Programme : Diploma in CE/EE/ET/ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18/19
Name of Course : English
Course Code : HU161

Teaching Scheme:

	Hours/Week	Total Hours
Theory	**02**	**32**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	**Two Class Tests each of 60 Minutes**	**03 Hrs.**	---	---	---
Marks	**20**	**80**	---	---	**25**

Course Rationale:

This is been noticed that diploma pass outs lack in grammatically correct written and oral communication in English. It is also been noticed that communication is not a problem of students, communication in correct English is the basic problem of Diploma pass outs. Students will have to interact in this language so far as their career in industry is concerned. In order to enhance this ability in students English is introduced as a subject to groom their personality.

Course Objectives:

After studying this course, the student will be able to

- Comprehend the given passage.
- Answer correctly the questions on seen and unseen passages.
- Increase the vocabulary.
- Apply rules of grammar for correct writing.
- Speak correct English

Course Contents:

Chapter No.	Name of Topic/Subtopic		Hrs	Weightage
1	**PART I : GRAMMAR**			
	1.1	Tenses : Past Perfect, Past Perfect Continuous	**12**	**20**
	1.2	Types of Sentences : Simple, Compound and Complex.		
	1.3	Verbs		
	1.4	Reported Speech : Complex Sentences		
	1.5	Uses of 'too' and 'enough' : Conversion and Synthesis		
	1.6	Modal Auxiliary : Will, shall, can, could		
	1.7	Articles		
	1.8	Preposition		
	1.9	Linking words		
	1.10	Affirmative and negative, interrogative		
	1.11	Question tag		
	1.12	Conjunctions		
	1.13	Interjections		
2	**PART II : PARAGRAPH WRITING**			
	2.1	Types of paragraphs (Narrative, Descriptive, Technical)	**04**	**10**
	2.2	Unseen passage for Comprehension		
3	**PART III : PHONETICS**			
	3.1	Consonants	**04**	**10**
	3.2	Vowels		
	3.3	Diphthongs		
4	**PART IV**			
	4.1	Comprehension – Responding to the questions from the text	**12**	**40**
	4.2	Vocabulary : Understanding meaning of new words from the text and use of such words in sentences.		
	(Yuvabharati – A Course Book in English) (Selected topics : Unit One – 1/3/4, Unit Two – 1/2/4 & Unit Three)			
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs.
1	Building of Vocabulary – 2 assignments 25 new words for each assignment with sentence	**04**
2	Conversational Skills – Role play student will perform the role on any 6 situations. Dialogue writing for the given situations.	**04**
3	Grammar – 2 assignments	**04**
4	Write paragraphs on given topics. 2 assignments.	**04**
5	Errors in English 2 assignments. Find out the errors and rewrite the sentences given by the teacher.	**04**
6	Essay writing 2 assignments. Write 2 assays on topic given by the teacher.	**04**
7	Phonetics. 2 assignments. Phonetic transcription of words.	**02**
8	Biography (Write a short biography on your role model approximately in 250-300 words)	**04**

9	Idioms and phrases Use of idioms and phrases in sentences(20 examples)	02
	Total	**32**

The term work will consist of 10 assignments.

Instructional Strategy :

Sr. No.	Topic	Instructional Strategy
1	PART I : GRAMMAR	Class room Teaching
2	PART II : PARAGRAPH WRITING	Class room Teaching
3	PART III : PHONETICS	Class room Teaching
4	PART IV : COMPREHENSION OF TEXT	Class room Teaching

Text Books :

Sr. No.	Author	Title	Publication
1	Yuvabharati	A course Book in English	---

Reference Books :

Sr. No.	Author	Title	Publication
1	J.D.O. Connors	Better English Pronunciation	London Cambridge University Press ELBS
2	Geofrey Leech	A communicative Grammar of English	Essex Longman Group Ltd. : ELBS
3	Randolf Quirk	University Grammar of English	Essex Longman Group Ltd. : ELBS
4	---	Spectrum – A Text Book on English (To be referred by students to improve comprehension ability)	MSBTE

Learning resources : Nil

Specification Table :

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	PART I : GRAMMAR	---	10	10	20
2	PART II : PARAGRAPH WRITING	---	05	05	10
3	PART III : PHONETICS	---	---	10	10
4	PART IV : COMPREHENSION OF TEXT	---	30	10	40
	Total	**---**	**45**	**35**	**80**

(Prof.M.A. Surdikar)	**(Prof. S.B. Kulkarni)**	**(Prof. C.C. Dandvatimath)**
Prepared By	**Secretary, PBOS**	**Chairman, PBOS**

Programme : Diploma in CE/EE/ET/ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/19
Name of Course : Communication Skills
Course Code : HU162

Teaching Scheme:

	Hours/Week	Total Hours
Theory	**02**	**32**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	**Two Class Tests each of 60 Minutes + One Oral Compulsory**	**03 Hrs.**	---	---	---
Marks	**20**	**80**	---	---	**25**

Course Rationale:

Classified under human sciences this subject is intended to introduce students with the process of communication so that they can identify conditions favorable to effective communication. They will also be taught basic and applied language skills viz. listening, speaking, reading and writing – all useful for the study of a technical course and communication. Specifically, writing and oral presentation skills are two top ranking capabilities needed for professional careers and must be developed systematically.

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Course Objectives:

After studying this course, the student will be able to

- Understand and use the basic concept of communication and principles of effective communication in an organized set up and social context.
- Give a positive feedback in various situations to use appropriate body language & to avoid barrier for effective communication.
- Write the various types of letters, reports and office drafting with the appropriate format.
- Communicate with the Industry Professionals.

Course content:

Chapter No.	Name of Topic/Subtopic	Hrs	Weightage
1	**Basic Concepts And Principles Of Communication**		

	1.1	**The Communication Event** The Communication event : Definition The elements of communication : The sender, receiver, message, channel, feedback and context.	12	24
	1.2	**The communication Process** The Communication Process : Definition Stages in the process : defining the context, knowing the audience, designing the message, encoding, selecting the proper channels, transmitting, receiving, decoding and giving feedback.		
	1.3	**Principles of Effective communication** Effective Communication : definition Communication Barriers and how to overcome them at each stage of communication process. Developing effective message : Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers and facilitating feedback.		
2	**Organizational Communication**			
	2.1	What is an organization? Goal, structure, hierarchy. Pattern of communication : Upward, Downward, Horizontal and Grapevine	04	12
3	**Non-verbal Communication**			
	3.1	Non Verbal Codes : Kinesics (eye-contact, gesture, postures, body movements and facial expressions) Proxemics (using space), Haptics (touch), Vocalics (aspect of speech like tone, emphasis, volume, pauses etc.) Physical Appearance, Chronemics (manipulating time), Silence.	06	12
4	**Business Correspondence and Office Drafting**			
	4.1	Business Correspondence : Letter of Enquiry, Order letter, Complaint Letter and Adjustment letter.	10	32
	4.2	Report Writing : Feasibility report/ Survey Report, Accident Report and Progress Report		
	4.3	Office Drafting : Circular, Notice and Memo		
	4.4	Job Application with resume.		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs.
1	Self Introduction	02
2	Elocution	04
3	Extempore	04
4	Mock Interview	04
5	Debate	02
6	Variety Application/Reports	02

7	Writing Paragraphs on Technical Subjects	02
8	Business letter	02
9	Individual/Group Presentation on identified topics	02
10	Group discussion	02
11	Role play	06
	Total	**32**

Text Books :

Sr. No.	Author	Title	Publication
1	MSBTE	Communication skills	MSBTE

Reference Books :

Sr. No.	Author	Title	Publication
1	Joyeeta Bhatacharya	Communication skills	Macmillan Co.
2	Sarah Freeman	Written communication in English	Orient Longman Ltd.
3	Krishna Mohan and Meera Banerji	Developing Communication skills	Macmillan India Ltd.

Learning resources : Nil

Specification Table :

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Basic Concepts and Principles of communication	08	08	08	24
2	Organizational communication	04	04	04	12
3	Non Verbal communication	---	---	12	12
4	Business Correspondence and Office Drafting	---	---	32	32
	Total	**12**	**12**	**56**	**80**

(Prof. M.A. Surdikar) **(Prof. S.B. Kulkarni)** **(Prof. C.C. Dandvatimath)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Programme : Diploma in Mechanical
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Applied Mathematics – I
Course Code : SC 161

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical/Tutorial	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three Class Tests each of 60 Minutes	**03 Hrs.**	--	--	--
Marks	**20**	**80**	--	--	--

Course Rationale:

The students of Diploma in Engineering and technology must acquire some essential competencies in Mathematics.

Course Objectives:

- The students will be able to think logically and systematically. They will learn the importance of accuracy and develop attitude of problem solving with diligence and perseverance**.**

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Algebra**			
	1.1	**Determinants**: Determinants of second and third orders, solution of simultaneous equations in two and three unknowns (Cramer's method), Properties of determinants of order 3 and examples.	**04**	**06**
	1.2	**Partial fractions**: Rational fractions, resolving given rational fraction into partial fraction (Type : Denominator containing non-repeated, repeated linear factors and quadratic factor non repeated)	**04**	**06**
	1.3	**Matrix Algebra** - Definition of a matrix, types of matrices, Equal Matrices, Addition, subtraction, multiplication of matrices. Scalar multiple of a matrix. Transpose of a matrix, Singular and Non singular Matrix. Adjoint of a square matrix. Inverse of a matrix. Solution of simultaneous linear equations in 3 unknowns	**04**	**06**
	1.4	**Binomial Theorem** Definition of factorial notation, definition of permutation and combinations with formula, Binomial theorem for positive index, General term, Binomial theorem for negative index, Approximate value (only formula)	**04**	**06**
2.	**Trigonometry**			
	2.1	Trigonometric ratios and fundamental identities.	**04**	**08**
	2.2	Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), sub multiple angle.	**06**	**08**
	2.3	Sum and product formulae.	**06**	**08**
	2.4	Inverse Circular functions. (Definition and simple problems)	**04**	**08**
3.	**Coordinate Geometry**			
	3.1	**Point and Distances** Distance formula, Section formula, midpoint, centroid of triangle. Area of triangle and condition of co linearity	**03**	**08**

	3.2	**Straight Line** Slope and intercept of straight line. Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line. Angle between two straight lines condition of parallel and perpendicular lines. Intersection of two lines. Length of perpendicular from a point on the line and perpendicular distance between parallel lines	**05**	**08**
	3.3	**Circle** Equation of circle in standard form, centre – radius form, diameter form, two – intercept form. General equation of circle, its centre and radius.	**04**	**08**
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
	Problems on following topics	
1.	Determinants	**02**
2.	Partial fractions	**01**
3.	Matrix Algebra	**02**
4.	Binomial Theorem	**02**
5.	Trigonometric ratios and fundamental identities	**01**
6.	Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), sub multiple angle.	**02**
7.	Sum and product formulae.	**01**
8.	Inverse Circular functions. (Definition and simple problems)	**01**
9.	Point and Distances	**01**
10	Straight Line	**02**
11.	Circle	**01**
	Total	**16**

Text Books:

Sr. No	Author	Title	Publication
1.	Shri.G.V.Kumbhojkar	Engineering Mathematics	Phadke Publication,Kolhapur
2.	Shri.Patel & Rawat	Engineering Mathematics	Nirali Prakashan

Reference Books:

Sr. No	Author	Title	Publication
1.	Shri S.P. Deshpande	Mathematics for Polytechnic Students	Pune Vidyarthi Griha
2.	Shri S.L. Loney	Plane Trigonometry	Macmillan and London
3.	Shri H.K. Dass	Mathematics for Engineers (Vol-I)	S.Chand and Comp.
4.	Shri Shantinarayan	Engg. Maths Vol-I and Vol-II	S. Chand and Comp.

Learning Resources: Chalk, Board etc

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Algebra	06	10	08	24
2.	Trigonometry	08	16	08	32
3.	Co-ordinate Geometry	06	10	08	24
	Total	**14**	**36**	**24**	**80**

(Prof. R.A.Pawar)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

Programme : Diploma in Mechanical
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Applied Mathematics – II
Course Code : SC162

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three Class Tests each of 60 Minutes	**03 Hrs.**	--	--	--
Marks	**20**	**80**	--	--	--

Course Rationale:

This subject intends to teach students basic facts, concepts, principles and procedure of Mathematics as a tool to analyze Engineering problems and as such it lays down foundation for the understanding of engineering science and core technology subjects.

Course Objectives:

After studying this course, the student will be able to

- Under stand basic facts of Mathematics about the field of analysis of any Engineering problem.
- Know the standard ways in which the problem can be approached.
- Apply basic concepts to engineering problems.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Functions and Limits**			
	1.1	Functions: Concept of functions, Types of functions; (only definitions)	**02**	**04**
	1.2	Limits: Concept of limits and limits of functions. (algebric, trigonometric, Logarithmic and exponential.)	**08**	**12**
2.	**Derivatives**			
	2.1	Definition of the derivative, derivatives of standard Functions.	**03**	**04**
	2.2	Differentiation of sum, difference, product and quotient of two or more functions	**03**	**04**
	2.3	Differentiation of composite, inverse, implicit functions.	**04**	**06**
	2.4	Differentiation of parametric exponential and logarithmic Functions.	**04**	**06**
	2.5	Successive differentiation.	**02**	**04**
3.	**Applications of Derivatives**			
	3.1	Geometrical meaning of derivative (Equations of tangents and Normals)	**04**	**08**
	3.2	Maxima and minima of functions.	**02**	**04**
4.	**Integration**			
	4.1	Definitions, standard formulae, integration of algebraic sum of two or more functions, integration by substitutions and by trigonometric , transformations, integration of $\sqrt{ax2+ bx+c}$, $1/\sqrt{ax2+ bx+c}$, integration by parts, integration by partial fractions.	**12**	**20**
5.	**Definite Integrals**			
	5.1	Definition and properties of definite integrals Example based on these properties	**06**	**12**
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment	Hrs
	Problems on following topics	
1.	Functions	01
2.	Limits	02
3.	Derivatives	04
4.	Applications of Derivatives	01

5.	Integration	06
6.	Definite Integrals	02
	Total	**16**

Text Books:

Sr. No	Author	Title	Publication
1.	S.P. Deshpande	Mathematic for polytechnic students I and II	Pune Vidyarthi Griha Prakashan
2.	G.V.Kumbhojkar	Applied Mathematics	Phadke Prakashan,Kolhapur
3.	Patel & Rawal	Applied Mathematics	Nirali Prakashan

Reference Books:

Sr. No	Author	Title	Publication
1.	Vishwanath	Engineering Mathematics Vol.I	Satya Prakashan, New Delhi
3.	H.K. Dass	Mathematics for Engineering Vol-I	S.Chand and Company
4.	Shantinarayan	Engineering Mathematics vol-I and II	S.Chand and Company

Learning Resources: Chalk, Board etc

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Function and Limits	04	06	06	16
2.	Derivatives	08	16	00	24
3.	Applications of derivatives	00	00	08	08
4.	Integration	06	10	04	20
5.	Definite Integrals	04	04	04	12
	Total	**22**	**36**	**22**	**80**

(Prof. R.A.Pawar)
Prepared By

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Chairman, PBOS

GOVERNMENT POLYTECHNIC, PUNE

(An Autonomous Institute of Govt. of Maharashtra)

Programme : Diploma in CE/EE/MT/ME
Programme Code : 01/ 02 /04/05/15/16/18/24
Name of Course : Engineering Physics
Course Code : SC164

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Three class tests, each of 60 Min. duration	**03 Hrs.**	**03 Hrs.**	-----	-----
Marks	**20**	**80**	**50**	-----	-----

Course Rationale:

The development of various engineering topics is primarily based on the fundamental principles. The different principles of physics have a wide range of applications in all the braches of engineering. A reasonably good level of knowledge of physics, therefore, forms sound base for engineering students. Physics can be considered as a basic tool in the hands of an engineer through which he can purse his studies and research work in technical field. The foundation level of the subject acquired by the student is kept in mind for selection of the topics. To create interest in the students more stress is given on the applications, in engineering field.

Course Objectives:

After studying this course, the student will be able to

- To appreciate the role of fundamentals of Physics in different branches of Engineering.
- To think in scientific manner and apply the knowledge gained in different situations.

Course contents:

Chapter No.	Name of Topic/Subtopic		Hrs	Weightage
1	**General Physics**			
	1.1	**Units and Measurement :** Need of measurement, unit of physics quantity, requirement of standard unit, system of unit, classification of physical quantities into fundamental and derived. Examples of conversion of unit.	14	20
	1.2	**Errors :** Instrumental, systematic and random error. Definition, explanation, examples and estimation of errors.		
	1.3	**Motion :** a) Introduction to rectilinear motion, $v=u+at$, $S=u+\frac{1}{2}at^2$, $v^2=u^2+2as$ b) Circular motion : Types of motion, uniform circular motion, angular displacement, radial velocity, definition and explanation of centripetal and centrifugal force, application of circular motion banking of road – definition and expression. Problems on banking and velocity limit on curved road. c) Simple harmonic motion : Definition of SHM as a projection of UCM on the diameter, equation of SHM, Graphical representation. Displacement, velocity acceleration of particle in SHM from mean and extreme position, problems.		
2	**Properties of Matter**			
	2.1	**Surface Tension :** Molecular theory of surface tension, Cohesive and adhesive forces, Angle of contact, Shape of liquid surface in capillary tube, Capillary action (Examples). Relation between surface tension and capillary and radius of capillary tube (no derivation), simple problem, Effect of impurity and temperature on surface tension.	06	10
	2.2	**Viscosity :** Explanation, definition, velocity gradient, Newton's & Stroke's law, law of viscosity, terminal velocity(No derivation), type of flow of liquid – stream line flow, turbulent flow, Reynolds's number(significance), applications and simple problems.		
	2.3	**Elasticity :** Elastic and plastic bodies, stress and strain, Hook's law, types of elasticity modulus, problems. Behavior of wire under continuosly increasing load.		

3	**Sound**			
	3.1	Wave motion, Transverse and longitudinal waves, free and forced vibrations, Resonance -explanation and example. Revision on reflection of sound, explanation of echo and reverberation of sound, absorption, reflection and transmission of sound, reverberation time (Sabine's formula), Acoustics factors affecting acoustical planning of building, requirements of good acoustics, unit of audibility, decibel, simple problems.	04	05
4	**Heat**			
	4.1	Explanation of gas laws, Boyle's law, Charles's law, Gay Lussac's law, General gas edition, Problems on gas laws, Absolute scale of temperature. Modes of **heat transfer**, Conduction, convection and radiation, Expansion of substance- linear, aerial and cubical expansion- Definition and problems, Black body radiation - concept, a + r + t=1.	04	05
5	**Light**			
	5.1	Introduction to reflection and refraction of light, Snell's law, physical significance of refractive index. Total internal refraction of light, critical angle, simple problems.	08	10
	5.2	Fiber optics : Propagation of light through optical fiber, numerical aperture, types of optical fibers, methods of production, applications and comparison with electrical cable.		
	5.3	**Laser :** Definition, spontaneous and stimulated emission, population inversion, He-Ne laser, construction and working, applications of LASER.		
	5.4	**Electromagnetic spectrum :** spectrum, origin of spectrum, electromagnetic spectral range, type of spectra, line, band and continuous spectra and their significance, applications of spectra.		

6	**Electrostatics**			
	6.1	**Electric charge :** Coulomb's law of charge, unit charge, electric field, intensity of electric field, electric lines of forces (properties) electric flux, flux density.	07	10
	6.2	**Electric potential :** explanation, definition**,** potential due to a point charge, potential due to a point charge, potential due to a charged sphere, absolute electric potential, expression for potential difference between two points, simple problems.		
	6.3	Electric condenser : Concept, capacity of condenser, unit, principle of condenser, series law and parallel law of condenser, simple problems. Application of condensers.		
7	**Current Electricity :**			
	7.1	Concept of resistance, Specific resistance, whetstone's network, meter bridge balancing condition of meter bridge, measurement of unknown resistance using meter bridge. Problems.	08	10
	7.2	Potential , Potential drop along the length of wire, principle of potentiometer, potential gradient, E.M.F. unit, comparison of E.M.F. using potentiometer.		
	7.3	Electric work, electric power, energy, units and calculation of electric bill.		
8	**Thermo-Electricity**			
	8.1	Thermo couple, material for thermocouples, seeback effect, Peltier effect, variation of thermo e.m.f. with temperature, thermo electric series, law of intermediate temp. Uses of thermocouple.	01	02
9	**Electromagnetism**			
	9.1	Magnetic effect of electric current, Ampere's rule, intensity of magnetic field, magnetic induction, relation between B & H, Biot and savert law (Laplace's law), Fleming's left hand rule.	04	05
	9.2	Force experienced by current carrying straight conductor placed in magnetic field, principle of galvanometer, problems.		

10	**Magnetism**			
	10.1	Domain theory of magnetism, intensity of magnetic field. Magnetic lines of forces (properties). Types of magnetic materials, para, dia and ferromagnetic substances – their properties and applications, Curie Temperature.	02	04
11	**Modern Physics**			
	11.1	X-rays : Production, properties and industrial applications.	06	07
	11.2	Ultrasonic and infrasonic waves, properties and industrial applications.		
	11.3	Non destructive testing methods – M.P.T., L.P.T. (advantages and disadvantages), X-rays, radiographic and ultrasonic		
	11.4	Introduction to Nanotechnology, methods and applications.		
	11.5	Introduction to superconductivity – properties and uses.		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of experiment/Assignment	Hrs.
1	Use of vernier caliper to measure the dimensions of different objects.	02
2	To understand the concept of error in instrument and to measure the dimensions of different objects using micrometer screw gauge.	02
3	To understand the concept of resonance and to determine the velocity of sound using resonance tube method.	02
4	Measurement of unknown temperature using thermocouple.	02
5	Measurement of unknown temperature using platinum resistance thermometer.	02
6	To determine the refractive index using spectrometer.	02
7	To determine the specific resistance using Ohm's law.	02
8	To understand the concept of whetstone's network and to determine the specific resistance using the meter bridge.	02
9	To study the principle of potentiometer.	02
10	To verify ampere's rule using Orested experiment and find the variation of intensity of magnetic field with current and distance.	02
11	To observe the rise in liquid level in capillary(Jurine's law)	02
12	To verify Boyle's law	04
13	To understand the concept of viscosity and hence to determine the coefficient of viscosity using stroke's method.	02
14	Study of spectra	04
	Total	**32**

Instructional Strategy :

Sr. No.	Topic	Instructional strategy
1	General physics	Class room teaching, Demonstration, Models
2	Properties of matter	Class room teaching, Demonstration, Models, Expert Lectures, Visits
3	Sound	Class room teaching, Demonstration, Models
4	Heat	Class room teaching, Demonstration, Models, Expert Lectures, Visits
5	Light	Class room teaching, Demonstration, Models
6	Electrostatic	Class room teaching, Demonstration, Models, Expert Lectures, Visits
7	Current electricity	Class room teaching, Demonstration, Models, Expert Lectures, Visits
8	Thermo electricity	Class room teaching, Demonstration, Models, Expert Lectures, Visits
9	Electromagnetism	Class room teaching, Demonstration, Models, Expert Lectures, Visits
10	Magnetism	Class room teaching, Demonstration, Models, Expert Lectures, Visits
11	Modern physics	Class room teaching, Demonstration, Models

Text Books :

Sr. No.	Author	Title	Publication
1	R.K. Gaur and S.L. Gupta	Engineering Physics	Dhanpal Rai and Sons Publication
2	Manikpure, Prakash Deshpande and Dagwar	Basic Applied Physics	S. Chand and Co. New Delhi.

