsion** 6.1 Concept of Pure Torsion, Assumptions in theory of pure Torsion, Torsion equation for solid and hollow circular shafts. 6.2 Power transmitted by a shaft. 6.3 Comparison between Solid and Hollow Shafts subjected to pure torsion (no problem on composite and non homogeneous shaft)	08	16
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skill:

1. Identification of different parts of machine and their function
2. Interpretation failure patterns of different metal under different action
3. Extrapolating test result or observation during test
4. Testing different metals and comparison of experimental result

Motor Skill:

1. Sketch of standard specimen, arrangement for test on respective machines
2. Measurement of different parameters
3. Handling Instrument
4. Observing behavior of different metal during test.

List of Practical:

01 Study and demonstration of Universal Testing Machine & its attachments.
02 Study & demonstration of Extensometer.
03 Tension Test on mild steel, Aluminum & compression test on cast iron on Universal Testing Machine.
04 Direct Shear Test of mild steel on Universal Testing Machine.
05 Brinell Hardness Test on Mild Steel.
06 Rockwell hardness Test on Hardened Steel.
07 Izod & Charpy - Impact tests of a standard specimen.
08 Torsion Test on Mild steel bar.
09 a) Assignments: Problems on shear force & bending moment diagrams to be drawn on graph paper.

Learning Resources:

Books:

SN	Author	Title	Publication
01	Andrew Pytel Fedrinand L. Singer	Strength of Material	Addison-Wesley An imprint of Addison Wesley Longman, Inc. Forth edition
02	B.K.Sarkar	Strength of Material	Tata McGraw hill New Delhi
03	Dr. R. K.Bansal	A Text Book strength of Material	Laxmi Publication New Delhi
04	S Ramamrutham	Strength of Material	Dhanpat Rai & Publication New Delhi
05	R.S.Khurmi	Strength of Material	S.Chand Company Ltd. Delhi

Course Name : Mechanical Engineering Group except Automobile Engineering

Course Code : ME/PT/PG/MH/MI

Semester : Third

Subject Title : Mechanical Engineering Materials

Subject code : 12044

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

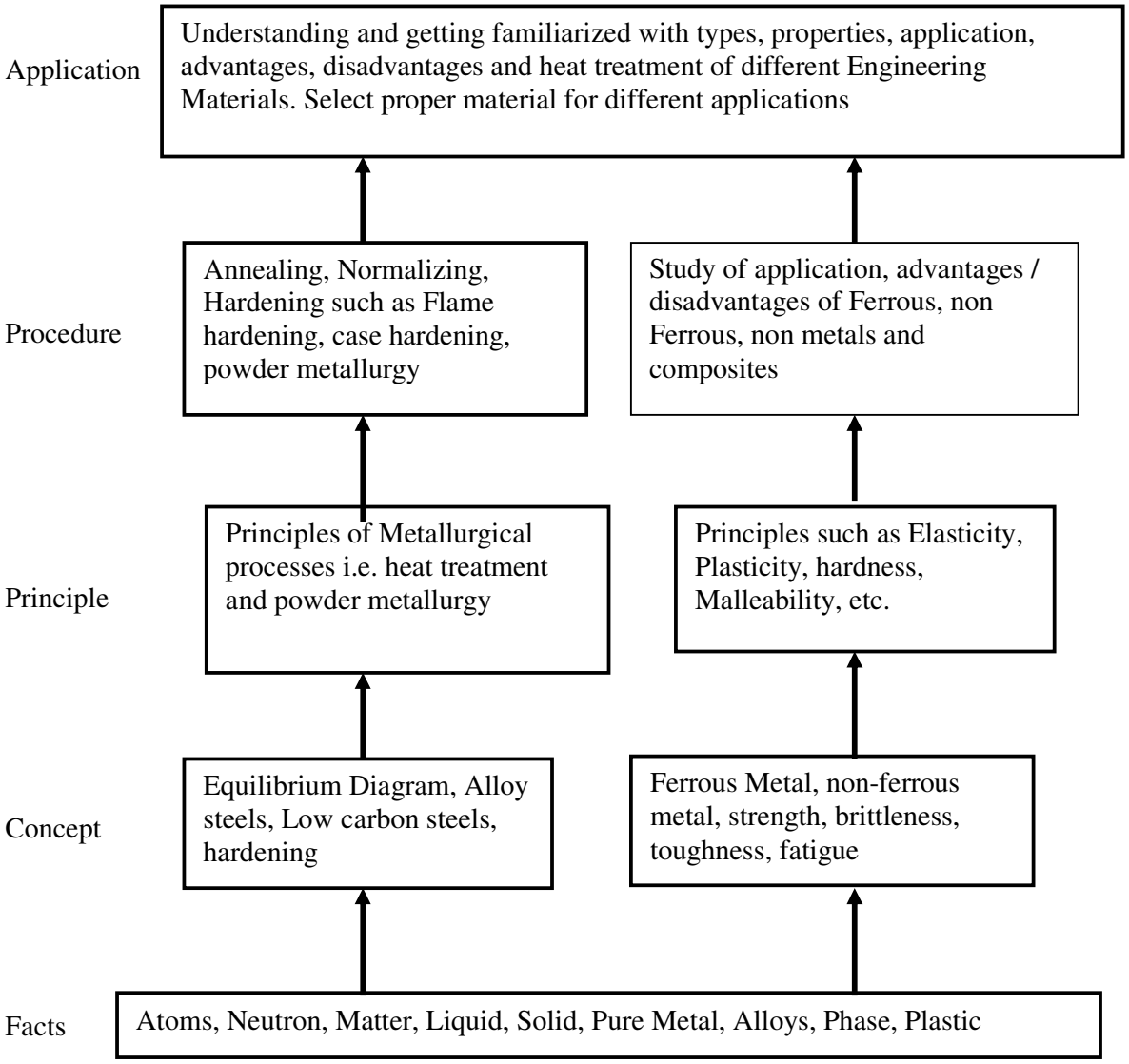
Rationale:

Mechanical Engineering Materials is a core technology subject in Mechanical Engineering Discipline. A Mechanical Engineering diploma holder deals with various materials required for cutting tools, Dies, Gears, Bearings and many other applications. Knowledge of selection of proper tool materials, heat treatments for specific materials, ferrous and non- ferrous materials and their alloys for various engineering application, as well as insulating, refractory and plastic materials as per the requirements is essential.