Reference Books :

Sr. No.	Author	Title	Publication
1	Modern Physics	Text Book in Physics for diploma Engg. students	Sony Publications Pvt. Ltd.
2	Applied Physics	Schum's Series	---
3	Kshirsagar, Avdhanalu	Engineering Physics	---

Learning resources : **1) Chart** **2) Black Board** **3) Television**

4) Internet **5) Educational CD's** **6) Models**

7) Experimentation **8) Diagram demonstration**

Specification Table :

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	General physics	5(9)	4 (6)	2(3)	11(18)
2	Properties of matter	5(7)	3(5)	2(3)	10(15)
3	Sound	2(3)	2(3)	1(1)	5(7)
4	Heat	2(3)	2(3)	1(1)	5(7)
5	Light	4(7)	3(5)	2(3)	9(15)
6	Electrostatic	5(7)	3(5)	2(3)	10(15)
7	Current electricity	5(7)	2(5)	2(3)	9(15)
8	Thermo electricity	2(3)	2(3)	1(1)	5(4)
9	Electromagnetism	2(3)	2(3)	1(1)	5(7)
10	Magnetism	2(3)	1(2)	1(1)	4(6)
11	Modern physics	3(5)	2(3)	2(3)	7(11)
	Total	**37**	**26**	**17**	**80**

Note : Figures in the bracket indicate the marks for which question will be set to account for internal options.

(Prof. Dr. A.U. Warad) (Prof. S.B. Kulkarni) (Prof.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04/18
Name of Course : Chemistry
Course Code : SC169

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	03 hrs	03 hrs	---	---
Marks	**20**	**80**	**25**	---	**25**

Course Rationale:

Material Science is the science that investigates the composition and structure of matter, the changes that matter undergoes, the amount and kind of energy necessary for these changes, and the law that govern the changes.

Applications of Material Science and Chemical Principles have resulted into the Development of new materials used in modern medicines and automobiles, synthetic fibers polymers, alloys, new energy sources and many other important products and processes.

Hence, Material Science is an important and expanding branch in scientific engineering and economic field of our society.

Thus the principles of Material Science have a wide application in all the branches of engineering and technologies.

In this syllabus, the coverage of various topics will orient the students to appreciate the principles Material Science in the fields of engineering and Technology.

The topic microstructure includes the basic structure of matter, which governs the Mechanical, Electrical and Magnetic properties of the matter. Steels, alloys, plastic resins and Elastomers are included in the syllabus considering their present extensive use in automobiles, chemicals and heavy engineering industries

Course Objectives:

After studying this course, the student will be able to

- Develop interest in the fundamental structure of matter, which governs the properties of matter.
- Apply principles of chemistry, to Engineering situations.
- Understand applications of basic concepts in chemistry.
- Appreciate effect of chemical changes.
- Understand various Chemical Technology processes

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Atomic Structure and Chemical Bonding**			
	1.1	Fundamental particles, electronic configuration, atomic orbital, main and sub energy levels, quantum numbers and their significance Definition of valency, types of bonds, formation of electrovalent and covalent compound, definition of metallic bond and examples, nuclear stability, mass defect, nuclear fusion and fission.	**06**	**06**
2.	**Plastic (Polymer)**			
	2.1	Definition, types of polymerization (addition and condensation), classification of plastic (thermoplastic and thermosetting), compounding of plastic, preparation, properties and uses of polyethylene, PVC, polystyrene, Teflon, nylon 66, bakelite, polyester, epoxy resin, silicone resin	**08**	**10**

	2.2	RUBBER (ELASTOMER) Definition, drawbacks of raw rubber, vulcanization of rubber, preparation, properties and uses of synthetic rubber, neoprene rubber, butyl rubber, silicone rubber, polyurethane rubber, compounding and application of rubber		
3.	**Metallurgy and Alloys**			
	3.1	Occurrence of metals, definitions of mineral, ore, flux, matrix, slag and metallurgy, mechanical properties of metal, flow chart showing different processes in metallurgy, classification, properties and application of carbon steel, heat treatment(definition, purposes and methods), definition of alloy, purposes of making alloys with examples, classification of alloys(ferrous and non-ferrous), effects of alloying elements on the properties of steel(Ni, Co, Si, Mn, V, W), composition, properties and application of duralumin woods metal, brass and monel metal.	**10**	**12**
4.	**Ceramics, Glass, Adhesives**			
	4.1	Introduction to ceramics, clay, white ware, earth ware, stone ware.	**08**	**12**
	4.2	Introduction to glass, properties, uses, types of glass.		
	4.3	Introduction to adhesives, definition, characteristics, classification of adhesives, properties and uses of synthetic, natural resins and starch adhesive.		
5.	**Water**			
	5.1	Causes and types of hardness, analysis of degree of hardness in calcium carbonate equivalent, bad effect of hard water in industries(paper, textile, dye, sugar), removal of hardness by lime soda method, zeolite, ion exchange method, reverse osmosis, PH scale, application of PH in engineering. Numerical based on PH and hardness.	**08**	**14**

6.	**Corrosion**			
	6.1	Definition, types of corrosion(atmospheric and electro chemical), causes of corrosion, Pilling Bedworth Rule, mechanism of wet corrosion, (evolution of hydrogen, absorption of oxygen), Galvanic Series and importance in corrosion, differential aeration, stress corrosion, factors affecting rate of electrochemical corrosion.	**12**	**14**
	6.2	Protection Methods- Galvanization and tinning processes, sherardizing, metal spraying, electroplating, metal cladding.		
7.	**Lubricant and Fuels**			
	7.1	Definition and functions of lubricant, mechanism of lubrication(fluid film, boundary, extreme pressure lubrication), classification of lubricant, properties of lubricating oils(physical and chemical), selection of lubricant for light machines, I.C.E., gears, cutting tools, high pressure and low speed machines, transformers, spindles in textile industry, for refrigeration system.	**12**	**12**
	7.2	Definition, classification of fuels, characteristics of good fuel, comparison between solid, liquid and gaseous fuel, types of coal, analysis of coal by proximate and ultimate analysis, refining of crude petroleum, fractions obtained by distillation of crude, gasoline, kerosene, diesel as a fuel, properties and uses of LPG, CNG, bio gas.		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of practical/Experiment/Assignment	Hrs
1.	Preparation of phenol formaldehyde resin.	02
2.	To determine acid content in plastic.	02
3.	To draw flow sheet of extraction of metal from its ore.	02
4.	To estimate percentage of pure iron in iron alloy or impure iron by redox titration method	02
5.	Determination of free residual chlorine in given sample of water.	02
6.	Determination of hardness of water by EDTA method.	02
7.	Determination of PH by lovibond comparator and PH meter	02
8.	Write the mechanism of electrochemical corrosion due to evolution of Hydrogen and absorption of oxygen	02
9.	Determination of moisture content from the coal by proximate analysis.	02
10.	Determination of ash content from coal by proximate analysis.	04
11.	Determination of viscosity by using Ostwald viscometer.	04
12.	Write the chart showing uses of lubricant for machines working under different condition.	02
13.	To find acid value of lubricant	02
14.	Formation of compound	02
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Atomic structure and Chemical Bonding	Class room Teaching, Demonstration, Models, Charts
2.	Plastic and Rubber	Class room Teaching, Demonstration
3.	Metallurgy and Alloys	Class room Teaching, Demonstration, Models, Charts
4.	Ceramics, Glass, Adhesives	Class room Teaching, Demonstration
5.	Water	Class room Teaching
6.	Corrosion	Class room Teaching, Demonstration, Models
7.	Lubricant and Fuel	Class room Teaching

Text Books:

Sr.	Author	Title	Publication

No			
1.	S.N.Narkhede	Chemistry of Engineering Materials	Nirali Publication
2.	V. P. Mehta	Polytechnic Chemistry	Jain Brothers, New Delhi.
3.	P.C. Jain and Monica Jain	Applied Chemistry	Dhanpat Rai and sons, New Del hi

Reference Books:

Sr. No	Author	Title	Publication
1.	M.M. Uppal	Engineering Chemistry	Khanna Publisher, Delhi.
2.	J.C. Kurlacose J. Jairam	Chemistry in Engineering and Technology volume I and II.	Tata McGraw hill.
3.	Linus Pauling	The nature of Chemical Bond and the structure of Molecules and crystals	Oxford and IBH Publishing Co.
4.	C.M. Shrivastav C. Shrinivasam	Science of Engineering Materials.	Wiley Eastern Ltd.
5.	Lawrence H Van Vlack	Elements of Material science and Engineering (6^{th} Edition)	Wesley Publishing Co.
6.	Z bigniew D Jastrebski	The nature and properties of engineering material third edition.	John Eiley and Sons.
7.	T.T.T.I. Chandigarah	Civil Engineering Materials	Tata McGraw hill
8.	P.N. Balguni and p.Shah	Fiber Reinforced Cement composites	Tata McGraw hill

Learning Resources: Models, Charts

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Atomic structure and Chemical Bonding	02	02	02	06
2.	Plastic and Rubber	02	04	04	10
3.	Metallurgy and Alloys	06	02	04	12
4.	Ceramics, Glass, Adhesives	04	04	04	12
5.	Water	06	03	05	14
6.	Corrosion	04	04	06	14
7.	Lubricant and Fuel	04	04	04	12
Total		**28**	**23**	**29**	**80**

(Prof. Smt.K.V.Mankar)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE/ EE/ ME/ MT
Programme Code : 01 / 02/ 04/ 05/15/16/18
Name of Course : Engineering Mechanics
Course Code : AM261

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

To find solutions to various practical problems, it is essential for the student to study and get acquainted with the various aspects in Statics and Dynamics. The fundamental concepts to be studied in this course are required for study of Strength of Materials, Mechanics of Structures and other courses of Mechanical & Civil Engineering to be studied at higher level.

Course Objectives:

After studying this course, the student will be able to

- Understand various concepts & principles in Engineering Mechanics.
- Apply those principles for evaluating various problems coming across various fields of engineering

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction**			
	1.1	Fundamental Concept such as Fundamental units, Derived unit, system of Unit, Scalars, Vectors.	**02**	**02**
	1.2	Mechanics, Statics, Dynamics, Kinematics, Kinetics.		
	1.3	Gravity, Mass, Weight, Inertia, Newton's Law of Gravitation and Newton's Law of motion.		
2.	**Resolution and composition of Forces**			
	2.1	Concept of force, unit force, graphical representation, Principle of transmissibility.	**08**	**12**
	2.2	System of forces, coplanar, non coplanar, concurrent, non-concurrent, parallel.		
	2.3	Resolution of a force, resolved parts, orthogonal and non-orthogonal components of a force.		
	2.4	Concept of composition & resultant of forces.		
	2.5	Law of Parallelogram of Forces, Triangle law of Forces, Polygon law of forces.		
	2.6	Moment of a force, Varignon's Theorem, couple & characteristics of couple.		
	2.7	Composition of Coplanar forces- Concurrent, parallel (like & unlike) non concurrent forces by analytical methods		
3.	**Equilibrium**			
	3.1	Concept of equilibrium, equilibrant, Relation between resultant & equilibrant. Analytical conditions.	**08**	**12**
	3.2	Equilibrium of coplanar concurrent forces, Lami's theorem and its application.		
	3.3	Equilibrium of coplanar parallel and non-concurrent forces.		
	3.4	Beam reactions - simply supported beams subjected to concentrated and distributed loads, beam supported on roller and hinge supports, overhanging beams.		

4.	**Graphic statics**			
	4.1	Concept of equilibrium, equilibrant, Relation between resultant & equilibrant. Analytical conditions.	**06**	**08**
	4.2	Equilibrium of coplanar concurrent forces, Lami's theorem and its application.		
	4.3	Equilibrium of coplanar parallel and non-concurrent forces.		
	4.4	Beam reactions - simply supported beams subjected to concentrated and distributed loads, beam supported on roller and hinge supports, overhanging beams.		
5.	**Centroid and Centre of gravity**			
	5.1	Concept of Centre of Gravity & Centroid.	**06**	**08**
	5.2	Centroid of regular plane areas & compound areas consisting of regular plane areas. Centroid of hollow solids such as hollow cylinder, hollow cone, hollow sphere.		
	5.3	Centre of gravity of simple solids-cylinder, prism, cone, sphere etc. and C.G. of compound solid objects made up of simple solids.		
	5.4	Beam reactions - simply supported beams subjected to concentrated and distributed loads, beam supported on roller and hinge supports, overhanging beams.		
6.	**Friction**			
	6.1	Introduction to friction.	**08**	**10**
	6.2	Types of friction, Laws of static friction, coefficient of friction, angle of friction, and angle of repose.		
	6.3	Equilibrium of body on horizontal & inclined planes.		
	6.4	Ladder friction.		
7.	**Kinetics**			
	7.1	Concept of force, mass, acceleration, momentum, impulse & impact.	**08**	**10**
	7.2	Types of friction, Laws of static friction, coefficient of friction, angle of friction, and angle of repose.		

	7.3	Principle of Conservation of momentum, principle-its application, recoil velocity of gun.		
8.	**Work, Power, Energy**			
	8.1	Definitions and units of work, graphical representation of work, work done by torque, work done by constant and variable force.	**08**	**08**
	8.2	Energy, forms, law of conservation of energy, work-energy principle and its applications.		
	8.3	Power-Definition, units.		
9.	**Simple Machines**			
	9.1	Definition of simple machine, mechanical advantage, velocity ratio, efficiency. Relation between them, friction in machines.	**10**	**10**
	9.2	Reversibility, law of machine, max MA & max efficiency.		
	9.3	Study of machine – levers, pulleys, wheel and axle, screws, worm & worm wheel, winches, gears, etc.		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment	Hrs
1.	Law of Polygon of Forces.	2
2.	Law of Moments.	2
3.	Lami's Theorem.	2
4.	Beam Reactions.	2
5.	Graphic statics-Two Problems each on composition of concurrent and parallel forces.	6
6.	Graphic statics-Two Problems on beam reactions.	4
7.	Centroid of Regular and irregular Laminas.	2
8.	Determination of coefficient of friction for different surfaces.	2
9.	To study various lifting machines – Differential axle and wheel, Worm and worm wheel, Simple screw jack, Single purchase crab, Double purchase crab.	10
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method, Demonstration

2.	Resolution and composition of Forces	Lecture method, Demonstration
3.	Equilibrium	Lecture method, Transparencies
4.	Graphic Statics	Lecture method, Transparencies
5.	Centroid & Center of Gravity	Lecture, Demonstration & Discussion
6.	Friction	Lecture method, Demonstration
7.	Kinetics	Lecture method, Demonstration
8.	Work, power, Energy	Lecture method, Demonstration
9.	Simple lifting machines	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	Junnarkar, Adavi	Applied Mechanics	Charotar Publishers
2.	Dadhe, Jamdar, Walawalkar	Applied Mechanics	Sarita Prakashan
3.	Khurmi	Applied Mechanics	S. Chand

Reference Books:

Sr. No	Author	Title	Publication
1.	Beer & Johnson	Vector Mechanics For Engineers (Statics & Dynamics)	Mc - Graw Hill Co., USA
2.	McLean & Nelson (Schaum's Series)	Engineering Mechanics	Mc - Graw Hill Co., USA
3.	Timoshenko & Young	Engineering Mechanics	Mc - Graw Hill Co., USA

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	02	--	--	02
2.	Resolution and composition of Forces	02	04	06	12
3.	Equilibrium	02	02	08	12
4.	Graphic Statics	04	04	--	08
5.	Centroid & Center of Gravity	02	02	04	08
6.	Friction	02	02	06	10
7.	Kinetics	02	02	06	10
8.	Work, power, Energy	02	02	04	08
9.	Simple lifting machines	02	04	04	10
Total		**20**	**22**	**38**	**80**

(Prof. R.M.Koranne)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

Programme : Diploma in ME/MT
Programme Code : 04 /05/18
Name of Course : Elements of Electrical Engineering
Course Code : EE 263

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	03 Hrs	---	---	---
Marks	**20**	**80**	---	---	**25**

Course Rationale:

Every branch of engineering is related with electrical Engineering. Therefore every engineering student is expected to know fundamentals of Electrical Engineering. From this point of view, this course is introduced.

Course Objectives:

After studying this course, the student will be able to

- Understand the basic and fundamental principle of Electrical engineering
- Know the various electrical circuits concept used in higher-level courses.
- Know principle and construction of various electrical machines and transformers.
- Measure electrical quantity.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Electrical Circuits:**			
	1.1	Introduction to electrical power supply system, A.C. supply –single phase and three phase, DC supply.	**08**	**12**
	1.2	Concept of Electric Circuit, D.C. Current, A.C. Current, Ohm's Law.		
	1.3	Resistances in series, voltage division formula for two resistances in series.		
	1.4	Resistances in parallel, current division formula for two resistances in parallel.		
	1.5	Kirchhoff's laws- Kirchhoff's current law (KCL), Kirchhoff's Voltage Law (KVL) (Simple Numerical with two equation)		
	1.6	Effect of temperature on resistance, temperature co-efficient of resistance (Simple Numericals)		
2.	**Magnetic Circuit**			
	2.1	Definition of magnetic flux, magnetic circuit, magneto motive force (MMF) reluctance, permeability, relative permeability, magnetic flux density.	**06**	**10**
	2.2	Magnetization curve (B-H Curve), Magnetic hysteresis, hysteresis loop, hysteresis loss.		
	2.3	Production of mechanical force on current caring conductor placed in magnetic field. Fleming's Left hand rule.(Simple numericals)		
	2.4	Comparison between electric circuit and magnetic circuit.		
	2.5	Concept of series and parallel magnetic circuit.		
3.	**Electromagnetic Induction**			
	3.1	Faradays laws of Electromagnetic Induction	**04**	**06**
	3.2	Statically (self & mutual) induced e.m.f & Dynamically induced e.m.f		
	3.3	Lenz's law, Fleming's right hand rule.		

4.	**A.C. Fundamentals**			
	4.1	Generation of single phase A.C.Voltage (Elementary Single Phase alternator), sinusoidal waveform & its graphical representation.	**08**	**12**
	4.2	Definitions: Waveform, cycle time period, frequency, angular frequency, phase & phase difference, maximum value, r.m.s. Value, average value, peak factor, form factor.		
	4.3	Purely resistive circuit, purely inductive circuit, and capacitive circuit.		
	4.4	A.C. Series circuit i) R-L ii) R-C iii) R-L-C series circuit. iv) R-L-C resonance.		
	4.3	Concept of true power, reactive circuit apparent power, power factor. (No derivation but simple Numericals)		
5.	**Three Phase Circuit**			
	5.1	Generation of three phase A.C. Voltage (Elementary 3-phase alternator)	**04**	**08**
	5.2	Concept of phase sequence.		
	5.3	Advantages of 3-phase supply over single-phase supply.		
	5.4	Types of connection Star & Delta Relation between line and phase values of voltage and current in i) Star ii) Delta connected three phase balanced system.(No derivation) (Simple Numerical).		
6.	**Electrical Measuring Instruments and measurement**			
	6.1	Connection of D.C. / A.C. Ammeter, D.C. /A.C. Voltmeter & their connection in D.C. Circuit.(For PMMC & MI Instruments, their identification from its dial)	**05**	**10**
	6.2	Connection of wattmeter, frequency meter, p.f. meter and energy meter in A.C. circuit.		
	6.3	Concept of C.T. & P.T., Measurement of high current in A.C. circuit with low range ammeter and C.T., Measurement of high voltage in A.C. with low range voltmeter and P.T.		
7.	**Single Phase Transformer**			
	7.1	Definition, principal of working, construction, Types of transformer.	**05**	**10**

	7.2	E.M.F. equation, Transformation ratio, Voltage ratio, current ratio, turns ratio, KVA rating, Rated full load current calculations (Simple numericals)		
	7.3	Losses in transformer, efficiency, voltage regulation.		
	7.4	Autotransformer: Construction, working principles and applications.		
8.	**D.C. Motor**			
	8.1	Importance of motors as an electrical drives.		
	8.2	Definition, principal of working and construction of d.c. Motors.		
	8.3	Types of D. C. Motors.		
	8.4	Applications.		
	8.5	**A.C. Motors.** Three Phase induction motor: Principle & working, construction, types, slip speed, connection of three phase I.M. and reversal of rotation of I.M. applications.		
	8.6	Single phase induction motor: Principal of working types of single-phase induction motor, applications.		
		Total	**48**	**80**

List of Practical/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment	Hrs
1.	To verify Kirchhoff's laws	04
2.	To determine temperature rise of resistance of metal.	02
3.	To plot the B-H curve of a magnetic material	02
4.	Demonstration of production of mechanical forces on current carrying conductor in magnetic field & verify Fleming's Left hand rule.	02
5.	Demonstration on Faraday's Laws of Electromagnetic Induction by using coil and magnet & verify Fleming's right hand rule.	02
6.	To observe waveforms of A.C. Voltage and current on CRO	02

7.	To measure voltage across each parameters of R-L-C series circuit and draw vector diagram. Also find impedance of circuit.	02
8.	Draw the vector diagram for R-L-C series resonance circuit and determine the P.F. and current of circuit.	02
9.	To verify the relation between phase values and line values of voltages and currents in three phase Star & Delta connected balanced load.	04
10.	Connection & readings of Wattmeter and Energy meter in A.C. circuit.	04
11.	Measurement of High current in A.C.Circuit with. low range ammeter and C.T.	04
12.	To determine efficiency and voltage regulation of single-phase transformer by direct loading method.	02
13.	Reversal of rotation of three phase Induction Motor.	02
	Total	**34**

NOTE : Minimum 12 Practical's are to be conducted & at least one from each Chapter

Instructional Strategy :

Sr. No.	Topic	Instructional Strategy
1.	Electrical Circuits	Lecture, problem solving, practical
2	Magnetic circuits	Lecture, Q/A technique.
3.	Electromagnetic induction	Lecture, problem solving
4.	AC Fundamentals	Lecture, problem solving
5.	Three phase circuits	Lecture, problem solving, practical, Q/A technique.
6.	Electrical Measuring Instruments and measurement.	Lecture, problem solving, practical
7.	Single-phase Transformers.	Lecture, problem solving, practical
8	Motors	Lecture, problem solving, practical

Text Books:

Sr. No	Author	Title	Publication
1.	M.V. Deshpande	Elements of Electrical Engineering	
2.	B.L. Theraja	Electrical Technology Vol. I and II	S. Chand & Co.

Reference Books:

Sr. No	Author	Title	Publication
1.	Hirst	Applied Electricity	
2.	H.Cotton	Electrical Technology	CBC, Delhi
3.	Edvard Hughes	Electrical Technology	Pearson Education.
4.	B. H. Deshmukh	Electrical Technology	Nirali Prakshan
5.	A.K. Shawhney	Electrical Electronics Measurements & Instrumentation	Dhanpat Rai & Sons

Learning Resources: Models, charts, books, Videocassettes. no.140, 141, 142, 145, 146, 157, 209, 210, 268, 271, 385, 386, 406, 410 of G.P.P. library, Transistor Data Manuals, CD no. 418 & 419 of GPP Library.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Electrical Circuits	02	04	06	**12**
2	Magnetic circuits	02	04	04	**10**
3.	Electromagnetic induction	02	04	00	**06**
4.	AC Fundamentals	02	04	06	**12**
5.	Three phase circuits	02	02	04	**8**
6.	Electrical Measuring Instruments and measurement**.**	04	02	04	**10**
7.	Single-phase Transformers.	04	02	04	**10**
8.	Motors	04	04	04	**12**
	Total	**22**	**26**	**32**	**80**

(Prof. K.M. Kakade)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

Programme : Diploma in ME / MT / CM / IT
Programme Code : 04/ 05 /06 /07/18
Name of Course : Elements of Electronics Engineering
Course Code : ET 262

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 minutes	3 hrs.	3 hrs.	--	--
Marks	**20**	**80**	**50**	--	**25**

Course Rationale:

This course will be useful in understanding of construction, working and applications of semiconductor devices and circuits.

Course Objectives:

After studying this course, the student will be able to

- Explain construction, working, characteristics and applications of semiconductor devices and circuits.
- Build and test the circuits

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Semiconductor devices**			
	Concept& principles of electronics devices		**15**	**20**
	1.1	**Rectifying diode :** Review of P - type and N - type semiconductor ,PN junction, Barrier voltage , depletion region ,Junction Capacitance **Forward biased & reversed biased junction** Diode symbol , forward & reversed Characteristics of PN junction diode **Specifications :** Forward voltage drop , Reverse saturation current, maximum forward current , power dissipation ,Package view of diodes of different power ratings (to be shown during practical hours)		
	1.2	**Zener diode :** construction ,Symbol ,characteristics (forward & reversed) Avalanche & zener breakdown **Specifications :** Zener voltage , power dissipation , break over current,dynamic resistance & maximum reverse current (to be shown during practical hours)		
	1.3	**Rectifier :** Half wave and Full wave Rectifier, circuit diagram, working, comparison, merits and demerits. Filters, necessity, types, comparison, merits, demerits.		
	1.4	**Transistor :** construction, symbol, operating principle, characteristics, applications, rating and specifications, configurations, comparison between CB, CE, CC.		
	1.5	**UJT :** Construction, symbol, operating principle, characteristics, applications, rating and specifications.		

	1.6	**FET:** Construction, symbol, operating principle, characteristics, applications, rating and specifications, configurations, comparison.		
	1.7	**SCR :** Symbol, their construction, working, characteristics, applications		
2.	**Oscillator**			
	2.1	Block diagram, Barkhausan Criteria for sustained oscillations, classification: LC and RC. Oscillations in LC tank circuit; Hartley; Colpitts. RC Wein Bridge and Phase shift, Oscillator. Crystal Oscillator.	**07**	**12**
3.	**Digital Fundamentals**			
	3.1	Number systems: Decimal, Binary, Hexadecimal, Octal.	**07**	**12**
	3.2	Basic logic gates: AND, OR, NOT, NAND, NOR,EXOR symbols, IC numbers and Truth Table.		
	3.3	Logic families : TTL, CMOS		
	3.4	Boolean Algebra: Fundamentals of Boolean algebra, Basic laws, De Morgan`s theorem,		
4.	**Linear ICs,**			
	4.1	OP AMP. IC 741, symbol, pin diagram, ideal and typical characteristics, Applications such as Inverting , Non Inverting amplifier, Difference amplifier, adder substractor , Integrator, differentiator.	**07**	**12**
	4.2	Timer IC 555: Block diagram, operating modes viz. Astable, Monostable.		
5.	**Instrumentation**			
	5.1	CRO: Cathode Ray Tube, Oscilloscope Block diagram, operation, oscilloscope specifications, Applications.	**05**	**12**
	5.2	Function generator, Block diagram, operation, specifications, applications		

6.	**Transducer**			
	6.1	Definition, classification: Active, Passive, Primary, Secondary, Mechanical, Electronic, Analog, Digital, Selection criteria, Resistive, Capacitive, Inductive, Transducers(LVDT), Photoelectric, Piezoelectric Transducers, proximity switch, Construction, Operation, One example of each, Applications,	**07**	**12**
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Plot V-I characteristics of P-N junction diode.	02
2.	Study of Half wave and Full wave rectifier with and without filter.	02
3.	Plot the i/p and o/p characteristics in CE configurations.	02
4.	Plot the characteristics of FET.	02
5.	Plot the characteristics of UJT.	02
6.	Plot the characteristics of SCR.	02
7.	Study of Hartley and Colpitts oscillator.	02
8.	Study of RC phase shift and Wein Bridge.	02
9.	Study of logic gates and verifications of logic gates.	02
10.	Verification of De Morgan`s theorem.	02
11.	Study of Inverting and Non Inverting Amplifier.	02
12.	Study of Adder, Substractor.	02
13.	Study of Integrator and Differentiator.	02
14.	Study of astable multivibrator using 555.	02
15.	Study of C.R.O.	01
16.	Study of Function generator.	01
17.	Study of Transducers.	02
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Semiconductor devices.	Classroom teaching and laboratory work.
2.	Digital fundamentals.	Classroom teaching and laboratory work.
3.	Linear IC`s.	Classroom teaching and laboratory work.
4.	Oscillator.	Classroom teaching and laboratory work.
5.	Instrumentation.	Classroom teaching and laboratory work.
6.	Transducer.	Classroom teaching and laboratory work.

Text Books:

Sr. No	Author	Title	Publication
4.	Albert Malvino.	Basic Electronics.	TMH.
5.	Katre.	Basic Electronics.	Tech-Max.
6.	B.L.Theraja.	Basic Electronics.	S.Chand.
7.	Ramakant Gaikwad	Linear Integrated Circuits	PHI
8.	R P Jain	Modern Digital Electronics	TMH
9.	A K Sawheny	Instrumentation	DHANPAT RAI & SONS

Reference Books:

Sr. No	Author	Title	Publication
4.	Mottershed	Electronics Devices and Circuits.	PHI
5.	Milmann Halkies	Electronics Devices and Circuits.	TMH

Learning Resources: Reference Books, Data Manual

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Semiconductor Devices	10	06	04	20
2.	Oscillators	04	06	02	12
3.	Digital Fundamentals	06	04	02	12
4.	Linear I C ‘s	06	04	02	12
5.	Instrumentation	06	04	02	12
6.	Transducers	06	04	02	12
Total		**38**	**28**	**14**	**80**

(Prof. R.M.Adhav)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE / ME / MT
Programme Code : 01/ 04 /05 /15/18
Name of Course : Engineering Graphics
Course Code : ME 262

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**04**	**64**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 minutes	4 hrs.	--	--	--
Marks	**20**	**80**	--	--	**25**

Course Rationale:

Engineering drawing is the graphical language. It is used by engineers, designers, planners, supervisors and also the workers to express their thoughts, ideas and concepts. The expression by drawing is very accurate, precise and brief. At a glance one can understand detailed description of any part to be manufactured or a dam to be built or an electric circuit to be used. For all technicians through understanding of principles of engineering drawing (Graphic Skills) is essential.

Course Objectives:

After studying this course, the student will be able to

- Draw various engineering curves.
- Incorporate Indian Standards in drawings.
- Sketch various orthographic and isometric views.
- Draw all different views from given components vis-à-vis.
- Draw free hand sketches.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1.	**Introduction of Drawing Instruments, Lines, Letters etc.**			
	1.1	Use of different drawing equipments.	**02**	**--**
	1.2	Type of letters.		
	1.3	Conventions of lines.		
	1.4	Scales.		
2.	**Curve and Tangential Exercises**			
	2.1	Geometrical constructions and tangential exercises.	**03**	**12**
	2.2	To draw an ellipse by concentric circle method.		
	2.3	To draw a parabola by : i) Directrix focus method.		
	2.4	To draw a hyperbola by : i) Directrix focus method.		
	2.5	To draw involute of circle.		
	2.6	To draw a cylindrical helix (limited to two turns)		
	2.7	To draw cycloid, epicycloids and hypocycloid.		
3.	**Orthographic Projections**			
		Introduction to orthographic projections first and third angle method of projection. Conversion of simple pictorial view, Dimensioning technique.	**06**	**12**
4.	**Sectional Orthographic Projections**			
		Introduction, converting the given pictorial view into sectional views.	**04**	**12**
5.	**Missing Views**			
		Interpretation of orthographic view, drawing of missing views from given two orthographic views	**03**	**08**
6.	**Projection of Lines, Planes and Solids**			
		Axis inclined to one plan only Concept of true length of a line, projection of Planes, & Regular solids such as Cylinder, Prism Cone and Pyramid.	**06**	**12**
7.	**Isometric Views**			
	7.1	Isometric scale and isometric views of simple objects.	**06**	**12**
	7.2	Isometric views of rectangular, cylindrical objects, Slots on sloping surface.		

8.	**Free Hand Sketches**

		Fasteners, temporary threaded fasteners, locking arrangement, Foundation Bolts.	**02**	**12**
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment	Hrs
Six sheets on topics covered in the syllabus.		
1.	Line letters and numbers. (Sheet No.1)	06
2.	Engineering curves and tangential exercises. (Sheet No.2)	06
3.	Orthographic projection, Sectional views (Sheet No.3)	16
4.	Missing views. Projection of lines, planes and solids (Sheet No.4)	12
5.	One sheet Isometric projection. Minimum Two Problems. (Sheet No.5)	16
6.	Free hand sketches. (Sheet No.6)	08
	Total	**64**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to Drawing instruments lines letters etc.	Classroom teaching and Demonstration.
2.	Curves and tangential exercises	Demonstrations and classroom teaching.
3.	Orthographic projection	Use of models and classroom teaching.
4.	Sectional views	Use of models, transparencies and classroom teaching.
5.	Missing views	Classroom teaching, self study and assignments.
6.	Projection of lines, planes and solids	Classroom teaching and assignments.
7.	Isometric views	Classroom teaching and use of models.
8.	Free hand sketches	Classroom teaching and assignments & use of Models.

Text Books:

Sr. No	Author	Title	Publication
1.	N.D. Bhatt	Elementary Engg. Drawing (Including plan and solid geometry)	Charotar Publication, Anand.
2.	Mali, Choudhary	Engineering Drawing	Vrinda Prakashan, Jalgaon

Reference Books:

Sr. No	Author	Title	Publication
1	N.D. Bhatt	Geometrical and Machine Drawing	Charotar Publication, Anand.
2	--	I.S. 696 Latest version	B.I.S.
3	Curriculum Development Centre, TTTI, Bhopal	A Workbook in Engineering Drawing	Somaiyya Publication Pvt. Ltd., Mumbai
4	--	SP 46 – 1988	B.I.S.
5	G.R. Nagpal	Machine Drawing	--
6	K. Venugopal	Engineering Drawing and Graphics + AutoCAD	New Age International Publishers.

Learning Resources: Video cassettes No. 122, 123 of G.P.P. Library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction to Drawing instruments lines letters etc.	--	--	--	--
2.	Curve and Tangential exercises	12	--	--	12
3.	Orthographic Projection	--	12	--	12
4.	Sectional views	--	12	--	12
5.	Missing views	--	--	08	08
6.	Projection of lines, planes and solids	--	12	--	12
7.	Isometric views	--	--	12	12
8.	Free hand sketches	12	--	--	12
	Total	**24**	**36**	**20**	**80**

(Prof.M.R.Mundhe)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S.W.Warke)
Chairman, PBOS

GOVERNMENT POLYTECHNIC, PUNE
(An Autonomous Institute of Govt. of Maharashtra) Diploma

Programme	**:**	**ME**/CE/EE/ET/ MT/CM/IT
Programme Code	**:**	04/24/18
Name of Course	**:**	Computer fundamentals
Course Code	**:**	CM 264

Teaching Scheme:

	Hours /Week	**Total Hours**
Theory	**2**	**32**
Practical	**2**	**32**

Evaluation Scheme:

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term work**
Duration	---	---	**2 hours**	---	**2 hours**
Marks	---	---	**50**	---	**25**

Course Rationale:

In this world of high speed computing it is essential for diploma in computer engineering students to know about device of computers, its operation and graphical base applications and latest technologies in the market. This course is designed for basic perspective for first year diploma students.

Course Objectives:

After studying this course, the student will be able to

1. Use computer system effectively.
2. Describe and use different application software's.
3. Use the basic functions of an operating system.
4. Use five essential utility programs.
5. Compare major OS like Linux and MS-Windows
6. Understand working of input output devices.
7. Understand working of secondary storage devices.
8. Set the parameter required for effective use of hardware combined with and application software's
9. Understand connectivity, internet multimedia and web

GOVERNMENT POLYTECHNIC, PUNE

(An Autonomous Institute of Govt. of Maharashtra) Diploma

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1	**Introduction to computer peripherals**		**6**	---
	1.1	Hardware: Input-output devices, CPU and general PC layout		
	1.2	Data storage devices: RAM, ROM, External storage – magnetic & USB		
	1.3	System units: System Board, Microprocessor System Clock, Ports And Cables		
2	**Introduction to system softwares**		**4**	---
	2.1	Operating systems: Introduction to various operating systems like DOS, Windows, Android, Unix, Linux.		
	2.2	Windows: working with Windows operating system		
	2.3	Utility software: Application and working of various utility softwares like Antiviruses, Internet browsers, Adobe reader, office suite, media players etc.		
3	**GUI Based Editing, Spreadsheets, Tables & Presentation**		**12**	**---**
	3.1	Applications Using MS Office or Open Office suites.		
	3.2	Working with menus: Open, Edit, Format, Inserts and standard toolbars.		

	3.3	MS Word: Working with word for creating documents & drafts.		
	3.4	MS Excel: Working with Excel to create datasheet or spreadsheet.		
	3.5	MS Powerpoint: Working with powerpoint to create presentations.		
4	**Communication & Connectivity**			
	4.1	Introduction to communication systems: Telephone, fax, e-mails, messengers (chatting), voice messaging system(voice mail), video-conferencing system .		

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
	4.2	Connectivity: Types of network for e.g. LAN, WAN. MAN, intranet, internet.	4	---
	4.3	Communication devices: Introduction to network modems like broadband, USB; Bluetooth devices; Wi-Fi devices etc.		
5	**Internet practices**		4	---
	5.1	Introduction: Terms associated with the internet like web browser, www, ISP, HTTP, web site& URL, web page, home page.		
	5.2	Application of internet: Emails, video conferencing, search engines, E-shopping, E-banking, E- travel, social networking etc.		
6	**Cyber laws and ethics**		2	---
	6.1	Introduction to security issues and cyber security.		
	6.2	Laws associated with cyber security.		
	6.3	Securing our cyber environment with Anti-viruses, firewalls, secured transaction, The ten commandments of computing, privacy & control, Intellectual property rights.		
		Total	**32**	---

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1	Understanding computer layout and its peripherals.	**2**
2	Study of printing and scanning devices	**2**
3	Working with operating systems like windows XP and understanding the working environment (Desktop, My Computer, My Documents, Recycle bin, Programme files & control panel.)	**2**
4	Working with MS world (at least four programs including use of pictures/ clipart, word art, shapes, tables, mail merging options)	**6**
5	Working with MS Excel (at least three programs including creating spreadsheets, performing arithmetic operations, creating charts & graphs).	**6**
6	Working with MS Powerpoint (at least three programs including creating simple presentation, use of hyperlinks, use of animation).	**6**
Sr. No.	**Name of Practical/Experiment/Assignment**	**Hrs**
7	Page setting, page layout and printing Word, Excel & powerpoint documents.	**2**
8	Study of different types of networks and communication devices.	**2**
9	Internet practices: i)Getting started with internet, ii) Use of search engines iii)creating an email account, iv)E-travel & E-trading .	**2**
10	Assignment on cyber laws and ethics.	**2**
	Total	**32**

Text Books:

Sr. No.	Author	Title	Publication
1	**Timothy J. O. Leary**	Computing Essentials	TMH
2	**Vikas Gupta**	Comdex Computer Course Kit	Dreamtech

Reference Books:

Sr. No.	Author	Title	Publication
1	**P.K. Sinha**	Computer Fundamentals	BPB
2	Henry C. Lucas, Jr.	Information Technology for Management	Tata McGraw Hill
3		Windows XP/2000/2003/ Vista Users Guide	Manuals

Prepared By	Secretary, PBOS	Chairman, PBOS
Mrs. Seema Kolhe (LCE) Mr. P P Waghralkar (LME)	Prof S.V.Choudhari	

Programme : Diploma in ME
Programme Code : 04 /18
Name of Course : Engineering Mathematics
Course Code : SC262

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**--**	**--**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	03 hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

The student shall learn various techniques in integration, differential equations & Laplace Transformation and use these techniques to their related Engineering problems.

Course Objectives:

After studying this course, the student will be able to

- Apply the definition of integration as inverse of differentiation to solve Problems.
- Students will be able to apply various methods of integration.
- To apply mathematical principle to solve engineering problems.
- To draw and come to a valid conclusion.
- To locate the exceptional and critical points in an engineering system.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weigh tage
1.	**Application of Integration**			
	1.1	Mean value and RMS value of the functions.	**04**	**08**
	1.2	Area under the curve and area between two curves.		
	1.3	Volume of solid of revolution.		
2.	**Differential Equations**			
	2.1	Definition, order and degree of differential equations.	**10**	**20**
	2.2	Formation of differential equations.		
	2.3	Solution of differential equations : (using following methods) i) Variable separable, (ii) Reducible to variable separable, (iii) Homogeneous differential equations, (iv) Exact diff. equations, (v) Linear differential equations.		
3.	**Numerical Methods**			
	3.1	Solution of algebraic equations. Bisection method, Regulafalsi method and Newton – Raphson method.	**06**	**12**
	3.2	Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method.		
	3.3	Iterative methods- Gauss Seidal and Jacobi's method		
4.	**Complex Numbers**			
	4.1	Definition and algebra of a complex numbers.	**07**	**10**
	4.2	Geometrical representation, Argand's diagram, modulus and amplitude of a complex number. De Moivre's theorem (without proof), roots of complex number.		
5.	**Laplace Transforms**			
	5.1	Definition, Laplace Transforms of elementary functions, important properties of Laplace Transforms,	**07**	**10**
	5.2	Inverse of Laplace Transforms, Convolution Theorem and application of Laplace Transform for solving differential equations.		

6.	**Statistics**			
	6.1	Measures of central tendency : (a)Mean (b) Median (c) Mode	**07**	**10**
	6.2	Measures of dispersion : a) Standard deviation (b) Co-efficient of variance		
7.	**Vectors**			
	7.1	Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication)	**07**	**10**
	7.2	Dot (Scalar) product with properties.		
	7.3	Vector (Cross) product with properties.		
	7.4	Workdone and moment of force about a point & line		
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment	Hrs
1.	NIL	--
	Total	--

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Application of integration	Classroom Teaching Method
2.	Differential Equations	Classroom Teaching Method
3.	Numerical methods	Classroom Teaching Method
4.	Complex Numbers	Classroom Teaching Method
5.	Laplace Transforms	Classroom Teaching Method
6.	Statistics	Classroom Teaching Method
7.	Vectors	Classroom Teaching Method

Text Books:

Sr. No	Author	Title	Publication
1.	P.N.Wartikar & J.N.Wrtikar	Engineering Mathematics I	Pune Vidyarthi Griha Prakashan,Pune
2.	Patel & Rawal	Applied Mathematics	Nirali Prakashan
3.	S.P.Deshpande	Applied Mathematics	Pune Vidyarthi Griha Prakashan,Pune
4.	G.V.Kumbhojkar	Applied Mathematics	Phadke Prakashan,Kolhapur

Reference Books:

Sr. No	Author	Title	Publication
1.	Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi
2.	Vishwanath	Engineering Mathematics Vol.II	Satya Prakashan, New Delhi
3.	B.L.Agarwal	Basic Statistics	New Age International Publication
4.	H.K. Dass	Engineering Mathematics Part II	S. Chand & Co. Ltd. Delhi

Learning Resources: Chock Board etc

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Application of integration	00	00	08	08
2.	Differential Equations	04	10	06	20
3.	Numerical methods	00	04	08	12
4.	Complex Numbers	04	06	00	10
5.	Laplace Transforms	02	04	04	10
6.	Statistics	02	02	06	10
7.	Vectors	02	02	06	10
	Total	**14**	**28**	**38**	**80**

(Prof.R.A.Pawar)

Prepared By

Programme : Diploma in CE/ME/MT
Programme Code : 01/04/05/15
Name of Course : Workshop Practice
Course Code : WS 261

Teaching Scheme:

	Hours/Week	Total Hours
Theory	---	---
Practical	**04**	**64**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	---	---	---	---	---
Marks	---	---	---	---	**50**

Course Rationale: To make the students conversant with use of various workshop tools used in smithy, carpentry, fitting, welding and plumbing shops.

Course Objectives:

After studying this course, the student will be able to

- Interpret the assigned job drawing.
- Identify various tools used in different shops of Work shop.
- Select appropriate tool set to perform a specific job.
- Acquire skills to use various tools.
- Take care and maintain the tools.

Course contents:

Chapter No.	Name of Topic/Subtopic	Hrs	Weightage
1	**Sketch of smithy/forging Hand tools**, Equipments with construction and Application.	08	05
2	**Sketch of carpentry hand & power tools,** Equipment with construction and application.	14	10
3	**Sketch of fitting and filling hand tools,** equipment with construction and application.	14	10
4	**Sketch of welding hand tools,** equipment with construction and application.	14	10
5	**Sketch of plumbing hand tools**, equipment with construction and	14	10

	application.		
6	Journal writing and submission on above given topic	---	05
	Total	**64**	**50**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of experiment/Assignment	Hrs.
1	Demo of job involving minimum three operations. e.g. Upsetting, Drawing Down, Bending, Setting down.	08
2	One useful carpentry job involving carpentry joints and wood turning.	14
3	One useful fitting job involving marking, Filing, Sawing, Drilling, Tapping.	14
4	One useful welding job involving welding joints.	14
5	One job in plumbing of pipe threading and pipe joints.	14
	Total	**64**

Instructional Strategy :

Sr. No.	Topic	Instructional strategy
1	Smithy and forging	Explanation, Demonstration, exhibition of Models/Samples pieces.
2	Carpentry	
3	Fitting and filling	
4	Welding	
5	Plumbing	

Text Books :

Sr. No.	Author	Title	Publication
1	Mali and Ghan	Elements of Electrical and mechanical technology (Mechanical technology portion)	Nirali and Pragati Prakashan
2	Deshmukh Mandke	Elements of Electrical and mechanical technology (Mechanical technology portion)	Nirali Prakashan
3	Chuadhari M.A.	Elements of Electrical and mechanical technology (Mechanical technology portion)	Sandeep Prakashan, Pune

Reference Books :

Sr. No.	Author	Title	Publication
1	S. K. Hajara Chaudhari A.K. Hajara Chaudhari	Elements of workshop technology - Vol. I	Media Promoters and Publishers Pvt. Ltd., Mumbai-7
2	V. Kapoor	Workshop Practice Manual	Dhanpat Rai and Sons, New Delhi-32
3	B.S. Raghuwanshi	A course in workshop technology Vol.- I	Dhanpat Rai and Sons, New Delhi-32

Learning resources : Demonstration kit, charts, models/sample pieces and books.

Video cassette no. 134 and 367 of G.P.P. library.

Specification Table :

Sr. No.	Topic	Cognitive	PSYCHOMOTOR			Total
		Knowledge	Imitation	Manipulation	Perfection	
1	Smithy and forging	5	---	---	---	5
2	Carpentry	3	2	3	2	10
3	Fitting and filling	3	2	3	2	10
4	Welding	3	2	3	2	10
5	Plumbing	3	2	3	2	10
6	Journal writing and submission on above given topics	5	---	---	---	5
	Total	**25**	**25**	**25**	**25**	**50**

(Prof. Hamid Zaheer) **(Prof. S.B. Kulkarni)** **(Prof. C.C. Dandvatimath)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

NAME OF PROGRAMME : Diploma in Mechanical Engineering

Programme code : 04/18/24

Name of Course : Computer Aided Drafting

Course Code No : ME264

Teaching Scheme

	Hours / Week	Total Hours
Theory	00	00
Term Work / Practical	04	64

Evaluation

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	-----	-----	-----	-----	-----
Marks	-----	-----	50	-----	50

Course Aim

- ✓ Student should be familiar with the different drafting techniques.
- ✓ The student should know the features of AutoCAD software.
- ✓ The student should be able to use AutoCAD for drafting.

Course Objectives

After undergoing this course the students will be able to

- ✓ Understand the importance of AutoCAD.
- ✓ Understand the general specifications and their configurations.
- ✓ Understand the system commands and their utilities.
- ✓ Draw different drawings by using computer aided drafting.