Objectives: Students should be able to:

1. know the properties of Engineering Materials like Metals, non-metals, ferrous metals and non-ferrous metals
2. Interpret Iron –Iron Carbide phase equilibrium diagram to find temperatures for heat treatment processes.
3. Select the proper materials for different applications like cutting tools, dies, gears & other applications.
4. Understand various heat – treatment processes & its applications for various. Components to improve its mechanical properties.
5. Understand powder metallurgy process and its applications.
6. Understand Non Destructive testing methods & its applications.

Learning Structure:



Chapter	Name of the Topic	Hours	Marks
1.	**Engineering Materials and their Properties** **1.1** Introduction, Classification and Application of Engineering materials, I.S specification of materials like plain carbon steel, Grey Cast iron, low alloy steels & bearing Materials. **1.2 Properties of metals**:- **Physical Properties** – Structure, Density, Melting point. **Mechanical Properties** – Strength, elasticity, ductility, malleability, plasticity, toughness, hardness, hardenability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion **1.3** Introduction to Corrosion, types of Corrosion, Corrosion resisting materials.	**06**	**12**
2.	**Ferrous Metals and Alloys** **2.1:-** Characteristics and application of ferrous metals Phase equilibrium diagram for Iron and Iron Carbide. Flow diagram for production of Iron and Steel, Classification, composition and uses of cast iron, effect of sulphur, silicon and phosphorous. Classification, composition and application of low carbon steel, medium carbon steel and high carbon steel with their chemical composition. Magnetic materials: - Properties & Applications of commonly used magnetic materials (Permanent magnets and temporary magnets). **2.2:-** Alloy Steels: - Low alloy steel, high alloy steel, tools steel & stainless steel. Effect of various alloying elements such as – Chromium, nickel, manganese, molybdenum, tungsten, vanadium. Tool Steels: - High speed Steels (HSS), Hot & cold Working dies, shear, punches etc., properties & applications. Special Cutting Tool Materials – Diamond, Stelites & Tungsten Carbide	**14**	**26**
3.	**Non Ferrous Metals and Alloys** **3.1** Properties, applications & chemical compositions of Copper alloys (naval brass, muntz metal, Gun metal & bronzes), Aluminium alloys (Y-alloy & duralumin) & bearing materials like white metals, leaded bronzes & copper lead alloys. **3.2** Desired properties of bearing materials.	**06**	**14**

4	**Heat Treatment of Steels** **4.1** Introduction to Heat treatment processes such as Annealing, subcritical annealing, Normalizing, Hardening, Tempering (Austempering & Martempering) - Principle, Advantages, limitations and applications. **4.2** Surface Hardening - Methods of surface hardening, i) case hardening ii) Flame Hardening, iii) Induction Hardening, iv) Nitriding, v) Carburizing - Principle, advantages, limitations and applications	**08**	**18**
5	**Non Metallic Materials** **5.1** Polymeric Materials – Introduction to Polymers- types, characteristics, properties and uses of Thermoplastics, Thermosetting Plastics & Rubbers. **5.2** Thermoplastic Plastics - characteristics and uses of ABS, Acrylics, Nylons and Vinyls **5.3** Thermosetting Plastics - Characteristics and uses of polyesters, Epoxies, Melamines & Bakelites. **5.4** Rubbers – Neoprene, Butadiene, Buna & Silicons – Properties & applications. **5.5** Properties and applications of following Engineering Materials – Ceramics, Abrasive, Adhesive and Insulating materials such as Cork, Asbestos, Thermocole and Glass Wool **5.6** Introduction to Composite Materials – Laminated & Fibre reinforced materials - Structure, Properties & Applications.	**07**	**16**
6	**Powder Metallurgy & Nondestructive Testing** **6.1** Advantages, limitations and applications of Powder Metallurgy for engineering products. **6.2** Brief Description of Process of Powder Metallurgy – Powder making, blending, compacting, sintering, infiltration & impregnation. **6.3** Applications of Powder metallurgy for tungsten carbide tip tools & porous bearing. **6.4** Importance of Non-destructive testing, Difference between Destructive and Nondestructive testing. **6.5** Nondestructive testing methods - Radiography (X-Ray & Gamma Ray), Ultrasonic crack detection, Dye penetrant test, Magnaflux test – Comparison & applications.	**07**	**14**
	TOTAL	**48**	**100**

Learning Resources:

Books:

Sr. No.	Author	Title	Publication
01	O.P.Khanna	A Text Book of Material Science and Metallurgy	Dhanpat Rai and Sons [1999]
02	Dr.V.D. Kodgire	Material Science And Metallurgy	Everest Publishing House [1990]
03	R.K.Rajput	Material Science and Engineering	S.K.Katari and Sons [2002 reprint 2003]
04	S.K.Hazra and Choudhari	Material Science and Processes	Indian Book Distribution Co. [1982]
05	Kenneth G. Budinski and Micheal K. Budinski	Engineering Materials Properties and Selection	Pearson Education, New Delhi
06	ASME	ASME Material Manuals	--
07	Sidney H. Avner	Introduction to Physical metallurgy	Tata Mc Graw Hill edition (2^{nd})

Course Name : Mechanical Engineering Group

Course Code : ME/ MH / MI

Semester : Third

Subject Title : Electrical Engineering

Subject Code : 12045

Teaching and Examination Scheme: 'E' Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25@	--	--	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE. Curriculum for first test and second test shall be approximately 40% and 60% respectively. Question paper for test: Q1: 3 bits of 3 marks each, option ¾ , Q.2 : 3 bits of 4 marks each, option 2/3, Q3: 3 bits of 4 marks each or 2 bits of 8 marks each, option 2/3 or ½.**
- **Total of test marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

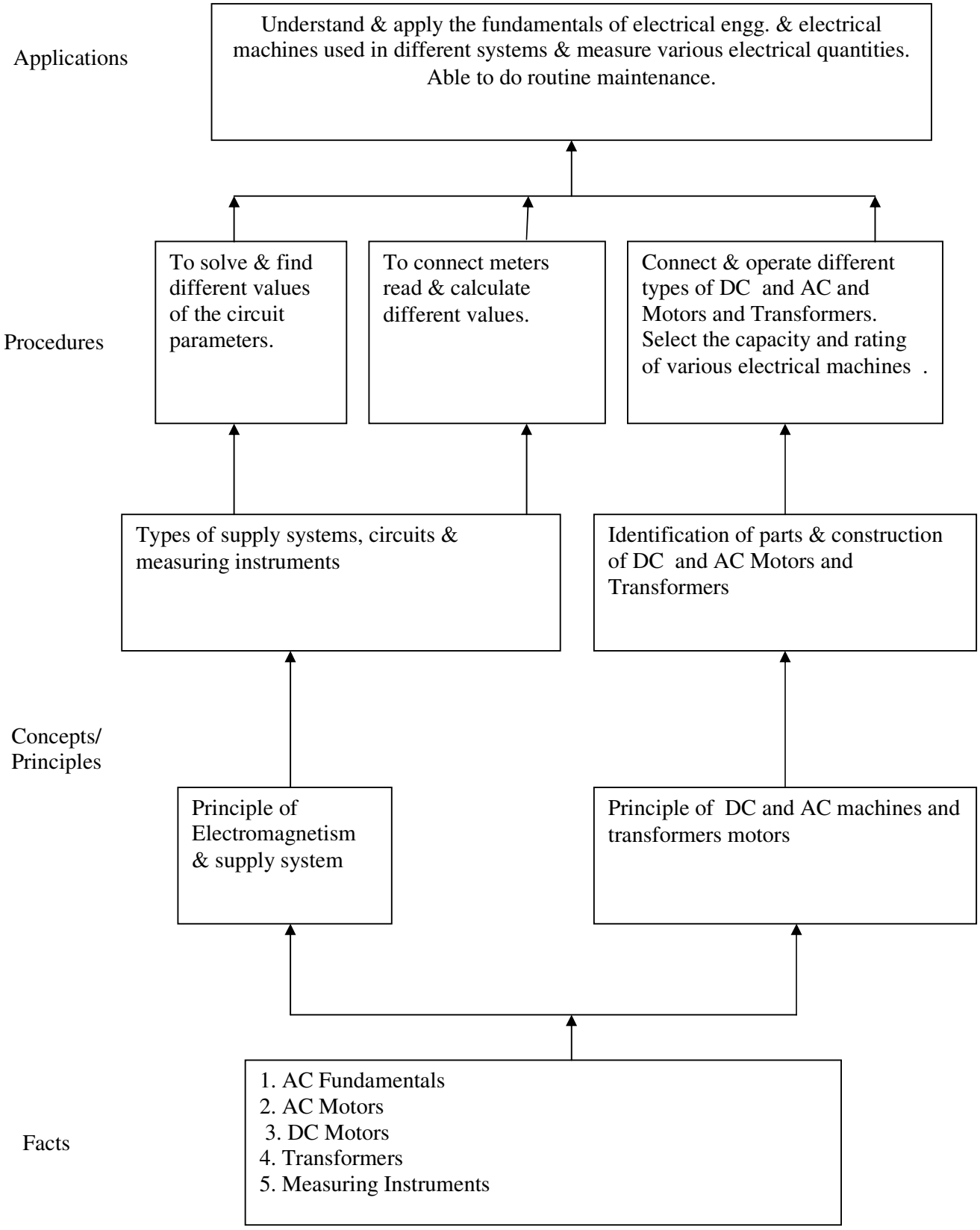
This subject is classified as Engg. Science subject, which intends to teach students facts, concepts, principles & procedure of operating electrical machines, circuits & systems and their applications. This subjects deals with measurements of electrical quantities to judge the performance of electrical machines. This subject is important as most of the drives are electrical drives and the knowledge of this subject helps in running and maintaining various electrical machines and drives.