Course contents

Sr. No.	Topic / Subtopic
1	**Introduction** ACAD as a drafting tool, Advantages, versions for ACAD, Hardware requirement, installation procedure. Opening an existing drawing file, Auto CAD's screen layout, Tool bars, Pull down menus, Dialog boxes, Command line and status bar.
2	**Initial Setting And Drawing Aids** Drawing setup-controlling unit display, Sizing that drawing sheet, creating new drawing with Wizards and Templates. Co-ordinate entry methods, viewing the drawing, setting snap and grid, Object snap Settings, Getting information about object in drawing.
3	**Basic 2D Commands** Draw commands- Line, Point, Arc, Circle, Polyline, Polygon, Doughnut, Ellipse, Text and Text styles. Modify commands- Move, Copy, Array, Rotate, Trim, Extend, Mirror, Offset, Stretch, Break, Fillet and Chamfer, Editing single line text, Entering multi-line text, Editing multi-line text.
4	**Dimensioning** Dimensioning concept, types of dimensioning, Linear, Angular, Diameter and radius, Ordinate, Dimensions, Dimension styles and components of dimension style, Geometric Tolerances, Editing dimension text and variables.
5	**Layer and Line Properties** Layers- creating, Modifying, Deleting, Making a layer current. Line types-Line type Manager, Loading line types, making a line type as current, Scale for line type, Modifying properties of lines, color, Line weight.
6	**Blocks And Attributes** Creating a new block, using a block in another drawing file, Blocks and layers, Retrieving blocks inserting more than one block. Nesting blocks, Editing a retrieved block. Attributes- Attribute modes, Defining attributes, Editing attributes.
7	**Hatching** Hatch commands, b hatch commands- hatch pattern, Pattern properties, selecting a boundary, view selections, Inherit properties, Composition, Preview and Apply Hatch. Advance boundary selection methods of hatching, using b hatch command and using hatch command, Care in selecting boundary.
8	**Basic 3D Commands** Drawing commands- Box, Cylinder, Wedge, Cone, Pyramid, Prism.

	Edit commands- Fillet, Chamfer, Subtract, Union, 3D Mirror, 3D array.
9	**Plotting** Plotting concept, Paper space, creating and working in plotting view port, Layers in view ports, Guide lines for using paper space. Print Command, Selecting plotter, paper size, setting up the parameters and batch plotting.

Laboratory Work :-

Sr. No.	Particulars	Hours
1	Drawing of circle, rectangle and simple parts	08
2	Sheet on orthographic projections	10
3	Sheet on sectional orthographic projections	10
4	Sheet on production drawing	12
5	Sheet on detailed drawing	12
6	Sheet on assembly drawing	12
	Total	**64**

(Sheet means print taken on A4 size paper)

Instructional Strategy

Sr. No.	Topic	Instructional Strategy
1	Introduction	Computer Lab Teaching
2	Initial Setting and Drawing Aids	
3	Basic 2D Commands	
4	Dimensioning	
5	Layer and Line Properties	
6	Block And Attributes	
7	Hatching	
8	Basic 3D Commands	
9	Plotting	

Text Books

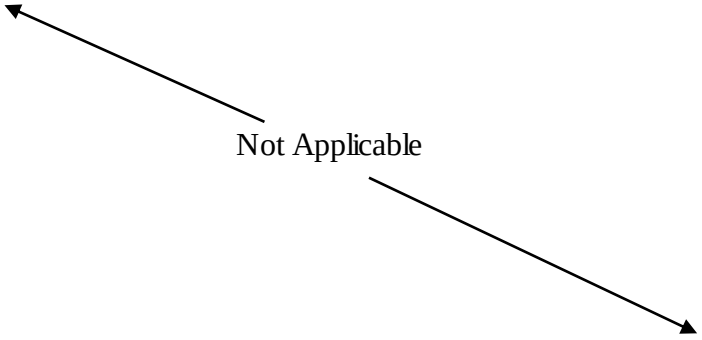
Author	Title	Publisher
Nil	Nil	Nil

Reference Books

Author	Title	Publisher
Miller	ABC' of Auto CAD	Technical Publication, Singapore
Ajit Sing	Working with Auto CAD	Tata McGraw Hill Publishing Company Ltd. New Delhi
David S. Cohn	Auto CAD 2002	Dreamtech, New Delhi

Learning Resources : Instruction Manual of Auto CAD R-14,2000(or any available latest version)

Specification Table

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction				
2	Initial Setting and Drawing Aids				
3	Basic 2D Commands				
4	Dimensioning				
5	Layer and Line Properties				
6	Block And Attributes				
7	Hatching				
8	Basic 3D Commands				
9	Plotting				
10	Script Files and Lip Files				

Prepared by Secretary PBOS Chairman PBOS Mech. Engg. Dept.

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Programme : Diploma in CE/EE / ET/ ME/MT/ CM / IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Environmental Science
Course Code : AU 361

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 min Duration**	**3 hours**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

This course has been introduced to make young engineers aware of the relation between society and environment; the global environmental issues, etc. To motivate them for environmental management and to adopt sustainable development practices.

Course Objectives:

After studying this course, the student will be able to

- Harmony between society and environment.
- Understand global environmental issues.
- Understand environmental pollution and remedial measures.
- Select environmental management practices.
- Adopt the sustainable development strategies in career.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction**			
	1.1	Society and environment, Indian traditions, customs and culture,	**04**	**08**
	1.2	Role of festivals in protecting environment.		
	1.3	Impact of population on environment.		
2.	**Developments and Environment**			
	2.1	Agriculture and Industry as major sectors of development.	**06**	**16**
	2.2	Impact of development on environment – changing pattern of land use, land reclamation, deforestation, resource depletion, environmental degradation.		
	2.3	Role of society in sustainable development – public awareness through education, campaigns, etc., public participation in decision making.		
	2.4	Causes of Lack of environmental awareness, measures to increase public awareness.		
3.	**Environmental Pollution**			
	3.1	Causes, effects and measures to reduce – air pollution, water pollution, soil pollution, sound pollution.	**06**	**16**
	3.2	Pollution due to radioactive causes, consequences including human diseases.		
	3.3	The price of civilization.		
4.	**Global Environmental Issues**			
	4.1	Ozone layer depletion and its effects.	**06**	**16**
	4.2	Greenhouse effect – global warming climate changes, their effects on human, agriculture, animals, plants.		
	4.3	Disasters - Natural (droughts, floods, earthquakes, cyclones, landslides, avalanches, Tsunamis) Manmade (industrial, technological, atomic). Their impact on environment, prevention and control.		

5.	**Environmental Management (E.M.)**			
	5.1	Need for environmental management,	**05**	**12**

	5.2	Three levels of environmental management (Global, national, local),		
	5.3	Aspects of E.M. – ethical, social, technological, economic.		
	5.3	Legal provision for E.M. – introduction to constitutional provisions, environmental laws.		
6.	**Sustainable Development (S.D.)**			
	6.1	Concept of S.D.	**05**	**12**
	6.2	Need for S.D.		
	6.3	Challenges for S.D. – Social, economic political considerations.		
	6.4	Role of individuals, society, Govt., Non-Govt. organizations, national and international agencies for S.D.		
	6.5	Green evolution.		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Group Discussion. & Assignment on Developments and Environment	02
2.	Group Discussion Assignment. Articles collection from newspapers, internet on Environmental Pollution	02
3.	Assignment, Articles collection from newspapers, internet on Global Environmental Issues.	04
4.	Assignment on Global Environmental Issues	04
5.	Assignment on Environmental Management	04
		16

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Class room teaching
2.	Developments and Environment	Class room teaching, Group Discussion.
3.	Environmental Pollution	Class room teaching, Group Discussion.
4.	Global environmental issues	Class room teaching, Group Discussion.
5.	Environmental Management.	Class room teaching.
6.	Sustainable Development	Class room teaching.

Text Books:

Sr. No	Author	Title	Publication
1.	Environmental Engineering	A. Kamala	Tata Mc Graw Hill, New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	Environmental Engineering.	TTTI Madras Chennai	Tata Mc Graw Hill, New Delhi

Learning Resources: Internet, Daily News papers, Environmental magazines

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	04	04	---	08
2.	Developments and Environment	10	06	--	16
3.	Environmental Pollution	04	06	06	16
4.	Global environmental issues	04	06	06	16
5.	Environmental Management.	04	04	04	12
6.	Sustainable Development	04	04	04	12
	Total	**30**	**30**	**20**	**80**

(Prof. R.H.Dhorje)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE/EE/ ET/ ME/MT/ CM/ IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Community Development
Course Code : AU362

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 min Duration**	**3 Hrs**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

The course has been introduced to make young Engineers especially aware of the present status of Villages &to motivate them to make improvement in villages when they start their Engineering carrier.

Course Objectives:

After studying this course, the student will be able to

- Able to understand present situation in villages and realize the gravity of the village development.
- Able to make survey of villages, collect the data, analyze it and identify the area of development.
- Able to identify the available natural resources and how they can be utilized for betterment of villages.
- Able to collect the useful information for starting probable new industries in villages.
- Able to guide villagers in building low cost durable houses taking in to considerations weather conditions of that area.
- Able to guide villagers for development good habits regarding health and

hygiene.

- Motivated to bring about all round development of villages.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction**			
	1.1	Present status of rural and urban community.	**02**	**04**
	1.2	Necessity of community development.		
	1.3	Identifying needs of community, Ways to develop community.		
2.	**Human Power Development**			
	2.1	Present scenario of Human power in India,	**04**	**08**
	2.2	Socioeconomic survey to ascertain requirement of human requirements.		
	2.3	Methodology for training the human power		
	2.4	Wage employment and self employment,		
	2.5	Support from financial institutions for self employment.		
3.	**Appropriate Technology and Technology Transfer**			
	3.1	Technological development of India, Additional needs of community due to technology development,	**04**	**12**
	3.2	Classification of rural industries,		
	3.3	Areas of appropriate technology,		
	3.4	Use of locally available materials,		
	3.5	Methods of transfer of technology, Project reports preparation.		
4.	**Industrialization**			
	4.1	Present status of rural traditional industries,	**04**	**12**
	4.2	Renewal of old industries in villages- • Manufacturing new commodities such as plastic utensils, nylon ropes, ceramics • Repairing – agricultural implements, tractors, automobiles, electrical or diesel pump sets, domestic appliances • Food processing – Papad, jam, jelly, pickles, preservation, spices, syrups, ketchups • Utilization of waste product – Gobar gas, fuel cake, • Construction – Brick clamp, stone quarry, sand		

		supply, and crusher. • Miscellaneous – Handlooms, power looms, Ginning mills, Jaggery making • Service Industry – STD/PCO/Net café, • Housing support to industrialization.		
5.	**Non Conventional Energy Sources**			
	5.1	Availability of energy sources in India,	**06**	**20**
	5.2	Needs of use of non conventional energy sources.		
	5.3	Availability of such sources in India.		
	5.4	Various types of non conventional energy sources. Solar energy – Solar water heater and solar cooker, wind energy, wind mill and wind turbines, bio-gas-generation.		
6.	**Community Services**			
	6.1	Health and Hygiene awareness,	**04**	**08**
	6.2	Health services,		
	6.3	Educating the community for good habits of health and hygiene, Potable drinking water, purifying well water, low cost latrines, drainage system and soak pits Tree plantation programmes, roads and communications.		
7.	**Waste Management**			
	7.1	Generation of waste, causes	**04**	**08**
	7.2	Types of waste – domestic, commercial, industrial, E-waste, hazardous waste.		
	7.3	Waste separation of domestic waste e.g. wet, dry, reusable, recyclable,		
	7.4	Waste disposal – methods, treatments, etc.		
	7.5	Reduce, Reuse, and Recycle, 3Rs in Waste Management.		
8.	**Developments**			
	8.1	Programmes for all round development of	**04**	**08**
	8.2	Community, Various government schemes, IRDP – Integrated Rural Development Programme.		
	8.3	Active participation of community in development programmes		
	8.4	Motivation for participation.		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on manpower development	02
2.	Assignment on appropriate Technology and technology transfer.	02
3.	Assignment on renewal of old industries in villages.	04
4.	Assignment on Non-conventional energy sources.	04
5.	Assignment on Waste Management	04
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Class rooms teaching
2.	Man power developments	Class rooms teaching, data collection
3.	Appropriate technology & technology transfer	Class rooms teaching
4.	Industrialization	Class rooms teaching
5.	Non-conventional energy sources	Class rooms teaching
6.	Community services	Class rooms teaching
7.	Developments	Class rooms teaching

Text Books:

Sr. No	Author	Title	Publication
1.	Katav Sing	Rural Development Principles, Policies and management.	---
2.	S.P. Sukhatme	Solar Energy	---
3.	G.P. Rai	Non-Conventional Sources of Energy	---
4.	Debendra K. Das	Dynamics of rural development, perspectives	Deep & Deep Publications Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	T.T.T.I. Madras	Environmental Engg.	Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Learning Resources: : Internet, Daily News papers

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	02	04	--	06
2.	Man-power development	04	04	--	08
3.	Appropriate technology & its transfer	04	04	04	12
4.	Industrialization	06	04	04	14
5.	Non-conventional Energy Sources	08	06	06	20
6.	Community Services	06	04	--	10
7.	Developments	06	04	--	10
	Total	**36**	**30**	**14**	**80**

(Prof. R. H. Dhorje)
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Secretary, PBOS

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Chairman, PBOS

Programme : Diploma in CE/EE/ET/ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Renewable & Sustainable Energy Management
Course Code : AU363

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**20**
Practical	**01**	**10**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 min Duration**	**3 Hrs**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

Energy is an important aspect in all sectors of country's economy. The energy crisis is mainly caused due to increased population and enhanced standard of living and life style of people. The conventional sources of energy are insufficient to meet these demands. Hence alternative energy sources are utilized for power production. The use of alternative energy source is increasing day by day. Diploma Engineers are to develop, operate and maintain these systems therefore essential to know basics of energy conversion, conservation, energy audit and waste heat recovery techniques.

Course Objectives:

After studying this course, the student will be able to

- Know the National scene of energy production, utilization, consumption and reserves.
- Appreciate the need for non-conventional energy sources.
- Understand relative advantages and disadvantages of various non-conventional energy sources.
- Develop awareness for effective utilization of alternative energy sources.
- Identify different components of solar energy and wind energy sources.

- Identify and analyze biomass plant.
- Identify and apply energy conservation techniques for commonly used Power absorbing and generating devices.
- Apply principles of energy conservation and energy management techniques

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Review of conventional sources of energy**			
	1.1	Types of conventional energy sources availability, important plant in India	**04**	**06**
	1.2	India's production and reserves for fossil fuels, waterpower, nuclear power		
	1.3	Need for non-conventional energy sources		
	1.4	Environmental impact of various energy sources.		
2.	**Solar Energy**			
	2.1	Principle of conversion of solar energy into heat and electricity	**06**	**16**
	2.2	Solar radiation. Solar radiations at earth's surface		
	2.3	Solar radiation geometry- declination, hour Angle, altitude angle, incident angle, zenith angle, solar azimuth angle.		
	2.4	Construction and working of typical flat plate Collector		
	2.5	Solar concentrating collectors and their applications, advantages and limitations		
	2.6	Applications of Solar energy- Space heating and cooling, photovoltaic electric conversion, Solar distillation, Solar cooking and furnace, Solar pumping and Green house, Agriculture and industrial process heat.		
3.	**Wind Energy**			
	3.1	Basic principles of wind energy conversion, power in wind, available wind power formulation, power coefficient, and maximum power	**04**	**12**
	3.2	Main considerations in selecting a site for wind mills, advantages and limitations of wind energy Conversion		
	3.3	Classification of windmills, construction and working of horizontal And vertical axis wind mills, their comparison		
	3.4	Main applications of wind energy for power generation and pumping		

4.	**Energy From Biomass**			
	4.1	Common species recommended for biomass, methods for obtaining energy from biomass, thermal	**06**	**12**
	4.2	Classification of biomass- gasified, fixed bed and fluidized		
	4.3	Application of gasifier		
	4.4	Biodiesel production and application		
	4.5	Agricultural waste as biomass, biomass digester, comparison of biomass with conventional fuels.		
5.	**Geothermal Energy**			
	5.1	Availability, forms of geothermal energy- Dry steam, wet steam, hot dry rock, magnetic chamber system	**02**	**06**
	5.2	Different power plants available		
6.	**Tidal Energy**			
	6.1	Tidal power, factors for selection of tidal power plant	**02**	**06**
	6.2	Classification-Single basin, double basin type		
	6.3	tidal power plants in world, ocean thermal plants.		
7.	**Energy Conservation**			
	7.1	Energy conservation and management, need and importance of energy conservation and management	**02**	**08**
	7.2	concept of payback period, return on investment, life cycle cost, Sankey diagrams, specific energy consumption		
8.	**Energy Conservation Techniques**			
	8.1	Distribution of energy consumption	**06**	**14**
	8.2	Energy audit, types of audit, methods of energy conservation		
	8.3	cogeneration and its application, combined cycle system		
	8.4	concept of energy management, study of different energy Management techniques like- analysis of input, reuse and recycling of waste, energy education, conservative technique and energy audit		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical / Experiment/Assignment	Hrs

1.	To collect information about global and Indian energy market	02
2.	One field visit to be conducted to demonstrate application of Solar Energy	04
3.	One field visit to be conducted to Wind Mill	04
4.	To visit a biomass/ biogas plant of municipal waste or elsewhere.	04
5.	Perform energy audit for workshop/Office/Home/SSI unit.	02
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Review of conventional sources of energy	Classroom teaching and Internet browsing
2.	Solar Energy	Classroom teaching and field visits, use of charts
3.	Wind Energy	Classroom teaching, field visit & use of charts
4.	Energy From Biomass	Classroom teaching, field visit & use of charts
5.	Geothermal Energy	Classroom teaching and Internet browsing
6.	Tidal Energy	Classroom teaching and Internet browsing
7.	Energy Conservation	Classroom teaching
8.	Energy Conservation Techniques	Classroom teaching and case study

Text Books:

Sr. No	Author	Title	Publication
1.	Non conventional energy resources	Dr B.H.Khan	Tata McGraw Hill
2.	Non conventional energy Resources	G. D. Rai	Khanna publication

Reference Books:

Sr. No	Author	Title	Publication
1.	Solar energy	S. P. Sukhatme	Tata McGraw Hill
2.	Solar energy	H. P. Garg	Tata McGraw Hill
3.	Power plant engineering	Arrora Domkundwar	Dhanpat Rai & co.
4.	India- The energy sector	P.H. Henderson	Oxford University Press
5.	Industrial energy conservation	D. A. Ray	Pergaman Press
6.	Non-conventional energy source	K. M. Mittal	---
7.	Energy resource management	Krupal Singh Jogi	---
8.	Website for Akshay Urja News Bulletin. (www.mnes.nic.in)	---	---

Learning Resources: Charts of solar water heater and cooker, Models of solar water heater and cooker, Photovoltaic cells etc., video cassette no.131, 365 of G.P.P. library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Review of conventional sources of energy	06	--	--	06
2.	Solar Energy	02	06	08	16
3.	Wind Energy	04	04	04	12
4.	Energy From Biomass	04	04	04	12
5.	Geothermal Energy	06	--	--	06
6.	Tidal Energy	06	--	--	06
7.	Energy Conservation	02	04	02	08
8.	Energy Conservation Techniques	04	04	06	14
	Total	**34**	**22**	**24**	**80**

(Prof.K.M.Kakade)
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Programme : Diploma in CE/EE/ET/ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Engineering Economics
Course Code : AU364

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**20**
Practical	**01**	**10**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 min Duration**	**3 Hrs**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

Diploma Engineers working in middle level management are no longer confined to the role of professional technicians. They often have to take business decisions, for which they are required to apply economic concepts, logic, tools of analysis and economic theories as they advance in their carrier. It is for this reason that diploma students are required to posses some working knowledge of economic concepts, economic policy of our country, also the effects of globalization, GATT, WTO etc.

Course Objectives:

After studying this course, the student will be able to

- Various concepts, applications, contribution of Micro Economics and macro economics to engineering business decisions.
- Consumer demand, market demand, supply and production.
- Prices and cost - Break even analysis, price decisions.
- Concept of National income.
- Inflation, Deflation and unemployment.
- Money and Banking, New economic environment.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction to Economics**			
	1.1	Engineering Economics –Definition, Objectives ,Importance	**04**	**10**
	1.2	Business Economics - General concepts on micro & macro economics Categories of Economy- Market economy , Command economy , Mixed economy		
2.	**Demand Analysis**			
	2.1	Consumer demand, utility, total and marginal utility, law of diminishing, cardinal and ordinal utility.	**07**	**20**
	2.2	Law of demand, Determinants of Demand, Elasticity of demand, Factors governing the elasticity of demand		
	2.3	Demand for forecasting necessity, techniques, methods		
3.	**Supply, Production and Cost analysis**			
	3.1	Law of supply, supply factors, supply function, Equilibrium of demand and supply	**06**	**14**
	3.2	Theory of production, Laws of production		
	3.3	Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)		
4.	**Time value of money**			
	4.1	Simple and compound interest	**08**	**16**
	4.2	Cash flow diagram Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects.		
	4.3	Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method		

5.	**National Income and Inflation**			
	5.1	Concepts, measurement, Gross National production, gross domestic production, methods of measuring national income, India's national income.	**03**	**08**
	5.2	Inflation - deflation, measures, kinds and effects.		
	5.3	Unemployment causes, kinds, effects and remedies.		
6.	**Finance, Money and Banking and New Economic Environment**			
	6.1	Business finance, Profit & Loss (Income) Statement ,Balance sheet, budget and budgetary control, Standards of Financial Reporting, Book – Keeping, Trial Balance	**04**	**12**
	6.2	Money- Kinds and functions, significance, Value.		
	6.3	Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India.		
	6.4	Liberalization, Trade Privatization, Globalization , GATT and W.T.O.		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical / Experiment/Assignment	Hrs
1.	Assignment on Engineering costs and estimates – fixed, variable, break even	**02**
2.	Assignment on Cash Flows, compounding, and time value of money	**02**
3.	Assignment on Nominal and effective rates, compounding periods, spreadsheets	**02**
4.	Assignment on Depreciation	**02**
5.	Assignment on Replacement analysis	**02**
6.	Assignment on Inflation & Min. rate of return	**02**
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to Economics	Lecture method, discussion
2.	**Demand Analysis**	Lecture method, Assignment, surveys, case study, discussion
3.	Supply Production and cost analysis	Lecture method, Assignment, surveys, case study, discussion
4.	Time value of money	Lecture method, Assignment, surveys, case study, discussion
5.	National income and inflation	Lecture method, Literature survey, discussion.
6.	Finance, money and banking and New economic environment	Lecture method, visits journals review, discussion.