Objectives:

Student will be able to:

1. Identify the type of Electric supply system.
2. Use the tariff system & calculate energy requirements and cost of energy.
3. Identify different types motors, transformers and drives.
4. Select suitable drive as per the requirements.
5. Apply knowledge of Electric heating & welding for various operations in manufacturing processes.
6. Supervise routine maintenance of electrical machines and supply systems.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Introduction** to Electrical power supply system Generation, Transmission, Distribution & Utilization. AC supply & DC supply	**02**	**02**
02	**AC Fundamentals**: Definitions; cycle, frequency, phase, period, maximum value, average value, r.m.s. value. Concept of current, voltage, power & energy in R, L, & C circuits.(Simple Numericals)	**03**	**10**
03	Three phase supply: Star & Delta circuit, Line & Phase relationship, power equation.(Simple Numericals.)	**03**	**08**
04	**Measuring Instruments**: Introduction to construction, operation and use of AC & DC ammeter, voltmeter, Electrodynamic Wattmeter, energy meter & digital multimeter, Clip on meter.	**04**	**06**
05	**DC Motor:** Construction and principle of operation. Speed torque characteristics. Types, specifications & ratings and applications. Types of insulation used.	**06**	**08**
06	**A. C .Machines** Transformer: Construction and principle of operation. EMF equation and transformation ratio. Load test, efficiency and regulation. Specifications & rating. Auto transformer & 3 phase transformer concept only. Applications of transformers.	**06**	**14**
	AC motor: Construction and principle of operation of 3 phase induction motor. Speed torque characteristics, slip, speed control of Induction Motor by variable frequency drive(VFD)-working principle and block diagram only, Reversal of rotation, starters-Direct ON Line Starters and Star-Delta Starters-Working principle, Construction , Circuit diagram and Applications. Study the following motors with respect to specifications and rating , Construction and applications. 1) Single phase motors a) Capacitor start, b) Capacitor start and run, c) Shaded pole 2) Universal motor 3) Stepper motor 4) Servo motor	**06**	**12**
	Alternator: Construction, principle of operation & applications. Self and separate excitation. Synchronous Motor- Construction, principle of operation, methods of starting & applications	**03**	**06**
07	**Utilisation of Electrical Energy** Industrial applications: Classification of drives, factors for selection of motor for different drives, Enclosures & Mountings	**02**	**08**
	Electric heating & welding: Working principle & types selection of system, specifications & rating	**02**	**06**
	Electrometallurgical & Electro Agro Systems: Concept & principle used in electroplating, Electrical machines used in	**02**	**06**

	electro-agro systems (irrigation pumps)		
08	**Electric wiring & Illumination**: Simple Electric Installations with 2 sockets,2 fans, 2 lamps, fuses. Introduction to different accessories like MCCB, ELCB, wires & cables. Different types of lamps their specifications,	**04**	**06**
09	**Electric safety**, **Tariff & Power conservation**; Necessity of Earthing, types safety tools, first aid measures, types of tariff, pf improvement only methods, energy conservation & audit, fire extinguishing methods adopted in electrical engineering.	**05**	**08**
	Total	**48**	**100**

PRACTICALS:

Skills to be developed:

Intellectual skills:

Identify and select suitable electrical instruments for measurement.

1. Identify and give specifications of electrical motors and transformers.
2. Interpret wiring diagrams for various applications.
3. Identify safety equipments required.
4. Decide the procedure for setting experiments.

Motor skills:

1. Draw wiring diagram
2. Make wiring connections to connect electrical equipments and instruments.
3. Measure electrical power, earthing resistance and other electrical quantities.
4. Calibrate electrical instruments.
5. Use of safety devices while working.
6. Prepare energy consumption bill with present tariff structure.

A) List of Practical:

1) For a given resistive & inductive series & parallel circuit, select ammeter, voltmeter & wattmeter. Make the connections and measure current, voltage and power drawn by the circuit. Measure it by clip on meter & compare it.

2) For a given DC Shunt/Series motor, select suitable meters, make connections as per diagram, check the connections and run the motor. Take the meter readings to draw speed torque characteristics. Make suitable changes in the connections to reverse the direction of rotation.

3) For the above given motor prepare a circuit to control its speed above & below normal, plot its graph.

4) List specifications of given single phase transformer. Perform no load test on the transformer to find transformation ratio.

5) Connect an electronic energy meter to a load, take reading & prepare energy consumption bill with present tariff structure

6) Prepare actual wiring on a board to study and operate one lamp controlled by one switch, staircase wiring, godown wiring using casing capping.

B) Field work:

7) Observe Electric wiring of main building in your campus list the accessories used and draw a general layout

8) Observe earthing of your laboratory, measure its resistance & list its significance

C) Mini project:

9) Prepare a simple electric wiring circuit comprising of 2lamps, 2 sockets, 1 fan with a fuse & check it.

10) Prepare trouble-shooting chart of above motors and identify the faults of a motor or a transformer

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	E. Hughes	Electrical Technology	ELBS
02	H. Cotton	Electrical Technology	Pitman
03	B. L. Theraja	Electrical Technology Vol I To Iv	S. Chand

Course Name: Mechanical Engineering and Fabrication Technology & Erection Engineering

Course Code : ME/MH/FE/MI

Semester : Third

Subject Title : Manufacturing Technology

Subject Code : 12046

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	04	--	--	50#	--	25@	75

Rationale:

Manufacturing Technology is a core technology subject for mechanical Engg. Course. Manufacturing is the basic area for any mechanical engineering technician. The technician should be introduced to the basic processes of manufacturing. This subject will help the student to be familiarized with working principles and operations like forging, rolling, extrusion, press working, lathe, drilling, milling, casting, welding, brazing and soldering etc which are the basic manufacturing processes.