Text Books:

Sr. No	Author	Title	Publication
1.	D.N. Dwivedi and Abhishek Dwivedi	Engineering Economics	Vikas publishing House Pvt. Ltd., New Delhi,
2.	Maheshwari	Managerial Economics (2nd ed)	Prentice Hall of India Pvt. Ltd. New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	Pannerselvam	Engineering Economics	Prentice Hall of India Pvt. Ltd. New Delhi
2.	Sasmita Mishra	Engineering economics & Costing	Prentice Hall of India Pvt. Ltd. New Delhi
3.	Newnan, Eschenbach, and Lavelle,	Engineering Economic Analysis, 9th Edition,	Oxford University Press, 2004.
4.	Eschenbach, Ted G.	Engineering Economy - Applying Theory to Practice	Irwin, 1995
5.	Newnan and Wheeler,	Study Guide for Engineering Economic Analysis, 9th Edition,	Oxford University Press, 2004.
6.	Anthony J. Tarquin	Engineering Economy	McGraw-Hill, 1989

Learning Resources: Books, Journals, and Reports etc.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction to Economics	04	06	--	10
2A.	Consumer Demand Analysis	04	04	02	10
2B.	Market demand & elasticities and Fore casting	02	04	04	10
3.	Supply Production and cost analysis	06	04	04	14
4.	Time value of money	06	06	04	16
5.	National Income and Inflation	04	04	--	08
6.	Finance, Money and Banking and New economic environment	06	04	02	12
	Total	**32**	**32**	**16**	**80**

(Prof. B.Prasad)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE/EE/ET/ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Industrial Psychology
Course Code : AU365

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 min Duration**	**3 Hrs**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

The overall purpose of the course is to acquaint with the major sub-areas within Industrial Psychology such as personality and temperament upon industrial psychology, psychology of management, impact of work environment upon the psychology of people in a workplace, psychology to recruitment, psychological testing ,motivation influences work productivity & psychological disorders or abnormalities

Course Objectives:

After studying this course, the student will be able to

- Maintain harmony among workers of various departments.
- Understand needs and requirements of workers.
- Extract maximum work with full cooperation and optimum efforts.
- Proper assigning of the job as per workers capability.
- Able to improve work culture of the organization, thus improving job satisfaction of the workers.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weigh tage
1.	**The Practice of Industrial Psychology**			
	1.1	Definition, objectives, scope, Principles, practices and problems,	**02**	**04**
	1.2	Methods and techniques		
2.	**Understanding the Employee's Thinking**			
	2.1	Sensation and Perception, Thinking and Day Dreaming, Gestalt Approach, Unconscious and Conscious Psychic Elements,	**06**	**14**
	2.2	Explaining Behaviour, Knowledge of Brain Processes, Personal Interpretation of a Given Situation, Instinct.		
3.	**Personality & Temperament**			
	3.1	Mature & immature temperaments (e.g. Sanguine, Melancholic, Choleric, Phlegmatic), emotional types, fear, intelligence, knowledge, deviation, etc	**04**	**08**
4.	**Personnel Management**			
	4.1	Recruitment and selection, Psychological testing, Performance appraisal, Training and development	**04**	**10**
5.	**Organizational Psychology**			
	5.1	Leadership, Motivation, job satisfaction and job involvement,	**06**	**14**
	5.2	Maslow's model of self actualisation, Security, Money, Ambition, Companionship, Social reinforcement, Labour wastage, etc		
6.	**Work Psychology**			
	6.1	Working conditions - Noise, Space, Light, Temperature, Speed of Work, etc. Accidents, Breakages, Fatigue etc. Safety, violence, and health in the workplace, Stress	**04**	**10**
7.	**Recruitment**			
	7.1	Ways of seeking applicants, types of interview, ways of selecting staff.	**04**	**10**
8.	**Social Considerations**			
	8.1	Group Behaviour, Conformity, Industrial Groups, The hawthorne effect	**04**	**10**
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical / Experiment/Assignment	Hrs
1.	Assignment on Identifying similarities and differences that occur in the way different employees perceive their workplace.	02
2.	Assignment on the effect of personality and temperament upon industrial psychology.	02
3.	Assignment on Identifying applications for psychological testing in industrial management.	02
4.	Assignment on Identifying ways that the work environment might impact upon the psychology of people in a workplace	02
5.	Assignment on the application of psychology to recruitment.	04
6.	Assignment on the impact of social factors upon work productivity.	02
7.	Assignment on the significance of psychological disorders or abnormalities in a workplace	02
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	The practice of Industrial Organizational psychology	Lecture method, Assignment discussion
2.	Characteristics of work place	Lecture method, visit short report
3.	Development of Human Resources	Lecture method, case study visit
4.	Selection, psychological testing and training	Lecture method, visit demonstration
5.	Engineering psychology	Lecture method, discussion, visit case study
6.	Consumer Psychology	Lecture method, discussion, assignment case study

Text Books:

Sr. No	Author	Title	Publication
1.	Thomas Harrel.	Industrial Psychology	
2.	K.K.Ahuja	Industrial management and organizational behaviour	Khanna Publications
3.	R.D.Agarwal	Organization & Management	
4.	O.P.Khanna , Lal	Production Technology Vol. I , II	Dhanpat Rai and sons

Reference Books:

Sr. No	Author	Title	Publication
1.	Schultz, D. & Schultz, S.E. (2006).	Psychology & work today. (9th International ed.)..	New Jersey: Pearson Prentice Hall
2.	Edgar H schien	Organisational Psychology	Prentice Hall of India Pvt. Ltd. New Delhi
3.	H.L. Kaila	Industrial Psychology	The Associated Publishers

Learning Resources: Books, Journals, and Reports etc.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	The Practice of Industrial Psychology	04	--	--	04
2.	Understanding the Employee's Thinking	06	06	02	14
3.	Personality & Temperament	04	04	--	08
4.	Personnel Management	06	04	--	10
5.	Organizational Psychology	06	04	04	14
6.	Work Psychology	04	04	02	10
7.	Recruitment	--	06	04	10
8.	Social Considerations	06	04	--	10
	Total	**36**	**32**	**12**	**80**

(Prof. B.Prasad)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE/ ME/ EE/ET/MT/ CM / IT
Programme Code : 01 / 02 / 03 / 04 / 05 / 06 / 07/15/16/17/18
Name of Course : Applied Mathematics – III
Course Code : SC361

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	03 hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

The student shall learn various techniques in integration and differential equations and use these techniques to their related Engineering problems

Course Objectives:

- Apply the definition of integration as inverse of differentiation to solve Problems.
- Students will be able to apply various methods of integration..
- To apply mathematical principle to solve engineering problems.
- To draw and come to a valid conclusion.
- To locate the exceptional and critical points in an engineering system.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Application of Integration**			
	1.1	Mean value and RMS value of the functions.	**04**	**08**
	1.2	Area under the curve and area between two curves.		
	1.3	Volume of solid of revolution.		
2.	**Differential Equations**			
	2.1	Definition, order and degree of differential equations.	**10**	**24**
	2.2	Formation of differential equations.		
	2.3	**Solution of differential equations** : (using following methods) i) Variable separable, ii) Reducible to variable separable, iii) Homogeneous differential equations, iv) Exact diff. equations, v) Linear differential equations.		
3.	**Numerical Methods**			
	3.1	Solution of algebraic equations. Bisection method, Regulafalsi method and Newton – Raphson method.	**06**	**16**
	3.2	Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's method		
	For EE / ET / CM / IT			
4.	**Complex Numbers**			
	4.1	Definition and algebra of a complex numbers.	**06**	**16**
	4.2	Geometrical representation, Argand's diagram, modulus and amplitude of a complex number. De Moivre's theorem (without proof), roots of complex number.		
5.	**Laplace Transforms**			
	5.1	Definition, Laplace Transforms of elementary functions, important properties of Laplace Transforms, Inverse of	**06**	**16**
	5.2	Laplace Transforms, Convolution Theorem and application of Laplace Transform for solving differential equations.		

For CE / ME/ MT				
4.	**Statistics**			
	4.1	Measures of central tendency : (a)Mean (b) Median (c) Mode	**06**	**16**
	4.2	Measures of dispersion : a) Standard deviation (b) Co-efficient of variance		
5.	**Vectors**			
	5.1	Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication)	**06**	**16**
	5.2	Dot (Scalar) product with properties. Vector (Cross) product with properties. Work done and moment of force about a point & line		
		Total	**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1	Application of Integration	02
2	Differential Equations	04
3	Numerical methods	04
For EE / ET / CM / IT		
4	Complex Numbers	03
5	Laplace Transforms	03
For CE / ME/ MT		
4	Statistics	03
5	Vectors	03
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Application of Integration	Classroom Teaching Method

2.	Differential Equations	Classroom Teaching Method
3.	Numerical methods	Classroom Teaching Method
For EE / ET / CM / IT		
4.	Complex Numbers	Classroom Teaching Method
5.	Laplace Transforms	Classroom Teaching Method
For CE / ME/ MT		
4.	Statistics	Classroom Teaching Method
5.	Vectors	Classroom Teaching Method

Text Books:

Sr. No	Author	Title	Publication
1.	P.N.Wartikar & J.N.Wrtikar	Engineering Mathematics I	Pune Vidyarthi Griha Prakashan,Pune
2.	Patel & Rawal	Applied Mathematics	Nirali Prakashan
3.	S.P.Deshpande	Applied Mathematics	Pune Vidyarthi Griha Prakashan,Pune
4.	G.V.Kumbhojkar	Applied Mathematics	Phadke Prakashan,Kolhapur

Reference Books:

Sr. No	Author	Title	Publication
1.	Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi
2.	Vishwanath	Engineering Mathematics Vol.II	Satya Prakashan, New Delhi
3.	B.L.Agarwal	Basic Statistics	New Age International Publication
4.	H.K. Dass	Engineering Mathematics Part II	S. Chand & Co. Ltd. Delhi

Learning Resources: Chalk Board

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	

1	Application of Integration	00	00	08	08
2	Differential Equations	04	12	08	24
3	Numerical methods	04	04	08	16
For EE / ET / CM / IT					
4	Complex Numbers	04	04	08	16
5	Laplace Transforms	04	04	08	16
For CE / ME/ MT					
6.	Statistics	04	04	08	16
7.	Vectors	04	04	08	16
	Total	**16**	**24**	**40**	**80**

(Prof. R.A.Pawar) Prepared By

(Prof. S. B. Kulkarni) Secretary, PBOS

(Prof.S.W.Warke) Chairman, PBOS

Programme : Diploma in CE/EE/ET/ME//MT/CM / IT
Programme Code : 01/02/03/04/05/06/07/15/16/
Name of Course : Development of Soft Skills - I
Course Code : NE 376

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**01**	**16**
Practical	**02**	**32**

* NON EXAM.NON CREDIT COURSES (COMPULSORY) - B # Credits over & above 180 credits

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	---	---	---	---	---
Marks	---	---	---	---	**25**

Course Rationale:

This course aims to make students aware of good interpersonal relations, Professionalism in etiquettes, importance of time management and importance of good health. The techniques such as role play, group discussions can be used effectively to demonstrate understanding emotions of persons in daily contact.

Course Objectives:

After studying this course, the student will be able to

- Develop better interpersonal relations among their peer group, subordinates and superiors and work effectively.
- Display corporate etiquettes and professionalism while attending /answering phone calls. Plan time optimally/effectively in office –work as well for their personal growth.
- Understand strengths and weaknesses of self.
- Understand /feel emotions of persons (from office and family) in daily contact and take appropriate actions.

- Demonstrate habits for keeping good health by following good food habits and daily exercise.
- Develop overall personality and be successful in his/her career.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Interpersonal Skills through Personal Development**			
	1.1	Reducing conflict by preventing problems in the classroom.	**03**	**--**
	1.2	Interpersonal Skills through Self Development and change.		
2.	**Corporate Etiquettes & Professionalism**			
	2.1	Understanding Self	**03**	**--**
	2.2	Polished personal habits		
	2.3	Ethics & Etiquettes: a way of life		
	2.4	Personal Attire & Grooming		
	2.5	Cell phone manners		
3.	**Time Management**			
	3.1	Time management skills in groups for completion of project	**03**	**--**
	3.2	Factors that lead to time loss and how they can be avoided		
	3.3	Time matrix & urgent versus Important jobs		
4.	**Managing Emotions**			
	4.1	To understand and identify emotions,	**03**	**--**
	4.2	To know our preferences		
	4.3	Strength, weaknesses ,opportunities and threats , Techniques of self control		
	4.4	To get desirable response from others		
5.	**Health Management**			
	5.1	Importance of health management,	**04**	**--**
	5.2	Relevance of it ,		
	5.3	Tips to maintain good health		
		Total	**16**	**--**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs

1.	Case studies to be discussed in a group and presentation of the same by group /group leader.	04
2.	Field exercises for the group of students.	02
3.	Role play by individual/group leader.	04
4.	Arranging Quizzes, puzzle- solving and educational games.	02
5.	Group discussions.	04
6.	Sharing of self -experiences in a group.	04
7.	Brain storming sessions	02
8.	Questionnaire -filling & discussing results of the same in a group.	04
9.	Live demonstrations on Yoga and other stress relieving techniques by professional persons.	06
	Total	**32**

Reference Books:

Sr. No	Author	Title	Publication
1.	Mr. Shiv Khera	You can win	
2.	Mr Abdul Kalam	Wings of Fire	
3.	Mr Nirfarake	Prabhavi Vyaktimatwa.(Marathi)	
4.	Mr Iyyengar	YogaDipika	
5.	Mr. Anand Nadkarni	Tan tanavache niyojan (Marathi)	
6.	Mr. Rajiv Sharangpani	Khusit raha ,Mast Jaga.(Marathi)	

Learning Resources: Video cassettes on 1. Effective Comminication 2. Group Discussions ,3. Corporate Etticates and professionalism.

(Prof. Smt.V.P.Ashwatpur)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.S.W.Warke)
Chairman, PBOS

Programme : Diploma in CE/EE/ET/ME/ MT/CM /IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Development of Soft Skills – II
Course Code : NE 377

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**01**	**16**
Practical	**02**	**32**

* NON EXAM.NON CREDIT COURSES (COMPULSORY) - B # Credits over & above 180 credits

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	---	---	---	---	---
Marks	---	---	---	---	**25**

Course Rationale:

This course aims to make students aware of importance of goal setting , develop self study techniques , importance of ethics and value system , This also aims one to inculcate creative mind along with interest in using problem solving techniques while dealing with any work. It also emphasizes about importance of stress relieving techniques to be practiced for good health.

Course Objectives:

After studying this course, the student will be able to

- Understand importance of goal setting and strategies for setting one's goal.
- Develop and practice self- study techniques.
- Use and practice stress management techniques for good health
- Use and practice problem solving skills.
- Understand importance of ethics and value system for positive interpersonal relations.

- Develop overall personality and be successful in his/her career.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Motivation & Goal Setting**			
	1.1	Importance of goal setting,	**02**	**--**
	1.2	How to set SMART goals.		
2.	**Study Habits**			
	2.1	Note taking, Methods of Learning,	**02**	**--**
	2.2	Memory Enhancement, self - Study Techniques,		
	2.3	Techniques for effective Reading and Writing.		
3.	**Stress Management**			
	3.1	Stresses in groups, how to control emotions,	**03**	**--**
	3.2	Strategies to overcome stress, understanding importance of good health to avoid stress.		
4.	**Ethics & Motivation**			
	4.1	What are ethics, how ethics help to ensure positive interpersonal relations,	**03**	**--**
	4.2	Personal value system, and personal quality primer		
5.	**Creativity**			
	5.1	Definition of Creativity, Tips and ways to increase creativity, importance of creativity.	**03**	**--**
6.	**Problem Solving Techniques**			
	6.1	Puzzles and technical quizzes to be organized to develop these skills.	**03**	**--**
		Total	**16**	**--**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs

1.	Case studies to be discussed in a group and presentation of the same by group /group leader.	04
2.	Field exercises for the group of students.	02
3.	Role play by individual/group leader.	04
4.	Arranging Quizzes, puzzle- solving and educational games.	02
5.	Group discussions.	04
6.	Sharing of self -experiences in a group.	04
7.	Brain storming sessions	02
8.	Questionnaire -filling & discussing results of the same in a group.	04
9.	Live demonstrations on Yoga and other stress relieving techniques.	06
	Total	**32**

Reference Books:

Sr. No	Author	Title	Publication
1.	Mr. Shiv Khera	You can win	
2.	Mr Abdul Kalam	Wings of Fire	
3.	Mr Nirfarake	Prabhavi Vyaktimatwa.(Marathi)	
4.	Mr Iyyengar	YogaDipika	
5.	Mr. Anand Nadkarni	Tan tanavache niyojan (Marathi)	
6.	Mr. Rajiv Sharangpani	Khusit raha ,Mast Jaga.(Marathi)	

Learning Resources: Video cassettes on 1. Motivation & Goal Setting 2. Stress Management,3. Ethics & Motivation

(Prof. Smt.V.P.Ashwatpur)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.S.W.Warke)
Chairman, PBOS

GOVERNMENT POLYTECHNIC, PUNE
(An Autonomous Institute of Govt. of Maharashtra) Diploma

Programme	**:**	Diploma in ME
Programme Code	**:**	04/24/18
Name of Course	**:**	Programming in 'C'
Course Code	**:**	AU367

Teaching Scheme:

	Hours /Week	**Total Hours**
Theory	**1**	**16**
Practical	**2**	**32**

Evaluation Scheme:

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term work**
Duration	---	---	**2 hours**	---	---
Marks	---	---	**50**	---	**50**

Course Rationale:

In this era of high speed computing, it is necessary to program computers with the help of structured & dynamic languages like „C" to study programming is useful in solving problems/tasks related to various domains. Now days almost every setup in software engineering domain chooses „C" as a basic tool to develop software.

Course Objectives:

After studying this course, the student will be able to

- Write a programs using „C" language
- Implement data types & structures related to problems.
- Solve the problems/tasks in structured way.

GOVERNMENT POLYTECHNIC, PUNE

(An Autonomous Institute of Govt. of Maharashtra) Diploma

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weigh tage
1	**Overview of 'C'**		**2**	---
	1.1	Problem, definition and analysis, Algorithm, Flow charts		
	1.2	History of Programming Languages, Development of C		
	1.3	Basic structure of 'C' program, Programming style, Simple 'C' programs		
2	**'C' Fundamentals**		**2**	---
	2.1	Data Types & Character set: C tokens, keywords & identifiers, constants, variables, Declaration of variables, assigning values to variables, defining symbolic constants.		
	2.2	Operators: Arithmetic, relational, logical, increment & decrement, conditional, bit-wise special.		
	2.3	Expressions: Arithmetic expressions, evaluation of expressions, procedure of arithmetic operators, type conversions in expressions, operator precedence & associatively, mathematical functions.		
	2.4	Managing input & output operators: Introduction, reading a character, writing a character, formatted input, formatted output, viz. use of printf(), scanf(), getch(), clrscr(), \n etc.		
3	**Decision making in 'C'**		**4**	---

	3.1	Decision making and branching: if statement (if, if-else, nested if-else).		
	3.2	Decision making and looping: while, do, do-while, for loop, continue statement, break statement.		
	3.3	Decision making using switch & goto statement.		
4	**Functions & Pointers**			
	4.1	Functions: Need of user defined functions, scope, defining functions, calling a function(call by value & call by reference)	**4**	---
	4.2	Pointers: Introduction to pointers, declaring pointer variable, initialization of pointer variable, accessing address of a variable, pointer expressions.		
5	**Arrays & Strings**			
	5.1	Arrays: Defining and declaring one and two dimensional arrays, reading and writing.	**4**	---
	5.2	Strings: Declaration and initialization of string variables, string handling functions from standard library like strlen(), strlwr(), strupr(), strcpy(), strcat(), strcmp() etc.		
		Total	**16**	---

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1	To understand concept of algorithm and flowchart in 'C' with example.	**2**
2	Simple 'C' programs based on declaring variables & assigning values to variables. (Minimum 4)	**4**
3	'C' Programs using if, if-else & nested if-else statement (two of each)	**5**
4	'C' Programs using while, do, do-while, for loop statements (two of each)	**6**
5	'C' Programs using switch & goto statement	**2**
6	'C' Programs illustrating use of continue and break statements	**2**
7	'C' Programs illustrating use of user defined functions	**3**
8	'C' Programs illustrating use of pointers	**3**
9	'C' Programs illustrating use of arrays	**3**
10	'C' Programs illustrating use of strings	**2**
	Total	**32**

Text Books:

Sr. No.	Author	Title	Publication
1	Yashwant Kanitkar	Let us 'C'	BPB Publication
2	E. Balguruswami	Programming in 'C'	Tata McGraw Hill

Reference Books:

Sr. No.	Author	Title	Publication
1	Madhusudhan Mothe	'C' for beginners	SPD Publications
2	Denis Ritchie and Kerninghan	Introduction to 'C' programming	Prantice Hall Publications

(Mr. P P Waghralkar- LME) **( )** **( )**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Programme : Diploma in ME
Programme Code : 04
Name of Course : Strength of Materials
Course Code : AM 470

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Analysis of forces on the members of structures & machines.

Determination of various stresses induced in the materials due to different types of forces.

Course Objectives:

After studying this course, the student will be able to

•	Understand the different types of forces and their effects on the bodies.
•	Basic principles related with the behavior of materials under the action of various types of forces
•	Apply the basic principles to solve the problems Apply the basic principles to solve the problems
•	To make the analysis & design of the different structural members / parts of a machine.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig - htage
1	**Introduction**			
	1.4	Mechanical properties of materials, their importance in mechanical engineering	**01**	**--**
2	**Stress & Strain**			
	2.1	Stress & Strain – concept & Definitions, elastic, plastic & rigid bodies. Hookes' law, elastic limits; Modulus of elasticity, permanent set, stress – strain curve for ductile, brittle metals.	**14**	**16**
	2.2	Poisson's ratio, Changes in dimensions of a body under Uni-axial, biaxial & triaxial stresses. Shear modulus and Bulk modulus. Complementary shear stresses. Relationship between the three modulii & application (No derivations) (Numerical problems only), Stresses developed in thin cylinders		
	2.3	Temperature stresses in homogeneous sections		
	2.4	Strain energy – Introduction and concept. Work done by external forces – Gradually applied, Suddenly applied & impact load. Stresses developed due to gradually applied, Suddenly applied & impact loadings. Resilience, Proof resilience and modulus of resilience		
3	**Shear force & Bending Moment**			
	3.1	Concept & definition of SF & BM. Sign conventions of SF & BM. Plotting of SF & BM diagrams for simply supported beams with over hangs and cantilever beam subjected to point loads & u.d.l.	**10**	**10**
	3.2	Points of zero shear and point of contra flexure and their significance		

4	**Moment of Inertia**			
	4.1	Concept of moment of inertia. MI of simple geometrical figures such as rectangle, circle and triangle.	**05**	**08**
	4.2	Parallel axis theorem and its applications. Perpendicular axis theorem. Radius of gyration. MI of composite figures		
5	**Bending Stresses**			
	5.1	Concept of Pure bending. Assumptions in theory of pure bending Equation of bending, Moment of Resistance.	**05**	**06**
	5.2	Bending stress diagram, Flexural Rigidity. Problems on bending stresses in circular, Rectangular and structural sections.		
6	**Direct and Bending Stresses**			
	6.1	Concept of eccentric load, Stresses due to eccentric load with eccentricity about one principle axis. stress distribution diagrams. Condition for no tension, limiting eccentricity, core of section.	**06**	**08**
	6.2	Problems on direct and bending stresses related to Mechanical Engineering.		
7	**Slope and Deflection**			
	7.1	Concept of slope & deflection. Slope and deflection of cantilever and simply supported beams due to point load and uniformly distributed loads only, simple problems on Macaulay's method and application of standard formulae.	**05**	**08**
8	**Principal Planes & Principal Stresses**			
	8.1	Normal stress, Shear stress & resultant stress on oblique planes, angle of obliquity. Concept of principal planes and principal stresses.	**07**	**08**
	8.	To locate Principal planes, to calculate principal stresses, plane of max. shear analytically and graphically using Mohr's Circle Method.		
9	**Columns & Struts**			

	9.1	Short columns and long columns, Effective length and end conditions of columns. Slenderness ratio.	**05**	**08**
	9.2	Euler's theory & its limitations. Rankine's crippling load, Safe load on column, simple problems on Euler's and Rankine's formulae		
10	**Torsion**			
	10.1	Theory of pure torsion, Assumptions in theory of torsion, Equation of Torsion, Strength of shaft.	**06**	**08**
	10.2	Shear stresses in hollow & solid shafts, angle of twist, torsional rigidity. Power transmitted by shaft, simple problems based on pure torsion		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Study of UTM, extensometer. Tension test on M.S. specimen.	**4**
2.	Compression test on metals.	**1**
3.	Shear test on metals.	**1**
4.	Impact tests on metals.	**2**
5.	Hardness Test on metals	**2**
6.	To plot SFD & BMD for simply supported beams, cantilever and overhanging beams. (Two problems each)	**2**
7.	Bending test on timber beam.	**2**
8.	To locate Principal planes, to calculate principal stresses using Mohr's circle method.(Two problems)	**2**
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Stresses and strains	Lectures & Demonstrations
3.	Shear force & Bending moment	Lecture method.
4.	Moment of inertia	Lecture method.
5.	Bending Stresses	Lecture method.
6.	Direct & Bending stresses	Lecture method
7.	Slope & Deflection	Lecture method.
8.	Principal planes & stresses	Lecture method.
9.	Columns & Struts	Lecture method.
10.	Torsion	Lecture & Demonstration method.

Text Books:

Sr. No	Author	Title	Publication
1.	Y.N. Walawalkar	Strength of Materials	Everest Publishing House.
2.	M.N. Panchanadikar	Strength of Materials	Pune Vidyarthi Griha
3.	R.S. Khurmi	Strength of Materials	S. Chand & Company Ltd., New Delhi.

Reference Books:

Sr. No	Author	Title	Publication
1.	Dr. V.L. Shah	Strength of Material	Structures Publishers, Pune
2.	Singer & Patel	Strength of Materials	Harper & Row (N.Delhi)
3.	S. Ramamrutham	Strength of Materials	Dhanpatrai & Sons (N.D.)

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	--	--	--	--
2.	Stresses and strains	05	07	04	16
3.	Shear force & Bending moment	04	06	--	10
4.	Moment of inertia	02	02	04	08
5.	Bending Stresses	02	02	02	06
6.	Direct & Bending stresses	--	04	04	08
7.	Slope & Deflection	04	04	--	08
8.	Principal plans & stresses	02	02	04	08
9.	Columns & Struts	02	02	04	08
10.	Torsion	02	02	04	08
Total		**23**	**31**	**26**	**80**

(Prof. Koranne R.M.) (Prof. S. B. Kulkarni) (Prof. S.W. Warke)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME / MT
Programme Code : 04 / 05
Name of Course : Electrical machines & Controls.
Course Code : EE 470

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	--	**50**

Course Rationale:

Diploma in mechanical engineering students often come across the electrical machines and their controls in the field of maintenance, manufacturing unit, commissioning of machineries. Under such situation mechanical diploma holder should understand the problems & its solution. Also he would able to rectify minor electrical faults and determine technical specifications of electrical machines & related control equipments. To have such knowledge this course has been introduced to mechanical engineering students.

Course Objectives:

After studying this course, the student will be able to

- Explain the concepts of force, inertia, speed, torque and the difference between work and power.
- Transform electrical energy into mechanical & vice-versa.
- Understand the power flow in electrical machine, losses & overall efficiency.
- Describe the operation of a DC motor and understand the performance of D.C. motor.
- Understand the starting and speed control of D.C. motor.
- Identify nameplate information on a DC motor necessary for application to a DC drive.
- Understand the braking of D.C. motor.
- Describe the construction of a squirrel cage AC motor and working of AC motor.
- Calculate synchronous speed, slip, and rotor speed.
- Plot starting torque, accelerating torque, breakdown torque, and full-load torque on a NEMA torque curve.
- Describe the relationship between V/Hz, torque, Horsepower and match an AC motor to an application and its load.
- Understand the construction, working principle and characteristics of synchronous motor.
- Understand the construction, working principle and characteristics of special motors.
- Understand the fundamentals of thyristors & its working.
- Understand the working of controlled rectifier, chopper & inverter.
- Understand the working of D.C. drives, AC drives & synchronous drives.
- Able to select AC motor & its drive for particular applications and find it technical specifications.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1	**Introduction**			
	1.1	Review of following terminology & their relationships: - Force, torque, speed, acceleration, law of inertia, friction, Mechanical work, power; horsepower, power of motor, kinetic energy.	**04**	**06**
	1.2	Transformation of electrical energy to mechanical energy & vice-versa.		
	1.3	Efficiency of machines and losses.		
	1.4	Speed of motor-load system.		
	1.5	Power flow in a mechanically coupled system, motor driving a load having inertia, Electric Motors driving linear motion loads.		
2	**D.C.Motors**:			
	2.1	Review of construction and working principle of D.C. motors & its type; importance of back emf.	**07**	**12**
	2.2	Mechanical power and torque, torque & speed of D.C. Motor, speed equation, Speed regulation.		
	2.3	Operating characteristics of D.C. motors: - Torque Vs Armature current, speed Vs armature current, speed Vs torque.		
	2.4	Speed control of D.C. motors. • Armature voltage speed control method • Field control method of speed control.		
	2.5	Performance of D.C. motors & their applications, nameplate of D.C. Motor.		
	2.6	Starting of D.C. Motor: - Necessity of starter, 3 point starter.		
	2.7	Electric Braking: - advantages. & disadvantages of Electric braking over mechanical braking, types of electric braking such as plugging and dynamic braking.		
3	**Three phase Induction motors**			
	3.1	Review of construction and working principle of 3		

		phase.I.M. & types of 3 phase.I.M.	**10**	**16**
	3.2	Slip frequency, rotor current & speed of rotor field, rotor emf, rotor current, rotor torque, measurement of slip.		
	3.3	Starting torque, running torque, starting current & full load current, Torque-slip characteristics, effect of change in rotor resistance upon torque vs. slip characteristics. Effect of change in supply voltage on starting torque and torque - slip, effect of change in frequency on torque.		
	3.4	Starting & running characteristics of 3 phase.I.M. determination of starting & full load current of given induction motor.		
	3.5	Performance of 3 phase.I.M. - Performance characteristics of 3 phase.I.M. & applications of 3 phase.I.M.		
	3.6	Starting of 3 phase.I.M. : - Starting of 3 phase.I.M ,D.O.L. starter/ star-delta starter, Automatic start-delta starter, Auto- transformer starting & starter.		
	3.7	Speed control of 3 phase.I.M: Concept of speed control, speed control. i) By variation of supply frequency. ii) Supply voltage, iii) changing number of poles.		
	3.8	Motor Nameplate, Selection of motors. • Standardization & classification of I.M. • Classification of I.M. according to environment and cooling methods. • Classification according to electrical & mechanical Properties. • Choice of speed.		

4	**Synchronous motors**			
	4.1	Construction and working principle of synchronous motor.	**06**	**08**
	4.2	Starting of synchronous motor.		
	4.3	Effect of load on synchronous motor.		
	4.4	Effect of varying excitation on current & power factor.		
	4.5	Power & torque, losses and efficiency of synchronous motor; V curves, Applications of synchronous motor		
5	**Special Motors.**			
	5.1	Construction, working principle, characteristics & applications of following 1 phase.I.M. • Split phase and capacitor start 1phase motor, • Shaded pole I. M. • Universal motor. • Linear I.M. • Brushless d.c.motor. • Stepper motors. • A.C. servo motor. • D.C. servo motor	**07**	**12**
6	**Fundamental of power Electronics**			
	6.1	Silicon controlled Rectifier (SCR) working principle, characteristics, and symbol.	**02**	**04**
	6.2	SCR firing principle.		
7	**Controlled Rectifier & D.C. Drives.**			
	7.1	(**No mathematical treatment only working & waveform for understanding the concept.)** Half & full wave controlled rectifier.	**06**	**10**
	7.2	Working principle of Thyristor Chopper.		
	7.3	**D.C. Drives:-**Special feature of d.c. drive, basic		

		operation of d.c. drive with d.c. motor at no load and full load, changing the direction of d.c. motor, drives specifications, Selection of drives for d.c. motors.		

8	**Inverter & A.C. drives.**			
	8.1	Introduction and working principle of inverter.	**06**	**12**
	8.2	Working principle and applications of A.C. drives.		
	8.3	Correlation of above concept to VFD, technical specification of VFD, selection & applications of VFD.		
	8.4	Synchronous motor drive: working principle, technical specification & applications.		
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Plot characteristics (i.e. Torque Vs Armature current, speed Vs armature current, speed Vs torque) D.C. Shunt motor.	**02**
2.	Plot characteristics (i.e. Torque Vs Armature current, speed Vs armature current, speed Vs torque) D.C. series motor.	**02**
3.	To perform speed control of D.C. shunt motors by • Armature voltage speed control method • Field control method of speed control. • Reversal of rotation of D.C. shunt motor.	**04**
4.	Study of three point starter and its connection to D.C. shunt motor.	**02**
5.	Study of nameplate of D.C. Motor and selection motor for particular load.	**02**
6.	Measurement of slip by a) Tachometer b) Stroboscopic method.	
7.	To perform load test on three phase I.M. and plot the characteristics. Also study the nameplate of three phase I.M.	**04**
8.	a) Study of D.O.L. & star-delta starter. b) Record starting & running (no load & full load) current of three phase I.M. by i) D.O.L. starting method ii) Star – delta starting method.	**04**
9.	Speed control of three phases I.M. by i) Supply voltage, ii) changing	**04**

	number of poles. iii) By changing rotor resistance.	
10.	a) Determine the phase sequence of three phase supply. b) Reversal of rotation of three phase I.M.	**02**
11.	To plot V curves of synchronous motor.	**02**
12.	Connection and reversal of rotation of following motors • Stepper motor, • Servo motor.	**04**
13.	Study dc drive & its connection to d.c. motor. Also perform speed control by drive.	**04**
14.	Study VFD & its connection to three phase induction motor and plot frequency Vs speed characteristics.	**04**
	Total	**40**

Note: Minimum any 12 practicals are to be performed.

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method, PPTs.
2.	D.C. Motors	Lecture, demonstration & working models, PPTs.
3.	Three Phase Induction motors.	Lecture, demonstration & working models, PPTs.
4.	Synchronous motor.	Lecture, working models, PPTs.
5.	Special Motors.	Lecture, demonstration & working models, PPTs.
6.	Fundamentals of Power Electronics.	Lecture method, PPTs.
7.	Controlled rectifier & D.C. Drives.	Lecture method, PPTs, case study.
8.	Inverter and A.C. Drives.	Lecture method, PPTs, demonstration & case study.

Text Books:

Sr. No	Author	Title	Publication
1.	Theodore Wildi	Electrical Machines, Drives and Power system.	Pearson Education.
2.	B.L. Therja	Electrical Technology Vol-II	S. Chand & co.

Reference Books:

Sr. No	Author	Title	Publication
1.	M.H. Rashid	Power electronics	PHI
2.	P.C. Sen	Power electronics	TMH
3.	J.B. Gupta	Electrical Machines.	S.K. Kataria

Learning Resources: 1) Text books, reference books, Models, 2) Laboratory work,3) Industrial visit, 4) Siemens product manual & training manual and 5) Animated clips for understanding concept of motor from website.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	02	04	00	06
2.	D.C. Motors	04	04	04	12
3.	Three Phase Induction motors.	04	06	06	16
4.	Synchronous motor.	04	02	02	08
5.	Special Motors.	04	04	04	12
6.	Fundamentals of Power Electronics.	02	02	00	04
7.	Controlled rectifier & D.C. Drives.	02	04	04	10
8.	Inverter and A.C. Drives.	04	04	04	12
	Total	**26**	**30**	**24**	**80**

(Prof. K.M. Kakade) (Prof. S. B. Kulkarni) (Prof. S. W. Warke)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Thermodynamics And Heat Engines
Course Code : ME 461

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Power engineering incorporating basic principles of the thermodynamics and heat transfer forms an essential element of any mechanical engineering course these days. In this core area, students will be able to solve many problems related to this and inter areas, because the principles involved have universal applications. Keeping this in mind, the present course lays more emphasis on understanding the basic principles of thermodynamics and heat transfer and applying these to practical thermodynamics practical problems. The understanding of fundamentals will also be of direct relevance later when power engineering – II is studied.

Steam power plants are being established in the country in a big way to cater for the spurt in power demand. It is expected that a large number of mechanical technicians will be associated with planning erecting, running and maintain steam power plant. The present course includes the study of important components of such plants so that these technicians do not find themselves stranger if called upon to perform these jobs.

Course Objectives:

After studying this course, the student will be able to

•	Understand units dimensions for common physical quantities.
•	Use systems concept for solving thermodynamics problems. Apply the first law of thermodynamics various thermodynamic systems.
•	Understand the second law of thermodynamics.
•	Understand the ideal gas laws and determine energy quantities for ideal gas process.
•	Understand properties which apply to two phase systems and determine energy quantities for two phase systems.
•	Understand working principles of common high pressure boilers.
•	Understand working principles of various mounting and accessories.
•	Know various draught systems.
•	Understand working of steam turbines and their subsystems.
•	Understand the functions and working of condensers.
•	Solve problems related to combustion of fuels

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1	**Thermodynamic principles**			
	1.1	Units and dimensions of force, Pressure, Volume, Temperature, Work, Power. (S.I. units).	**16**	**24**
	1.2	Basic concepts – Thermodynamic systems, boundary, surroundings. Types of system closed and open, properties like specific volume, density, pressure, temperature. Process, work, thermodynamic definitions, work done at the moving boundary, heat thermodynamic definition, difference between heat and work.		
	1.3	First law of thermodynamics : First law for closed system, internal energy, first law for open system, potential energy, kinetic energy, flow energy, steady		

		flow energy, equation, enthalpy. Application of first law to the close system, application of first law to open system like boiler, turbine, engine, nozzle, condenser, pump, compressor, throttling. Definition of specific heat Cp and Cv.		
	1.4	Second law of thermodynamics : Heat engine, thermal efficiency, second law of thermodynamics, Kelvin Plank and Clausius statement, equivalence of two statements, reversible process, factors making process irreversible, entropy, property of system entropy change in reversible processing.		
2	**Ideal gases and ideal gas processes**			
	2.1	Definition of an ideal gas, ideal gas laws equation of state or characteristic of gas equation, specific and universal gas constant, specific heat, internal energy and enthalpy analysis of ideal gas processes assuming constant specific heats,	**08**	**16**
	2.2	Process like constant volume (isochoric), constant pressure (isobaric), adiabatic (isentropic), irreversible adiabatic, polytropic, throttling etc. may be considered. In each case change in internal energy, enthalpy, entropy and determination of heat and work may be considered, and processes plotted on pressure volume (P-V) and temperature entropy (T-S) diagrams.		
	2.3	Two phase system : Properties and property changes for vapour like steam, P-V, T-S diagram, Mollier diagrams (H-S diagrams).		

3	**Steam power plant subsystems**			
	3.1	Steam boilers : Classification, description and working of common boiler (this may be included in laboratory work only and should be as a demonstration in laboratory with available models, charts)	**04**	**16**
	3.2	Maintenance and inspection boilers.		
	3.3	Principles of steam generation in modern steam power with particular reference to (1) Lamont, (2) Loeffler, (3) Velox and (4) Benson boiler.		
	3.4	Boiler mountings and accessories, study of various boiler mountings such as safety valve, water level indicators, pressure gauge, feed check valve, blow off cock, fusible plug (this should be done in laboratory with available models and charts). Study of various boiler accessories such as feed water injector, economiser, super heater, air heater, (this should be done in laboratory with available models and charts).		
	3.5	Boiler draught – natural and artificial draught, relative merits and demerits (No analytical treatment).		
4	**Steam nozzles and steam turbines**			
	4.1	Steam nozzles, continuity equation, steady flow energy equation.	**06**	**08**
	4.2	Impulse Turbine, Reaction Turbine compounding and various methods of compounding of turbines their relative comparison.		
5	**Condensers and cooling tower**			
	5.1	Vacuum, function of condensers, classification of condensers	**08**	**08**
	5.2	jet and surface condensers. “Dalton’s law of partial pressure",		
	5.3	sources of air leakage into condenser,		
	5.4	effects of air leakage, definitions of vacuum efficiency, condenser efficiency,		
	5.	cooling towers, description		

	5			
6	**Fuels and fuel combustion**			
	6.1	Calorific value of fuels (higher and lower), flash point and fire point, calculation of minimum air requirement for complete combustion, fuel gas analysis.	**06**	**08**
	6.2	Alternative fuels like LPG, CNG, Hydrogen, advantages and disadvantages. volumetric analysis of exhaust gas, conversion of one into other.		
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Experiments to measure the following situations. a. Pressure above and below atmosphere. b. Temperature (temperature of following fluid & surface temperature) c. Flow measurement of fluids (cooling, water, steam, Refrigerant) d. Speed e. Power (brakes and dynamometer Indicators)	04
2.	Study by models, charts and actual units of the following : common types of fire tube and water tube boilers (one example of each type in details)	04
3.	Boiler mountings and accessories (any four mountings and any two accessories in details)	04
4.	Steam turbine	04
5.	Surface condenser	04
6.	Cooling tower	04
7.	Bomb calorimeter & Boys gas calorimeter	04
8.	Analysis of exhaust gas with the use of orsat apparatus	04
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Thermodynamic principles	Lecture, Demonstration & Discussion
2.	Ideal gases and ideal gas processes	Lecture method, Demonstration
3.	Steam power plant subsystems	Lecture, Demonstration & Discussion
4.	Steam nozzles and steam turbines	Lecture method, Demonstration
5.	Condensers and cooling tower	Lecture, Demonstration & Discussion
6.	Fuels and fuel combustion	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	P.K.Nag	Thermodynamics and Heat Engines	TATA McGraw Hills, New Delhi
2.	Patel and Karamchandani	Elements of heat engines Vol I, II and III	Acharya Publication, Vadodara
3.	P.L. Ballaney	Thermal Engineering	Khanna Publishers Delhi,

Reference Books:

Sr. No	Author	Title	Publication
1.	Roy and Chaudhari	Engineering thermodynamics	TATA McGraw Hills, New Delhi
2.	Pandya and Shah	Element of heat engines	Charotar Book Stall, Anand
3.	D.A. Low	Element of heat engines	Longman Publication, London
4.	Mathur	Thermodynamics	
5.	R.S. Thetty	Power Engineering	Tata International Publishing, Delhi -6
6.	Domkundwar, Kothand Ram, Khajuria Aurora	Thermal Engineering	Dhanpatrai and Sons, Delhi 6
7.	S.Domkundwar	Course in heat and mass	Dhanpatrai and Sons, Delhi

		transfer	6
8.	C.P. Aurora	Heat and mass transfer	Khanna Publication
9.	Sukhatme S.P.	Heat Transfer	Orient Longman Publication,
10.	Lewitt	Thermodynamics and applied to heat engines	Sir Issac Publication Ltd.
11.	P.B. Joshi, V.S. Tumane	Engineering thermodynamics	Pune Vidyarthi Griha Prakashan, Pune 30
12.	A.S. Sarao	Thermal engineering	Satya prakashan, New Delhi
13.	Kumar, Vasandani	Heat Engineering	Metropolitan book company (p) Ltd. Delhi-6

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Thermodynamic principles	06	10	08	24
2.	Ideal gases and ideal gas processes	04	02	10	16
3.	Steam power plant subsystems	08	04	04	16
4.	Steam nozzles and steam turbines	04	02	02	08
5.	Condensers and cooling tower	04	02	02	08
6.	Fuels and fuel combustion	02	02	04	08
	Total	28	32	30	80

(Prof. A.V. Joshi) (Prof. Kulkarni S. B.) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Fluid Mechanics & Fluid Machinery
Course Code : ME462

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Knowledge of fluid pressure, fluid flow and related machinery is essential in all fields of engineering.

Hydraulic machines and hydraulic devices have important role in power generation, power transmission, water supply, irrigation and other engineering segments.

This subject requires the knowledge of basic engineering science, applied mechanics and mathematics etc.

The fundamentals of this subject are essential for the subject Industrial Hydraulics to be taught in higher semesters.

Course Objectives:

After studying this course, the student will be able to

- Understand the theoretical concepts involved in the pressure, velocity and discharge measurements.
- Understand the theoretical concepts involved in the calculation of parameters such as coefficient of friction, power and efficiency of various systems
- Understand the construction and working of different hydraulic machines
- Select turbines and pumps.
- Locate faults in turbines and pumps and suggest remedies

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1	**Fluids, Fluid Pressure & Measurement of Pressure**			
	1.1	Fluid, types of fluids, properties of fluids and units	**09**	**16**
	1.2	Pascal's Law, concept of static pressure, pressure head, centre of pressure and total pressure for rectangular, circular and triangular plane surfaces.		
	1.3	Concept of atmospheric pressure, Gauge pressure and vacuum pressure. Pressure head measurement by Piezometer, U-tube manometer, inverted U-tube manometer, micro manometer and Bourdon's pressure gauge.		

2	**Flow of Fluids**			
	2.1	Types of flows, law of continuity, Reynolds's number.	**08**	**12**
	2.2	Energies possessed by flowing liquids like pressure, kinetic and potential energy, total energy equation		
	2.3	Bernoulli's theorem with proof and its application to venturimeter and Pitot tube		
	2.4	Derivation for discharge through Venturimeter		
	2.5	Hydraulic coefficients, determination of coefficient of velocity by trajectory method		
	2.6	Flow through small circular orifice, rectangular and V-notches.		
3	**Flow through Pipes**			
	3.1	Laws of fluid friction for laminar and turbulent flow. Darcy's equation for frictional loss. Different types of head losses in pipes.	**07**	**12**
	3.2	Hydraulic gradient line, total energy line.		
	3.3	Power transmitted thorough pipes, transmission efficiency, water hammer and its effects		
4	**Impact of Jet and Water turbines**			
	4.1	Impact of jet and generation of force on stationary and moving flat plate, stationary and moving curved vanes.	**10**	**16**
	4.2	Tangential entry on the moving vanes mounted on wheel, calculation of work done and efficiency.		
	4.3	Simple layout of hydro-electric power plant showing dam, reservoir pen stock, surge tank pressure relief valves turbine pen stock and tail race.		
	4.4	Classification of turbines, principles of working and construction of Pelton, Francis, and Kaplan Turbines.		
	4.5	Velocity diagram for Pelton wheel and Francis turbine, calculation of work done, power developed losses and different efficiencies		
	4.6	Methods of governing, performance characteristics,		
	4.7	Principles of similarity, calculations and model testing.		
5	**Centrifugal Pumps**			
	5.1	Classification and applications of pumps, main components, construction, and working. Priming,	**09**	**16**

		different heads, velocity diagrams, calculation of power required to drive the pump, manometric efficiency and overall efficiency. NPSH and performance characteristic curves		
	5.2	Multistage pumps, submersible pumps, maintenance and fault finding, their remedies. Installation and testing of centrifugal pumps and pump selection		
6	**Reciprocating pumps and Hydraulic devices**			
	6.1	Construction and working of single acting and double acting pumps, indicator diagramme. Positive and negative slip, calculation of power required. Air vessels, functions and advantages.	**05**	**08**
	6.2	Working principle, construction & applications of hydraulic intensifier, hydraulic accumulator, hydraulic press and hydraulic lift. Working principle, construction & applications of hydraulic intensifier, hydraulic accumulator, hydraulic press and hydraulic lift.		
Total			**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Determination of coefficient of discharge of rectangular notch or circular orifice.	4
2.	Determination of coefficient of discharge of Venturimeter.	4
3.	Determination of coefficient of friction for flow through pipes.	4
4.	Determination of loss of head due to sudden enlargement and sudden contraction in pipes.	4
5.	Observe construction and working of Hydram.	4
6.	Observe construction, working and find power and efficiency of Pelton wheel or Francis turbine.	4
7.	Observe construction working & find power & efficiency of centrifugal pump.	4
8.	Observe construction, working find power & efficiency of reciprocating pump.	4
Total		**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Fluid, Fluid Pressure and Measurement of pressure	Lecture method, Demonstration
2.	Flow of Fluids	Lecture method, Demonstration
3.	Flow through Pipes	Lecture method, Transparencies
4.	Impact of Jet and Water turbines	Lecture method, Transparencies
5.	Centrifugal Pumps.	Lecture, Demonstration & Discussion
6.	Reciprocating pumps and hydraulic devices	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	R.S. Khurmi	Fluid mechanics and Hydraulic machines	S.Chand and Co. Ltd.