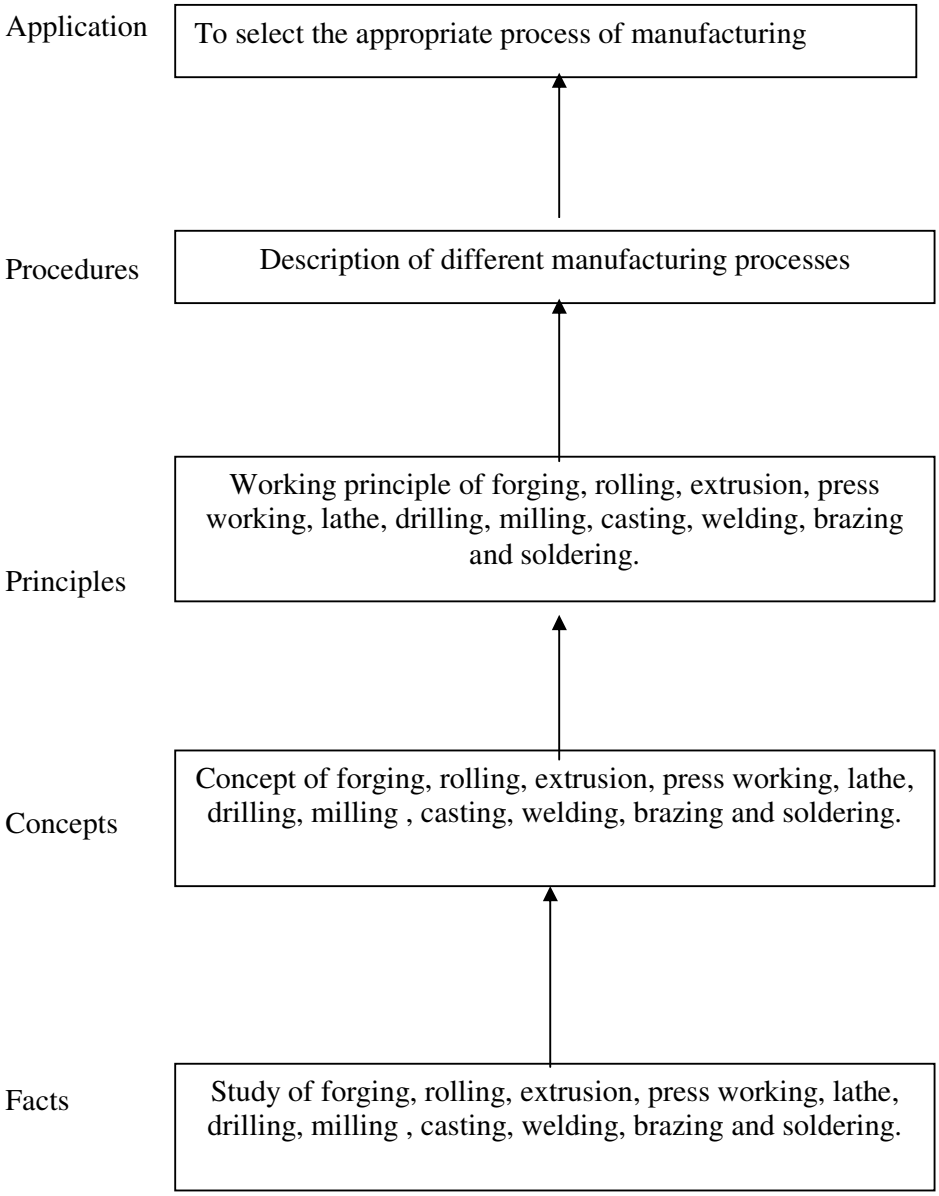
The basic knowledge of these processes will be helpful to select the most appropriate process for getting the desired results in terms of getting the raw material converted to finished product as per the requirements.

Objectives:

The student will able to

1. Know and identify basic manufacturing processes for manufacturing different components.
2. Operate & control different machines and equipments.
3. Iinspect the job for specified dimensions.
4. Produce jobs as per specified dimensions.
5. Select the specific manufacturing process for getting the desired type of output.
6. Adopt safety practices while working on various machines.

Learning structure:



Contents: Theory

Chapter	Name of the Topic	Hours
01	**Forging** 1.1 Forging Processes – Drop forging, Upset forging, Die forging or press forging. 1.2 Types of dies - Open Die, Closed Die(Single Impression and Multi-impression) Closed die Forging operations - Fullering, Edging, Bending, Blocking, Finishing 1.3 Forgeable material and forgeability, Forging temperature, Grain flow in forged parts, Types of Presses and hammers.	03
02	**Rolling and Extrusion** 2.1 Principles of rolling and extrusion. 2.2 Hot and cold rolling. 2.3 Types of rolling mills. 2.4 Different sections of rolled parts. 2.5 Methods of extrusion – Direct, Indirect, backward & impact Extrusion, Hot extrusion, Cold extrusion 2.6 Advantages, disadvantages and applications.	03
03	**Press working** 3.1 Types of presses and Specifications. 3.2 Press working operations - Cutting, bending, drawing, punching, blanking, notching, lancing 3.3 Die set components.- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot. 3.4 Punch and die Clearances for blanking and piercing, effect of clearance.	04
04	**Lathe Operations** 4.1 Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC lathe. 4.2 Specifications. 4.3 Basic parts and their functions. Operations and tools – Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning.	03
05	**Drilling** 5.1 Classification. 5.2 Basic parts and their functions - Radial drilling machine. 5.3 Types of operations. 5.4 Specifications of drilling machine. 5.5 Types of drills and reamers	02
06	**Milling** 6.1 Classification. 6.2 Basic parts and their functions – column and knee type. 6.3 Types of operations 6.4 Types of milling cutters.	02

07	**Casting** 7.1 Patterns - Material used, types, Patterns allowances, Cores, Core allowances. 7.2 Moulds - Mould materials, Types of sand, Mounding processes Sand molding, Pit molding, machine molding. Shell molding. 7.3 Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace. 7.4 Casting principle and operation 7.5 Special casting processes. viz die casting, centrifugal casting, Investment casting. 7.6 Casting defects	**08**
08	**Welding** 8.1 Classification. 8.2 Gas welding techniques. 8.3 Types of welding flames. 8.4 Arc Welding – Principle, Equipment, Applications 8.5 Shielded metal arc welding. 8.6 Submerged arc welding. 8.7 TIG / MIG welding. 8.8 Resistance welding - Spot welding, Seam welding, Projection welding 8.9 Welding defects. 8.10 Brazing and soldering: Types, Principles, Applications	**07**
	Total	**32**

Notes:

1] The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given bysubject teacher/ workshop superintendent)

2] Theory behind practical is to be covered by the concerned subject teacher/ workshop superintendent.

3] Workshop diary should be maintained by each student duly signed by respective shop instructors

Practical:

Skills to be Developed:

Intellectual Skills:

1. Identify basic manufacturing processes.
2. Understand need of pattern allowances.
3. Identify joining methods for fabrication.
4. Specify press tool dies for given cutting/forming operations.

5. Understand various sand casting processes.
6. Understand types of pattern, materials of construction and identify casting defects.

Motor Skills:

1. Operate lathes, drilling, milling machines
2. Use welding machines and equipment
3. Set the tools, jobs and decide cutting parameters of machines
4. Make simple pattern out of wood/themocole
5. Inspect diamensions of jobs using measuring instruments

LIST OF PRACTICALS

1) Assignment on forging die nomenclature.
2) One turning job on lathe containing the operations like plain turning, step turning, grooving, knurling, chamfering.
3) One composite welding job having two different joints. (Batch of four students per job.)
4) One simple job on TIG / MIG welding setup or visit to TIG / MIG welding setup and write report.
5) One composite job containing the operations like face milling, side and face milling (slotting), drilling / tapping (drilled hole should be perpendicular to slotting operation).
6) Making of one simple wooden Pattern (max. 4 students per group, each group should make different type of pattern).
7) Making of one Thermo-Cole Pattern (max. 4 students per group, each group should make different type of pattern).

Learning Resources:
Books:

Author	Title	Publisher
S. K. Hajra Chaudary, Bose, Roy	Elements of workshop Technology – Volume I & II	Media Promoters and Publishers limited
D. L. Wakyl	Processes and design for manufacturing	Prentice Hall
O. P. Khanna and Lal	Production Technology - Volume I & II	--
W.A.J. Chapman	Workshop Technology - Volume I , II & III	--
Jhon A Schey	Introduction to Manufacturing Processes	McGraw Hills International
M. Aduthan and A. B. Gupta	Manufacturing Technology	New Age International

Course Name : Mechanical Engineering and Technology

Course Code : AE/CE/CS/CV/CR/PG/PT/ME/MH/MI/FE/CH/PS/PT/TC/DC

Semester : Third

Subject Title : Development of Life Skills-II

Subject Code : 12041

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25#	25@	50

Rationale:

In today's competitive world, the nature of organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. He will be a part of a team in the organization. As such the individual skills are not sufficient to work at his best.

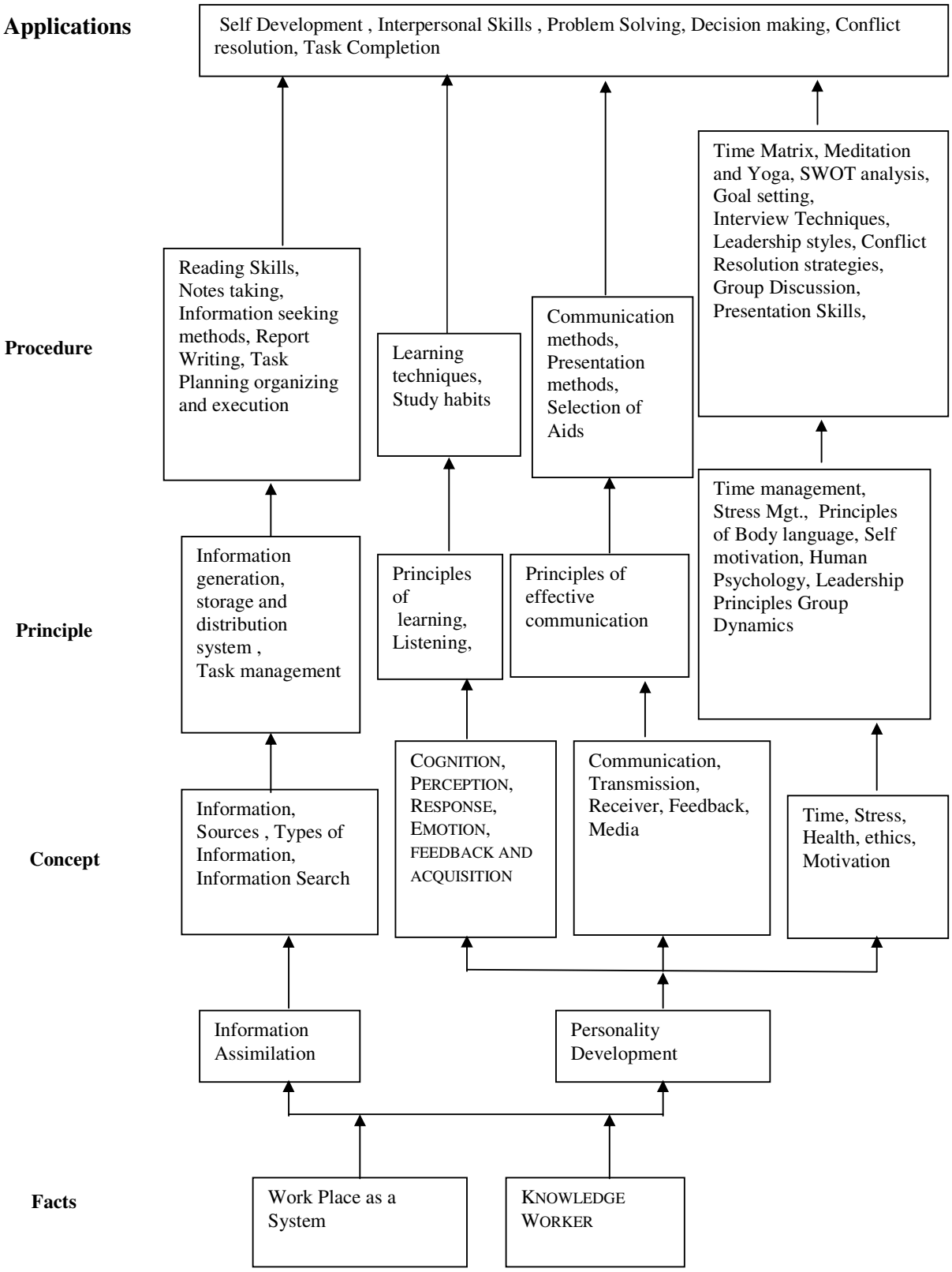
This subject will develop the student as an effective member of the team. It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.