Reference Books:

Sr. No	Author	Title	Publication
1.	Jagdishlal	Hydraulic machines and Fluid mechanics- Vol I & II	Metropolitand Book Ltd.
2.	Modi Seth	Fluid mechanics and Hydraulic machines	Std. Book House, New Delhi

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Fluid, Fluid Pressure and Measurement of pressure	06	04	06	16
2.	Flow of Fluids	08	02	02	12
3.	Flow through Pipes	06	02	04	12
4.	Impact of Jet and Water turbines	04	04	08	16
5.	Centrifugal Pumps	04	04	08	16
6.	Reciprocating pumps and hydraulic devices	04	02	02	08
Total		**32**	**20**	**28**	**80**

(Prof. B. Prasad)	(Prof. S. B. Kulkarni)	(Prof. Warke S. W.)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME

Programme Code : 04/18/24

Name of course : **Machine Drawing**

Course Code : ME468

Teaching Scheme :

Theory/Practical	Hours/ Week	Total Hours
Theory	02	32
Practical	04	64

Evaluation Scheme :

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	4 Hrs	--	--	--
Marks	20	80	--	--	25

Course Rationale:

With the Science & Technology advancing at a rapid pace, the type of man power required by the industry and society is becoming more & more specific. Industry requires among other things a workforce having a technological bent of mind and the much desired temper and competencies to maintain high quality standards & productivity. The quality & productivity depends mainly on the ability of Technician to communicate through drawing. Mechanical Technicians are able to read the drawing correctly. The drawing prepared must be clear and it should not have any scope for different interpretations. Machine drawing is more of a performance based rather than knowledge based.

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Diploma in Mechanical Engineering

Course Objectives:

After studying this course the student will be able to

- Visualize the given objects.
- Draw developments of common engineering objects used in sheet metal work.
- Draw inter-penetration curves of common engineering objects used in sheet metal work.
- Understand various conventions as per B.I.S.
- Draw assembly drawing from the given details.
- Draw detailed (part) drawing from given assembly drawing and vice a versa.
- Read and interpret the drawing correctly.

Course Content

Chapter		Name of Topics / Sub topics	Hours	Marks
1.	1.1	**Sections of Solids** Sectional representation of solids. Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other & when the section plane is perpendicular one reference plane and inclined to other, drawing of true shape of section.	**04**	**08**
2.	2.1	**Development of surfaces of solids** Development of lateral surfaces of cube, Prism, Cylinder Pyramid, Cone and their applications such as tray, Funnel, Chimney, Pipe bends etc…	**04**	**08**
3		**Intersections of solids** Curves of intersection of surfaces of the solids in the following cases a) Prism with prism, Cylinder with cylinder, Prism with cylinder, when 1) The axes are 90° and intersecting 2) The axes are 90° and offset b) Cylinder with cone When the axis of cylinder is parallel to both the reference plane and cone resting on base on HP. and with axis intersecting & at 90° & offset from the axis of	**05**	**08**

		cylinder.		
4		**Auxiliary views :** Study of auxiliary planes, projection of objects on auxiliary planes. Completing the regular view with the help of given auxiliary views.	**04**	**08**
5		**Conventional Representation** **Standard conventions using sp – 46(1988)** a) Materials C.I., M.S., Brass, Bronze, Aluminium, Wood, Glass, Concrete & rubber. b) Long & short break in pipe, rod & shaft. c) Ball & roller bearings, Pipe joints, cocks, valves, internal / External threads. d) Various sections - Half, removed, revolved, off-set, partial and aligned section. e) Knurling, serrated shaft, splined shaft and chain wheels. f) Springs with square and flat ends, Gears, sprocket wheel. g) Counter sunk, counter bore. h) Tapers.	**02**	**08**

6		**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 tolerancing, dimensional tolerances, and elements of interchangeable system, hole & shaft based system, limit, fits & allowances, Selection of fits. 3) Geometrical tolerances, tolerances of form and position and its geometrical representation 4) General welding symbols, sectional representation and symbols used in	**03**	**04**

		engineering practice		
7		**Free hand sketching** Free hand sketching of the following components : Keys, Sunk. Saddle, Taper, Gib headed feather keys, Splined shaft, Woodruif key, Cone key Joints & couplings.- cotter joint, knuckle joint, turn buckle, muff, flanged, flexible, universal & oldham's couplings. *I.C. Engine parts – piston (two stroke, four stroke) Connecting rod, crank (disc & overhung) Bearings, journal, pedestal (plummer block) foot step bearing* Spur & helical gears, Bevel gears, worm& worm wheel.	**04**	**16**
8		**Details to assembly & Assembly to details** 1) Introduction 2) Couplings – Universal coupling & old ham's coupling 3) Bearings – foot step bearing & Pedestal bearing 4) Lathe tool post 5) Machine vice 6) Screw jack 7) Lathe tailstock 8) Drilling jigs 9) Piston & connecting rod 10) Gland & stuffing box assembly 11) Valve (not more than eight parts)	**06**	**20**
Total			**32**	**80**

A) Each student will draw 7 Half imperial size drawing sheets and will submit at the end of term.

B) A sketch book containing minimum 3 home assignments to be submitted by each student at the end of term.

Sheet No.	Particulars	Hours
01	Sections of solids – 2 problems	04
02	Development of solids – 2 problems	04
03	Intersection of solids – 2 problems	04
04	Auxiliary views -- 2 problems	04
05	Free hand sketching (min 6 objects)	04
06	Assembly to details – one sheet	06
07	Details to assembly – one sheet	06
	Total	**32**

Text Books:

Sr. No	Author	Title	Publication
1.	N.D. Bhatt	Engineering Drawing	Charotar Publishing House, Anand
2.	N.D. Bhatt	Machine Drawing	Charotar Publishing House, Anand
3.	Mali. Choudhary	Machine Drawing	Vrinda Publication
4.	Kannaiah, Narayan & K. vekanta Reddy	Machine Drawing (II edition)	New Age International Limited.
5.	R.B. Gupta	Engineering Drawing	Satya Prakashana, New Delhi
6.	Kamat, Rao	Machine Drawing	Jeavandeep Prakashan, Mumbai
7.	Pandya Shah	Machine Drawing	Charotar Publishing House, Anand
8.	Mandke	Machine Drawing	Nirali Prakashan, Pune
9.	Khurmi, Gupta	Machine Drawing	Eurasia Publ. Hs. (Pvt.) Ltd., New Delhi.

Reference Books:

Sr. No	Author	Title	Publication
1.	--	S.P. 46 – 1988 Code of Engg. Drawing for Schools & Colleges	Bureau of Indian Standards, New Delhi
2.	--	I.S. 813 – 1988 Code of welding symbols	Bureau of Indian Standards, New Delhi
3.	--	C.M.T.I. Hand Book	C.M.T.I., Banglore

Learning Resources:

S.P. 46 – 1988, I.S. 813 – 1988, Text Books, Actual working assemblies eg. Bench vice, pipe vice, screw jack, tool post, tail stock piston, cylinder connecting rod, crank and models of keys, cotter joints knuckle joints, Pulleys, plumbing material used.

(Prof. D. P. Khadse)	(Prof. S. B. Kulkarni)	(Prof. Mrs Deshmukh M. S.)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04/18
Name of Course : Mechanical Measurements
Course Code : ME 464
Prerequisite : SC167

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**01 (02** Periods alternate week**)**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**10**	**40**	--	--	**25**

Course Rationale:

Methods and techniques of measurements are becoming increasingly important in engineering in recent years laboratory programmes have been modernized, sophisticated electronic instrumentation has been incorporated into the programme and newer techniques have been developed. The course aims at making a Mechanical Engineering student familiar with the principles of instrumentation, transducers & measurements electrical parameters like temperature, pressure, flow, speed, force and stress. Sound knowledge of measurement of various quantities associated with particular engineering application/ process/ equipment is very necessary. Considering vital importance of measurement and associated measurement techniques/ equipments it is essential that diploma engineer should have good proficiency of mechanical measurement

Course Objectives:

After studying this course, the student will be able to

- Understand the principle of operation of an instrument.
- Appreciate the concept of calibration of an instrument.
- Select Suitable measuring device for a particular application.
- Distinguish between various types of errors.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig-htage
1	**Significance of measurement**			
	1.1	Classification of instruments, static terms and characteristics- range and span, accuracy and precision, reliability, calibration, hysterisis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity. Dynamic characteristics- speed of response, fidelity and dynamic errors, overshoot.	07	08
	1.2	Measurement of error- classification of errors, environmental errors, signal transmission errors, observation errors, operational errors.		
	1.3	Transducers : Classification of transducers- active and passive, resistive, inductive, capacitive, piezo, resistive, thermo resistive Specification, selection and application for pressure, temperature, flow, humidity, displacement, velocity, force, strain, sound .		

2.	**Control systems**			
	2.1	Block diagram of automatic control system, closed loop system, open loop system, feed back control system, feed forward control system, servomotor mechanism, comparison of hydraulic, pneumatic, electronic control systems, proportional control action.	05	08
	2.2	Applications of measurements and control for setup for boilers, air conditioners .motor Sneed control.		
3	**Displacement measurement**			
	3.1	Potentiometer, LVDT, Eddy current generation type,Tachometer, incremental and absolute type. Speed measurement - Mechanical Tachometers, Revolution counter & timer, Slipping Clutch Tachometer, Electrical Tachometers, Eddy current Drag Cup Tachometer, Magnetic and photoelectric pulse counting methods, Contact less Electrical tachometer, Inductive Pick Up, Capacitive Pick Up, Stroboscope	05	06
4	**Temperature measurements**			
	4.1	Non-electrical methods- bimetal and liquid in glass thermometer, pressure thermometer	05	06
	4.2	Electrical methods- RTD, platinum resistance thermometer, thermostat		
	4.3	Thermoelectric methods- elements of thermocouple, law of intermediate temperature, law of intermediate metals, thermo emf measurement.		

5	**Flow measurements**			
	5.1	Variable head flow meters, variable area meter-rota meter, turbine meter, anemometer- hot wire and hot film, electromagnetic flow meter, ultrasonic flow meter.	05	06
	5.2	Strain Measurement-Stress-strain relation, types of strain gauges, strain gauge materials, resistance strain gauge-bonded and unbounded, types (foil, semiconductor, wire wound gauges), , selection and installation of strain gauges load cells, rosettes		
6	**Miscellaneous measurement**			
	6.1	Acoustics measurement- sound characteristics - intensity, frequency, pressure, power - sound level meter, piezoelectric crystal type.Humidity measurement -hair hygrometer, Humistor hygrometer Liquid level measurement - direct and indirect methods Force measurement -Tool Dynamometer (Mechanical Type) Shaft Power Measurement - Eddy Current Dynamometer, Strain Gauge Transmission Dynamometer.	05	06
		Total	**32**	**40**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Study of generalized measurement & its components	02
2.	Study & detection of different types of errors in any one measurement system	02
3.	Calibration of pressure gauge using Dead weight Tester	02
4.	Temperature Measurement using thermocouples & Thermistors.	02
5.	Temperature measurement using Radiation / Optical pyrometer.	02
6.	Displacement measurement using Linear variable differential transducer.	02
7.	Force measurement on load cell demonstrator	02
8.	Speed measurement with Magnetic pickup transducer/ Strobosc	02
	TOTAL	16

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Significance of measurement	Lecture method, Demonstration
2.	Control systems	Lecture method, Demonstration
3.	Displacement measurement	Lecture method, Transparencies
4.	Temperature measurements	Lecture method, Transparencies
5.	Flow measurements	Lecture, Demonstration & Discussion
6.	Miscellaneous measurement	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	A.K.Sawhney	Mechanical Measurements & Instrumentation	Dhanpat Rai & Sons, New Delhi.
2.	R.V. Jalgaonkar	Mechanical Measurement & Control	Everest Publishing House, Pune
3.	D.S.Kumar	Mechanical Measurements & Control	Metropolitan Publications, New Delhi
4.	C.S. Narang	Instrumentation Devices & Systems	Tata McGraw Hill Publications
5.	R.KJain	Mechanical & Industrial Measurements	Khanna Publications, New Delhi
6.	B.CNakra and K.K.Chaudhry	Instrumentation, Measurement and Analysis	Tata Me Graw Hill Publication

Learning Resources:

Chalk, Board etc, Animations, Power point presentations, Industrial Automation Magazine and Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Significance of measurement	04	02	02	08
2.	Control systems	02	02	04	08
3.	Displacement measurement	02	02	02	06
4.	Temperature measurements	02	02	02	06
5.	Flow measurements	02	02	02	06
6.	Miscellaneous measurement	02	02	02	06
	Total	**14**	**12**	**14**	**40**

(Mrs Jadhav V.S.)	(Prof. S. B. Kulkarni)	(Prof. Warke S.W.)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04/18
Name of Course : Theory of Machines and Mechanisms
Course Code : ME 467

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

In this machine age it is necessary to know the mechanism of machines to understand its functioning. A number of links transmitting the forces and motion will comprise mechanism. The subject deals with geometry of mechanism as well as the forces acting, acceleration of links, inversion of mechanisms different power drives, power transmitting equipment.

The scope of subject is kinematics and dynamics of machines, role of friction, power transmission and application of cams in machines.

Course Objectives:

After studying this course, the student will be able to

- To state difference between machines and mechanisms and their application in practice**.**
- To study power transmission system, friction, brakes, dynamometer.
- Analyse velocity and acceleration of different points of four bar mechanism and slider crank mechanism.
- Student will be able to analyses power lost in friction.
- Draw cam profile and analyse gear trains in order to transmit relative motion.
- Analyse the fluctuation of speed and its regulation and governing by different types of flywheels and governors.
- To state difference between machines and mechanisms and their application in practice.
- To study power transmission system, friction, brakes, dynamometer.
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- Student will be able to analyses power lost in friction.
- Draw cam profile and analyse gear trains in order to transmit relative motion.
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- To study power transmission system, friction, brakes, dynamometer.
- Analyse velocity and acceleration of different points of four bar mechanism and slider crank mechanism.
- Student will be able to analyses power lost in friction.
- Draw cam profile and analyse gear trains in order to transmit relative motion.
- Analyse the fluctuation of speed and its regulation and governing by different types of flywheels and governors.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig-htage
1	**Kinematics**			
	1.1	Definition of kinematics, machines, dynamics, statics, kinematics link, kinematics pair, constrained motion, kinematic chain, mechanism inversion, machine.	06	12
	1.2	Single slider, double slider mechanism, four bar mechanism, their inversions.		
2	**Velocity and acceleration**			
	2.1	Types of motion, concept of displacement, velocity and acceleration.	12	12
	2.2	Concept of relative velocity and relative acceleration of point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity.		
	2.3	Drawing of velocity and acceleration diagram of given configuration diagram of simple mechanisms limited to four links. Determination of velocity and acceleration of a point on link (exclude coriolis components) ratio of cutting to return time in quick return mechanism. Klien's construction for reciprocating engine mechanism(limited to uniform angular velocity of crank)		
3	**Flywheel & Governors**			
	3.1	Flywheel – Functions and application of flywheel with help of turning moment diagram for reciprocating I.C. engines.	06	08
	3.2	Governors – Types, function and application of centrifugal governor. Its comparison with flywheel. Governor terminology.		

4	**Friction**			
	4.1	Uniform pressure and uniform wear assumptions.	08	12
	4.2	Derivation and numerical problems to determine power absorbed in friction for flat collared and pivot bearings.		
	4.3	Study of single plate, multi plate and cone clutch, Centrifugal clutch. Derivation to find torque to over come thread friction. Numerical problems to determine power transmitted in single plate, multi plate, cone clutch.		
5	**Brakes and dynamometers**			
	5.1	Definition, classification and comparison between brakes and dynamometers.	08	12
	5.2	Construction and working of i) Block brake, ii) Band brake, Internal expanding shoe brake and line diagrams for hydraulic, vacuum and air brake systems.		
	5.3	Construction and working of i) Rope brake, ii) Hydraulic, iii) Belt –Transmission, iv) Epicyclic gear train, and v) Swinging field type dynamometer (No numerical problems on dynamometers).		
6	**Cams and followers**			
	6.1	Definition of cam and follower, types of cam and followers, Cam terminology.	10	10
	6.2	Drawing of profile of cams with knife edge follower and roller follower (with and without offset). Motion imparted to follower: i) Uniform velocity, ii) S.H.M., iii) Uniform acceleration and retardation.		

7	**Power Transmission**			
	7.1	Materials, cross section, Comparison of ropes, belts, chains, gears and types of belt drives, angle of lap, belt length.	10	10
	7.2	Determination of velocity ratio, ratio of tight side to slack side tensions, centrifugal tensions, condition for maximum power transmitted, calculation to find power transmitted, belt cross section.		
	7.3	Gear terminology, types of gear and gear trains, their selection for different application, train value for simple, compound and epicyclic gear trains.		
8	**Balancing**			
		Balancing of co-planner masses, static balancing and dynamic balancing.	04	04
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Study of inversions of four bar, single slider crank and double slider crank mechanisms	02
2.	Construction of velocity and acceleration diagrams.	04
3.	Study and demonstration of different types of governors.	02
4.	Demonstration of clutches.	02
5.	Study of different types of brakes and dynamometers.	02
6.	Construction of profiles of cam with different followers.	02
7.	Study of gear box of an automobile.	02
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Kinematics of machine elements	Classroom teaching and illustration with charts and models.
2.	Velocity and acceleration.	Classroom teaching / Practice in drawing Hall.
3.	Flywheel and Governors	Classroom / Lab. teaching and illustration with models
4.	Friction	Illustration with charts and models transparencies / Problem practice in classroom
5.	Brakes and dynamometers	Classroom teaching, transparencies and actual demo on different engines in P.E. Lab.
6.	Cam and followers	Classroom teaching, models, Practice in drawing Hall.
7.	Power transmission	Classroom teaching, charts and transparencies, models in Lab.
8.	Balancing	Classroom teaching

Text Books:

Sr. No	Author	Title	Publication
2.	R.S. Khurmi	Theory of machines	(S.I. Unit) Eurasia Pub. House (Pvt.) Ltd., New Delhi
2.	Pandya and Shah	Theory of machines	Charotar Book stall, Mumbai
3.	M.S. Mahajan, N.J. Pandey	Mechanisms	Vrinda Publications.

Reference Books:

Sr. No	Author	Title	Publication
1.	P.L. Balaney	Theory of machines	Khanna Publishers
2.	Beven	Theory of machines	Orient Longmans Ltd. London/ New Delhi
3.	Abdulla Sheriff	Theory of machines	Engg. Book Co. Mumbai / Aflies Book stall Pune.

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Kinematics of machine elements	08	04	--	12
2.	Velocity and acceleration.	04	02	06	12
3.	Flywheel and Governors	04	04	--	08
4.	Friction	04	04	04	12
5.	Brakes and dynamometers	06	06	--	12
6.	Cam and followers	04	06	--	10
7.	Power transmission	04	06	--	10
8.	Balancing	04	--	--	04
		38	32	10	80
Total		**20**	**22**	**38**	**80**

(Prof. M.S. Deshmukh) (Prof. S. B. Kulkarni) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04/18

Name of Course : Engineering Materials
Course Code : MT 468

Teaching Scheme:

Theory/Practical/Tutorial	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**--**	**--**
Tutorial	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	--	**25**

Course Rationale:

This course in engineering materials is a part of acquiring basic and essential knowledge about materials being used in engineering products and industry.
The course is useful for mechanical engineers to understand metallurgical aspects of materials, processes and related problems encounter in industry. Course deals with classification, properties and applications of materials with processes carried on them as well as testing of materials.

This course in engineering materials is a part of acquiring basic and essential knowledge about materials being used in engineering products and industry.
The course is useful for mechanical engineers to understand metallurgical aspects of materials, processes and related problems encounter in industry. Course deals with classification, properties and applications of materials with processes carried on them as well as testing of materials.

Course Objectives:

After studying this course, the student will be able to

- Understand significance of properties in engineering context.
- Structures, phases, alloys of materials
- Heat treatment processes.
- Testing of materials.
- Applications, knowledge of steels, CI, Non ferrous and Non metals collective

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1	**Classification & properties of materials**			
	1.1	Classification (Cryst, Non Cryst, Ceramics, Composites) Phy / Chemical / (Tensile, compressive, imp Mechanical properties : T, H, C etc. creep, fatigue, Endur Hardness, chemical properties)	04	10
	1.2	structure of materials : Crystal structures (BCC …) Allotropy, and solid solutions.		
2.	**Steels**			
	2.1	Fe – Fe3C diag; different phases in the diag. Transformations occurring in steels phase rule and Lever Rule. Critical Temperatures (A321, ACM), Classification & Designation of steels.	06	12
	2.2	Study of Alloy steel, Tool Steel, Stainless steel. (properties, composions, applications) functions on uses of alloying elements. Study of Alloy steel, Tool Steel, Stainless steel. (properties, composions, applications) functions on uses of alloying elements.		
3	**Heat Treatment of Steels**			
	3.1	Principles and process of HT, (TTT diag, CCR).	04	12
	3.2	Anneal, Normalising, Concept of Hardenability, H curve, Hardening of steels, Tempering, Austemp & Martemp, Case Hardening : Introduction, Flame, Work, Case Carbu, carbonitriding.		

4	**Cast Irons**			
	4.1	Cast iron types : White GCI, FG, SG, Malleable Alloy CI, Concept of castability & suitable production methods (Only factual).	04	12
	4.2	Heat Treatments on CI.		
5	**Engineering Non Ferrous Metals and Alloys**			
	5.1	Copper and its alloys (Brass, Bronze, Curpronickel). Designations, Aluminium and its alloys, Applications of Al, Cu, Alloys, Bearing materials.	04	12
6	**Other Engineering Materials**			
	6.1	Polymers, - Str, Props, Classification Rubber, Plastics, Resins. Ceramics : Glass, Refractories etc.	05	10
	6.2	Composites: Reinforcements, Laminates, Particulates, Nano materials.		
7	**Testing, Inspection and Examination of materials**			
	7.1	NDT : Advantages of NDT, Dye penetrant, eddy curve, Ultrasonic, X-ray. Inspection : Visual, Optical. Destr. Testing : On UTM, Hardness, Wear. Standard specimen examination to identify phases in steel & CI (Pearlite, mort. etc.).	05	12
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Assignment	Hrs
•	Assignment based on properties of materials.	04
•	Assignment on Iron carbon diagram.	02
•	A visit report to heat treatment shop (various heat treatments are to be observed and a report is to be prepared by students)	02
•	One assignment on micro structures and heat treatment of cast iron.	02
•	Assignment on copper, aluminum alloys, bearing materials.	02
•	Assignment based on topic no. 6.	02
•	Assignment based on topic no. 7.	02
	Total	**16**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Classification & properties of materials	Lecture, Demonstration.
2.	Steels	Lecture, Demonstration.
3.	Heat Treatment of Steels	Lecture, Demonstration.
4.	Cast Irons	Lecture, field visit.
5.	Engineering Non Ferrous Metals and Alloys	Lecture, field visit.
6.	Other Engineering Materials	Lecture, Demonstration, Group Discussion, Seminar, Video film.
7.	Testing, Inspection and Examination of materials	Lecture, Demonstration, Group Discussion, Seminar, Video film

Text Books:

Sr. No	Author	Title	Publication
	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	O.P. Khanna, M. Lal	Workshop Technology / Production Tech.	Dhanpat Rai & Sons, Delhi
2.	O.P. Khanna	A Text Book Of Material Science And Metallurgy	Dhanpat Rai & Sons, Delhi
3.	Dr. Kodgire	Material Science And Metallurgy	Everest Publishing House
4.	R.K. Rajput	Material Science And Engineering	S.K. Kataria and Sons
5.	S.K. Hazra Choudhary	Material Science And Processes	Indian Book Distribution Company
6.	Kenneth G. Budinski And Micheal K. Budinski	Engineering Materials Properties And Selection	Printice Hall of India Pvt. Ltd.
7.	C.P. Sharma	Engineering Materials	Printice Hall of India Pvt. Ltd.