THE SUBJECT IS CLASSIFIED UNDER HUMAN SCIENCE.

Objectives: The students will be able to:

1. Developing working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Face interview without fear
10. Follow moral and ethics
11. Convince people to avoid frustration

LEARNING STRUCTURE:


Applications
Self Development , Interpersonal Skills , Problem Solving, Decision making, Conflict resolution, Task Completion
Procedure
Reading Skills, Notes taking, Information seeking methods, Report Writing, Task Planning organizing and execution
Learning techniques, Study habits
Communication methods, Presentation methods, Selection of Aids
Time Matrix, Meditation and Yoga, SWOT analysis, Goal setting, Interview Techniques, Leadership styles, Conflict Resolution strategies, Group Discussion, Presentation Skills,
Principle
Information generation, storage and distribution system , Task management
Principles of learning, Listening,
Principles of effective communication
Time management, Stress Mgt., Principles of Body language, Self motivation, Human Psychology, Leadership Principles Group Dynamics
Concept
Information, Sources , Types of Information, Information Search
COGNITION, PERCEPTION, RESPONSE, EMOTION, FEEDBACK AND ACQUISITION
Communication, Transmission, Receiver, Feedback, Media
Time, Stress, Health, ethics, Motivation
Information Assimilation
Personality Development
Facts
Work Place as a System
KNOWLEDGE WORKER

CONTENTS: Theory

Chapter	Name of the Topic	HOURS
1	**SOCIAL SKILLS** Society, Social Structure, Develop Sympathy And Empathy.	01
2	Swot Analysis – Concept, How to make use of SWOT.	01
3	**Inter personal Relation** Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.	02
4	**Problem Solving** **I)STEPS IN PROBLEM SOLVING,** 1)Identify and clarify the problem, 2)Information gathering related to problem, 3)Evaluate the evidence, 4)Consider alternative solutions and their implications, 5)Choose and implement the best alternative, 6)Review **II)Problem solving technique**.(any one technique may be considered) 1) Trial and error, 2) Brain storming, 3) Lateral thinking	02
5	**Presentation Skills** Body language -- Dress like the audience Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board	03
6	**Group discussion and Interview technique** – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making **INTERVIEW TECHNIQUE** Necessity, Tips for handling common questions.	03
7	**Working in Teams** Understand and work within the dynamics of a groups. Tips to work effectively in teams, Establish good rapport, interest with others and work effectively with them to meet common objectives, Tips to provide and accept feedback in a constructive and considerate way , Leadership in teams, Handling frustrations in group.	02

8	**Task Management** Introduction, Task identification, Task planning ,organizing and execution, Closing the task	**02**
	TOTAL	**16**

CONTENTS: PRACTICAL -

List of Assignment: (Any Eight Assignment)

1) SWOT analysis:- Analyse yourself with respect to your strength and weaknesses, opportunities and threats.Following points will be useful for doing SWOT.
   a) Your past experiences,
   b) Achievements,
   c) Failures,
   d) Feedback from others etc.
2) Undergo a test on reading skill/memory skill administered by your teacher.
3) Solve the puzzles.
4) Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities like giving cloths to poor etc.(One activity per group)
5) Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.
6) Watch/listen an informative session on social activities. Make a report on topic of your interest using audio/visual aids. Make a report on the programme.####
7) Conduct an interview of a personality and write a report on it.
8) Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed
9) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Note: - Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic. The **term work** will consist of any eight assignments.

Mini Project on Task Management: Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management.

LEARNING RESOURCES:

BOOKS:

Sr. No	Title of the book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India
3	Body Language	Allen Pease	Sudha Publications Pvt. Ltd.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi
11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

INTERNET ASSISTANCE

1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy/swot/

Course Name : Mechanical Engineering Group

Course Code : ME/MH/MI/FE/PS/PT

Semester : Third

Subject Title : Professional Practices-III

Subject Code : 12047

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

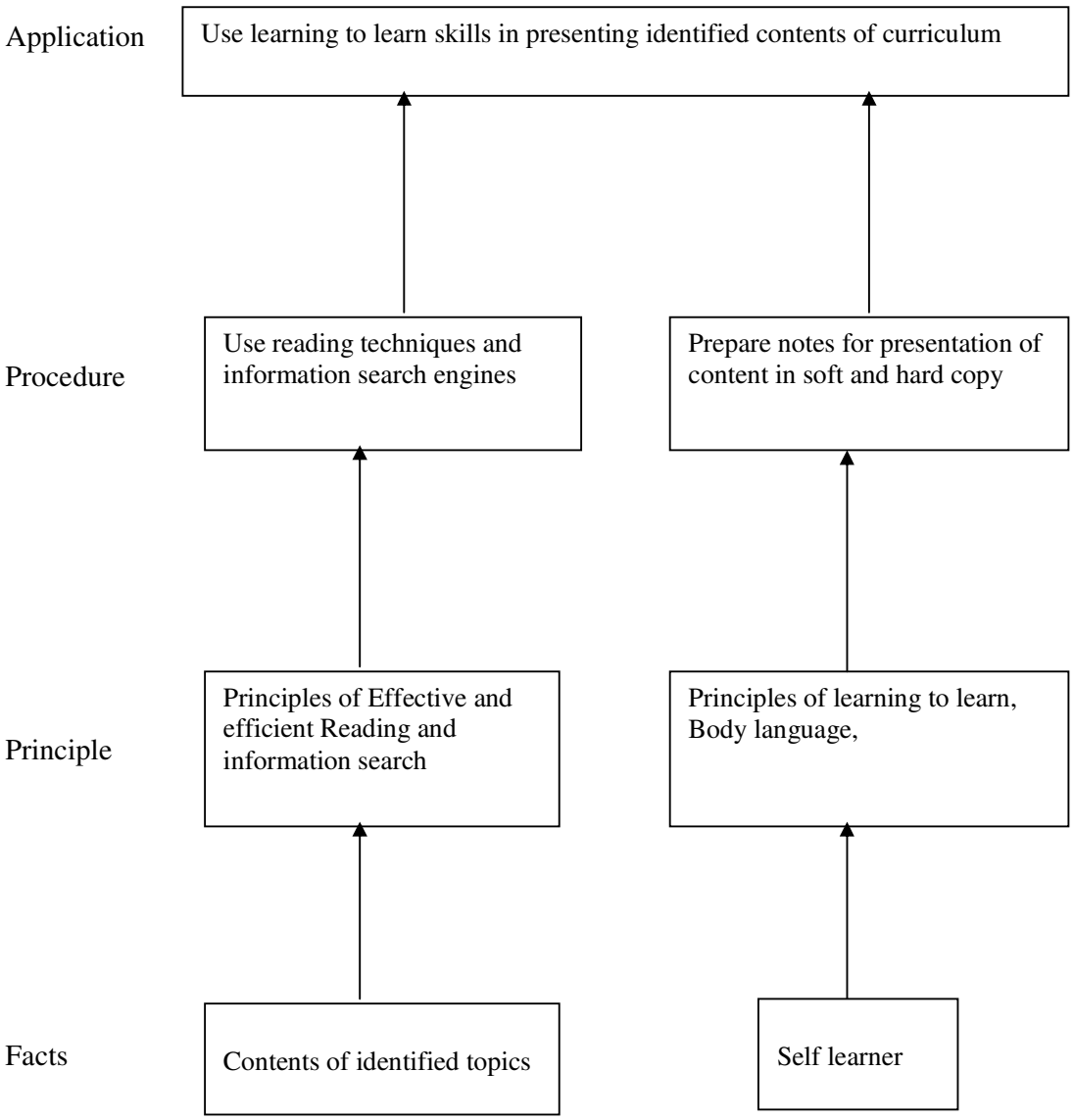
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Serial No.	Activities	Hours
1	**Industrial Visits** Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. **TWO** industrial visits may be arranged in the following areas / industries : i) Manufacturing organizations for observing various manufacturing processes including heat treatment ii) Material testing laboratories in industries or reputed organizations iii) Auto workshop / Garage iv) Plastic material processing unit v) ST workshop / City transport workshop	08
2	**Lectures by Professional / Industrial Expert be organized from** ANY THREE **of the following areas :** i) Use of a plastics in automobiles. ii) Nonferrous Metals and alloys for engineering applications iii) Surface Treatment Processes like electroplating, powder coating etc. iv) Selection of electric motors. v) Computer aided drafting. vi) Industrial hygiene. vii) Composite Materials. viii) Heat treatment processes. ix) Ceramics x) Safety Engineering and Waste elimination	08
3	**Individual Assignments** : **Any two** from the list suggested a) Process sequence of any two machine components. b) Write material specifications for any two composite jobs. c) Collection of samples of different plastic material or cutting tools with properties , specifications and applications. d) Preparing models using development of surfaces. e) Assignments on bending moment , sheer forces , deflection of beams and torsion chapters of strength of material. f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable. g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes. h) List the various properties and applications of following materials – a. Ceramics b. fiber reinforcement plastics c. thermo plastic plastics d. thermo setting plastics e. rubbers.	08

	OR Conduct **ANY ONE** of the following activities through active participation of students and write report i) Rally for energy conservation / tree plantation. ii) Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc. iii) Conduct aptitude , general knowledge test , IQ test iv) Arrange **any one** training in the following areas : a) Yoga. B) Use of fire fighting equipment and First aid Maintenance of Domestic appliances.	
4	Modular courses (Optional) : A course module should be designed in the following areas for max. 12 hrs. Batch size – min. 15 students. Course may be organized internally or with the help of external organizations. a) Forging Technology. b) CAD-CAM related software. c) Welding techniques. d) Personality development. e) Entrepreneurship development.	08
5	3-D Design using software Computer screen, coordinate system and planes, definition of HP,VP, reference planes How to create them in $2^{nd}/3^{rd}$ environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line, circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet, Curves, Constraints fit tangency, perpendicularity, dimensioning zine convention, material conventions and lettering. The Student should draw – different orthographic Views (including sections), Auxiliary views according to first/ Third angle method of projection. (Minimum two sheets, each containing two problems) after learning the contents as above.	16
	Total	**48**