Learning Resources: Books, Models

Specification Table:

Sr.No	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Classification & properties of materials	10	--	--	10
2.	Steels	06	06	--	12
3.	Heat Treatment of Steels	06	06	--	12
4.	Cast Irons	08	--	04	12
5.	Engineering Non Ferrous Metals and Alloys	08	--	04	12
6.	Other Engineering Materials	06	04	--	10
7.	Testing, Inspection and Examination of materials	04	04	04	12
	Total	48	20	12	80

(Prof. M.S. Deshmukh) (Prof. S. B. Kulkarni) (Prof. Warke S. W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : ME
Programme Code : 04
Name of Course : Manufacturing Processes
Course Code : WS 461

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**02**	**32**
Practical	**04**	**64**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

To enable the students to :

Understand construction and working of various conventional machine tools

Understand various manufacturing processes performed by them. Use of various cutting tools.

Course Objectives

After studying this course, the student will be able to

- Select appropriate tools
- Select and perform various processes on different machines.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1.	**Metal cutting**			
	1.1	Basic element of machining, orthogonal and oblique cutting,	05	14
	1.2	Classification of cutting tools, geometry of a single point cutting tools		
	1.3	Chip formation, types of chips, tool wear, tool life, tool failure, cutting tool materials, cutting fluids, machinability index.		
2.	**Lathe and lathe work**			
	2.1	Introduction, working principles, types, specifications, parts, accessories, attachments, operations,		
	2.2	Taper turning methods, lathe tools speed, feed, depth of cut, estimation of machine time.	05	14
3.	**Shaper, Planner and Slotting machine**			
	4.1	Introduction, working principle parts, specification classification, construction, mechanisms used, operations performed,	07	14

4.	**Press and Press work**			
	4.1	Introduction, types of press, parts, specifications, power pressed driving mechanisms, Press Tools,	03	10
	4.2	Die accessories, Types of dies and their operations.		
5.	**Sheet metal work**			
		Introduction, Sheet metal hand tools, operations, sheet metal joints and machines.	02	08
6.	**Foundry Technology**			
	6.1	Introduction, Pattern-Materials, Tools, Types, Allowances, Core Prints, Core boxes, Colour Code,	06	14
	6.2	Moulding – Processes – Green Sand moulding, moulding machines. Casting – Die casting.		
7.	**Powder Metallurgy**			
		Introduction, Powder manufacturing, Compaction, Powder conditioning, Sintering, Applications	04	06
Total			**32**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	One job involving plain turning , step turning, taper turning and threading (v).	18
2.	One Job of shaper involving angular and plane shaping.	18
3.	One job of pattern making in workshop and demonstration of moulding process in metallurgy department.	18
4.	One job of sheet metal.	10
Total		**64**

Instructional Strategy:

Sr.	Topic	Instructional Strategy

No.		
1.	Metal cutting	Lecture, Demonstration, Group Discussion, Seminar, Video film. .
2.	Lathe and lathe work	
3.	Shaper, Planner and Slotting machine	
4.	Press and Press work	
5.	Sheet metal work	
6.	Foundry Technology	
7.	Powder Metallurgy	

Text Books:

Sr. No	Author	Title	Publication
1.	Hajra and Chowdhary	A book of shop technology	Media Promotary – Publisher Pvt. Ltd., Mumbai
2.	R.S. Raghuwanshi	A Course in workshop technology	Dhanpat Rai Sons, Delhi
3.	H.S. Bawa	Workshop technology	Tata McGraw Hill, Delhi.

Reference Books:

Sr. No	Author	Title	Publication
1.	O.P. Khanna, M. Lal	Workshop Technology / Production Tech.	Dhanpat Rai & Sons, Delhi

Learning Resources: Books, Handbooks, Catalogues, Video cassettes. no. 129, 130, 135 ,136, 154, 155, 156, 199, 253 to 258 of G.P.P. library, Transparency Set no. 201

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Metal cutting	06	04	04	14
2.	Lathe and lathe work	06	04	04	14
3.	Shaper, Planner and Slotting machine	06	04	04	14
4.	Press and Press working	02	04	04	10
5.	Sheet metal work	02	04	02	08
6.	Foundry Technology	06	04	04	14
7.	Powder Metallurgy	02	02	02	06
	TOTAL	**30**	**26**	**24**	**80**

(Prof. V. J. Deshpande
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S. W. Warke)
Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Power Engineering
Course Code : ME 561

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

Students will be able to understand

- Working of different types of I.C. engines and their sub systems.
- The working and applications of different types of air compressors.
- The working of gas turbines.
- The various refrigeration systems and their applications.
- The principles of jet propulsion systems.
- The working of vapour compression, vapour absorption, refrigeration components and controls.
- Various modes of heat transfer.
- Various thermodynamic cycles.
- Various refrigeration and air – conditioning systems.
- Layout of different Power plants.

Course Objectives:

After studying this course, the student will be able to

- Distinguish between different types of I.C. engines.
- Take tests and trials on the various types of I.C. engines with their respective sub-systems.
- Take various tests on the different types of air – compressors.
- Know construction and working of gas turbines for appropriate applications.
- Know jet propulsion systems.
- Know different refrigeration systems of their respective particular applications.
- Carry out leak detection, vacuumization, pressure, testing and charging of refrigeration system.
- Understand and compare the cycles of I.C. engines.
- State the different modes of heat transfer.
- Understand the various refrigeration and Air-conditioning systems.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig-htage
SECTION- I				
1	**Thermodynamic cycles**			
	1.1	Air standard power cycles, Carnot, cycle representation on P-V and T-S diagram. Air standard efficiency derivation	09	08
	1.2	Otto cycle, Diesel cycle, representation on P-V and T-S diagram. Air standard efficiency derivation.		
	1.3	Duel combustion and Brayton cycles, representation on P-V and T-S diagram. Air standard efficiency derivation		

2	**I.C. Engines**			
	2.1	Classification of I.C. engines,	09	12
	2.2	Construction and working four stroke petrol and diesel engines,		
	2.3	Applications of I.C. engine.		
	2.4	Combustion and ignition system in petrol engines including electronic ignition, DIS (distributor less ignition system controlled by ECV)		
	2.5	Concept of carburetion, air fuel ratio.		
	2.6	Multi point fuel injection system.		
3	**Testing of I.C. Engines**			
	3.1	Engine power, indicated and brake, methods of determining indicated and brake power,	09	12
	3.2	Morse tests.		
	3.3	Calculations of I.P., B.P. Mechanical, thermal and relative efficiencies, fuel consumptions at various loads		
	3.4	Heat balance sheet.		
	3.5	Testing of I.C. engines as per I.S. specifications		
4	**Gas turbines and jet propulsion**			
	4.1	Working cycle, elements of gas turbine (descriptive treatment only).	05	08
	4.2	closed cycle and open cycle gas turbines, their comparison (descriptive treatment only).		
	4.3	applications of gas turbines (descriptive treatment only).		
	4.4	Principles of turbojet, turboprop, ramjet and rockets, rocket fuels (descriptive treatment only).		
	SECTION- II			
5	**Air – Compressor**			
	5.1	Uses of compressed air, classification of air compressor	11	10
	5.2	construction and working of single stage, single acting, reciprocating air compressors displacement, volumetric, isothermal, mechanical efficiencies,		

	5.3	effect of clearance and pressure ratio on volumetric efficiency,		
	5.4	necessity of multi-staging, inter-cooling (perfect and imperfect), advantages of multi-staging, after coolers (use of formulae only, no derivation).		
	5.6	Rotary compressors - Roots Blower, vane, screw compressor. Factors to be considered for energy saving in air compressors.		
	5.7	Pneumatic circuit, components, FRL unit, Simple circuits using D.C. valves, shuttle valve, Flow control valves etc.		
6	**Heat Transfer principles**			
	6.1	Modes of heat transfer, conduction, convection and radiation.	05	08
	6.2	Conduction heat transfer – Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance composite walls, composite cylinders, combined conduction and convection.		
	6.3	Thermal radiation, absorptivity, transmissivity, reflectivity, emissivity, black and grey bodies, Stefan-Boltsman'' law, heat transfer by radiation,		
7	**Refrigeration and Air-conditioning**			
	7.1	Definition, vapour compression cycle, vapour compression cycle components, C.O.P., Unit of Refrigeration,	08	12
	7.2	sub cooling and super heating,		
	7.3	Refrigerants – properties, R12, R22, R134a & hydrocarbon..		
	7.4	Psychrometric proportion, Psychrometric Processes, Psychromatric charts applications		
	7.5	ice-plant, domestic refrigerator, water cooler, cold storage,		
	7.6	definition of air conditioning, air conditioning systems,		
	7.7	window room air conditioner,		
	7.8	factors contributing to cooling load. (No analytical treatment).		
	7.9	Vapour Absorption Refrigeration system (No		

		numericals).		
8	**Power plant engineering**			
	8.1	Layouts of steam power plant,	08	10
	8.2	I.C. engine power plants, gas turbine power plant,		
	8.3	nuclear power plant and hydro-electric power plant., site selection criteria.		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
	Section I	
1.	Dismantling a stationary diesel or petrol engine, studying different parts and assembling.	03
2.	Dismantling and assembling carburetors fuel injector, fuel pump, diaphragm type petrol pump.	03
3.	Common faults, their detection and remedies for petrol and diesel engine.	03
4.	Working of 2 stroke cycle engine.	03
5.	Trial on four stroke engine with heat balance sheet.	04
	Section II	
6.	Trial on reciprocating air compressor system.	04
7.	Demonstration of simple pneumatic circuits on pneumatic trainer.	03
8.	Study of heat exchangers.	03
9.	Study of domestic refrigerator / window air – conditioner, Split A/C.	03
10.	Study of vapour Absorption Refrigeration system.	03
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
Section I		
1.	Thermodynamic cycles	(Common for all) Classroom teaching, Charts, Models, actual working engines, Internet.
2.	I.C. Engines	
3.	Testing of I.C. Engines	
4.	Gas turbines and jet propulsion	
Section II		
5.	Air – Compressor	(Common for all) Classroom teaching, Charts, Models, actual working engines, Internet.
6.	Heat Transfer principles	
7.	Refrigeration and Air-conditioning	
8.	Power plant engineering	

Learning Resources Charts, models, Video cassette No. 132, 133, 137a & b, 138 a & , 259,262,265, 274 and 382 of G.P.P. library, Transparency Set no. 203

Text Books:

Sr. No	Author	Title	Publication
1.	Nil	Nil	Nil

Reference Books:

Sr. No	Author	Title	Publication
1.	V.P. Vasudani and D.S. Kumar	Heat engineering	Metropolitan Book Co., New Delhi
2.	P.L. Ballaney	Thermal Engineering	Khanna Publishers, Delhi 6.
3.	A.R. Basu and T.P. Mukherjee	Heat engine	
4.	A.S. Sarao, P.S. Gaabi	Refrigeration and air conditioning	Satya Prakashan, New Delhi
5.	Domkundwar and others	A course in thermodynamics and heat engines	Dhanpatrai and Sons, New Delhi 6
6.	C.N. Mishra	Refrigeration and air conditioning	
7.	Goliber	Refrigeration servicing	
8.	Patel Karamchandani	Heat engine – Vol – III	Acharya Publication, Vadodara
9.	V. Ganeshan	Internal Combustion Engines	Tata Mcgraw Hills, New Delhi.

Learning Resources: Charts, models, Video cassette No. 132, 133, 137a & b, 138 a & b, 259,262,265, 274 and 382 of G.P.P. library, Transparency Set no. 203

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Thermodynamic cycles	03	--	07	10
2.	I.C. Engines	06	06	--	12
3.	Testing of I.C. Engines	04	--	08	12
4.	Gas turbines and jet propulsion	02	04	--	06
	Total	15	10	15	40
Section II					
5.	Air – Compressor	02	02	06	10
6.	Heat Transfer principles	03	03	02	08
7.	Refrigeration and Air-conditioning	02	08	02	12
8.	Power plant engineering	03	03	04	10
	Total	10	16	14	40

(Prof. A. V. Joshi) (Prof. Kulkarni S. B.) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME

Programme Code : 04

Name of Course : Industrial Hydraulics and Pneumatics

Course Code : ME562

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

In any mechanical industry hydraulic and pneumatic control systems are widely used due to its versatility and adaptability to automation. Understanding of fundamental principles, construction and working of elements of hydraulic and pneumatic control systems helps a Diploma technician in operation, maintenance and erection of modern machine tools. Practical circuits are also dealt so that the student is familiar with the industrial hydraulics. So the objective of this course is to enable him to face trouble shooting and modify the circuits for different uses.

Course Objectives

After studying this course, the student will be able to

- Know the working principle of various components used for hydraulic & pneumatic systems.
- Read and interpret the drawings showing different hydraulic and pneumatic circuits.
- Select appropriate components required for simple hydraulic and pneumatic circuits.
- Design simple hydraulic and Pneumatic circuits.
- Connect simple hydraulic and Pneumatic circuits as per the drawings.
- List probable causes of faults or defects in the components of hydraulic & pneumatic Circuits

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section I				
1	**Introduction to Hydraulic & Pneumatic Systems**			
	1.1	**Hydraulic System:** Principles of fluid system, General layout of oil hydraulic	**08**	**12**
	1.2	Merits and limitations of oil hydraulic		
	1.3	Types of Hydraulic fluids, Properties of fluids,		
	1.4	Selection of fluids, effect of temperature & Pressure on Hydraulic fluid		
	1.5	**Pneumatic Systems:** Choice of working medium. Characteristics of compressed air.		
	1.6	Structure of Pneumatic control System, Production of compressed air -compressors,		
	1.7	Preparation of compressed air -Driers, Filters, regulators, Lubricators,		

	1.8	Distribution of compressed air		
2	**Introduction to Hydraulic Power and Pumps**			
	2.1	Types, construction, working principle and symbols of all following components: Vane pump, Gear pump, Screw pump, Piston pump, Selection of Pump for Power Transmission, , Pump performance	**06**	**08**
3	**Hydraulic Actuators and Motors**			
	3.1	Linear Actuators: Cylinders - single acting, double acting.	**05**	**06**
	3.2	Rotary Actuators: Hydraulic motors		
	3.3	Accessories: Pipes, Hoses, fittings, Oil filters, Seals and gaskets, Accumulators.		
4	**Control Components in Hydraulic Systems**			
	4.1	Pressure control valves – Pressure relief valve, Pressure reducing valve, Pressure unloading Valve, Counter Balance valve, Sequence valve	**06**	**08**
	4.2	Direction control valves – Poppet valve, spool valve, 3/2, 4/2, 5/3 D.C. valves with pilot, manually & solenoid operated, Sequence valves.		
	4.3	Flow control valves –Pressure compensated, non pressure compensated flow control valve.		

5	**Hydraulic Circuit Design and Analysis**			
	5.1	Control of single and Double acting Hydraulic cylinders,	**07**	**06**
	5.2	Regenerative circuit, Counter balance Valve application,		
	5.3	Hydraulic Cylinder sequencing Circuits, Cylinder Synchronizing Circuits,		
	5.4	Speed Control of Hydraulic Cylinder – Meter in & Meter out, speed control of Hydraulic Motors,		
	5.5	Accumulators and accumulator circuits. Hydraulic circuits for Milling machine, Shaper machine		
Section II				
6	**Components of Pneumatic Systems**			
	6.1	Compressors: Types, construction, working principle and symbols of Reciprocating & Rotary compressors	**10**	**14**
	6.2	Control Valves: Types, construction, working principle and symbols of Pressure regulating valves, Flow Control valves, Direction Control Valves, Dual pressure valve, Shuttle valve, Quick exhaust valve, Time delay valve.		
	6.3	**Actuators:** Types, construction, working principle and symbols of : Linear actuators - Cylinders-Single acting, Double acting and Rotary actuators – air motors		
	6.4	**Accessories :** Types, construction, working principle and symbols of FRL unit ,Pipes, Hoses, Fittings		
7	**Industrial Pneumatic Circuits**			

	7.1	Use of Logic functions – OR , AND , NOR, NAND, NOT functions in pneumatic applications, Practical examples involving the use of logic functions.	**07**	**08**
	7.2	Speed control circuits, Sequencing circuits, Time dependent controls – Principle, Construction, and Practical applications.		
8	**Fundamentals of Programmable Logic Controllers**			
	8.1	Introduction, definition, Evaluation of PLC and IEC61131,	**07**	**08**
	8.2	Advantages of PLC. Types of PLC & Programming Languages of PLC as per IEC61131-3,		
	8.3	PLC Manufacturers, Block diagram And Architecture of a PLC.		
	8.4	Input devices such as limit switches, pressure switch, float switches, thermostat, temperature sensors, (No constructional details required only applications in control circuits in view of NO/NC), and proximity switches (technical specifications & symbols for control circuits.).		
	8.5	Output devices of PLC such as contactors, relay, Solenoid valve (technical specifications & symbols for control circuits.).		
	8.6	Input & Output modules: Types, sink/source concept, Connection of I/O devices, technical specifications and selections of I /Os modules.		
	8.7	Scan cycle &Watchdog timer		
9	**Development of Ladder Diagram**			

	9.1	Creating New Project in Ladder Diagram editor/ language.	**08**	**10**
	9.2	Rules for Variables, standard data types, PLC or I/O Configurations & Addressing system of PLC.		
	9.3	Development ladder diagram of logic gates, simple programming on input / output and interlocking applications.		
	9.4	PLC functions blocks and programming: Timer, Types of timer & programming on timer applications. Counter & types of counters & programming on counter/ timer applications.		
	9.5	Ladder diagram for Pneumatics and Hydraulics control circuits as mention in Chapter 5& 7.		
		Total	**64**	**80**

List of Practicals/ Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1	Survey of oil used for hydraulic circuits -specifications, manufacturer's names, costs	02
2	Assignment on Pumps	02
3	Study of Hydraulic Power Pack & accessories	02
4	i- Study of Pressure control valves & circuits using Pressure control valve ii- Study of Flow control valves & circuits using Flow control valve	02
5	Demonstration of meter- in, meter- out and sequencing circuits	02
6	Demonstration of hydraulic circuit for shaper machine	02
7	Assignment on Compressor, Direction Control Valve & Actuators	02
8	Study of direction control valve in Pneumatic circuits using manual & pilot operated valves	02
9	Demonstration of pneumatic circuit for speed control of double acting cylinders	02
10	Demonstration of pneumatic circuit involving the logical functions	02
11	Browse different PLC manufacture's site (minimum five) and determine technical specifications of a) DI/DO modules and b) Proximity sensors.	02
12	Development of ladder diagram for all logic gates and simulate on PLC simulation software.	04
13	Development of ladder diagram for pneumatic circuits such as i) A+,B+,C+,A-,B-,C- and ii)A+,A-,B+,B-,C+,C-. etc. (minimum 03 circuits)	06
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to hydraulic & Pneumatic systems	Class rooms teaching
2.	Introduction to Hydraulic Power & Pumps	Class rooms teaching, Power point presentation, Demonstrations
3.	Hydraulic Actuators and Motors	Class rooms teaching, Power point presentation, Demonstrations
4.	Control Components in Hydraulic Systems	Class rooms teaching, Power point presentation, Demonstrations
5.	Hydraulic Circuit Design and Analysis	Class rooms teaching, Power point presentation, Demonstrations
6.	Components of pneumatic systems	Class rooms teaching, Power point presentation, Demonstrations
7.	Industrial Pneumatic Circuits	Class rooms teaching, Power point presentation, Demonstrations
8.	Fundamentals of Programmable Logic Controllers	Class rooms teaching, Power point presentation, Demonstrations
9.	Development of Ladder diagram, general guidelines for ladder diagram	Class rooms teaching, Power point presentation, Demonstrations

Text Books:

Sr. No	Author	Title	Publication
1.	Anthony Esposito	Fluid Power with application's	Fifth edition, Pearson Education, Inc 2000.
2.	S.R. Majumdar	Oil Hydraulic Systems (Principle & maintenance)	Tata McGraw Hill Publications, New Delhi
3.	S.R. Majumdar	Pneumatic Systems	Tata McGraw Hill Publications, New Delhi
4.	Andrew Parr	Hydraulics & Pneumatics A Technicians & Engineers Guide	Jaico Publishing
5.	Pippinger, Hicks	Industrial Hydraulics	Tata McGraw Hill Publications, New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	D. Stewart	Hydraulic And Pneumatic Power For Production Industrial Hydraulics	Industrial Press INC. 200, Madison Avenue, New Your 10016.
2.	Vickers Perry	Industrial Hydraulics Manual	Vickers Systems International (Company Manual)
3.	Festo	Basic Pneumatic manual	Festo

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Introduction to hydraulic & Pneumatic systems	06	04	02	12
2.	Introduction to Hydraulic Power & Pumps	04	04	--	08
3.	Hydraulic Actuators and Motors	06	--	--	06
4.	Control Components in Hydraulic Systems	--	04	04	08
5.	Hydraulic Circuit Design and Analysis	--	04	02	06
	Total	**16**	**16**	**08**	**40**
Section II					
6.	Components of pneumatic systems	08	06	--	14
7.	Industrial Pneumatic Circuits	06	--	02	08
8.	Fundamentals of Programmable Logic Controllers	06	02	--	08
9.	Development of Ladder diagram	06	--	04	10
Total		**26**	**08**	**06**	**40**

(Prof. S. B. Kulkarni	(Prof. S. B. Kulkarni)	(Prof. S. W. Warke)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME

Programme Code : 04
Name of Course : Production Planning and Control & CAPP
Course Code : ME 563

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

Modern manufacturing industries have complex manufacturing processes. A technician working in production department has to deal with various processes, planning for processes and control for the same for increasing the productivity.
This course is being introduced so as to enable the students to work efficiently as a production supervisor, which is the main job area for technicians.

Course Objectives

After studying this course, the student will be able to

- Know various types of production processes
- Know different process planning principles
- Forecast production.
- Know different steps followed in controlling production.
- Know comp. aided P.P. principles.
- Know various resource engineering techniques Forecast production.
- Know different steps followed in controlling production.
- Know comp. aided P.P. principles
- Know various resource engineering techniques

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section I				
1	**Introduction**			
	1.1	Meaning, scope, objectives and functions of production planning and control, types of PPC organizations.	04	08
2	**Process Planning**			
	2.1	Introduction, definition, contents of process plan factors affecting Process Planning.	15	16
	2.2	Process Operations – Basic process operations, principal process operations, major operations & its types, auxiliary process operations, supporting operations.		
	2.3	Steps in process planning, selection of machines, combining operations, planning sequence of machining operations by selection of tools, Jigs & fixtures, cutting variables.		
	2.4	Process sheet format, process sheet design for simple parts. Machine load charts, Gantt charts, Master Schedule.		
3	**CAPP – Computer Aided Process Planning**			

	3.1	Introduction, Retrieval CAPP, Generative CAPP, Benefits of CAPP.	06	08
4	**Production Forecasting**			
	4.1	Introduction, definition, need, types, Judgmental Techniques, Time series analysis – least square, moving avg., Regression & Commutation analysis, (simple problems on above forecasting methods).	07	08
Section II				
5	**Production Planning**			
	5.1	Planning functions, routing, scheduling, loading, types of production and their characteristics – continuous, intermittent production. Determination of capacity.	16	12
	5.2	Sequential load statements, scheduling, difficulties, machine capacity, make-buy decisions.		
	5.3	Introduction to operation research tools. Objectives, functions, Computer assisted planning. Linear programming, two variable problem, graphical solutions, Sequencing – n jobs, 2 machines n jobs 3 machines.		
6	**Production Control**			
	6.1	Definition – Dispatching, follow-up and co-ordination with various departments. Dispatching : Job orders and issuing system.	10	12
	6.2	Progressing, types of feedback system, preventing production delays, causes of delay. Work flow systems.		
	6.3	Definition, need, importance and advantages of evaluation.		
	6.4	Production control of continuous and intermittent production. Flow control applied to continuous production		

7	**Production Co-ordination**			
	7.1	Co-ordination and manufacturing planning, facility planning, sales planning, production planning, quality planning, inventory planning, manpower planning and financial planning activity.	04	08
	7.2	Total cost of production, impact of all the activities as cost of production.		
8	**Resource Engineering**			
	8.1	Supply, Chain, Management, Logistic. Development, relation quality improvement and transportation	02	08
Total			**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Process sheet design of one machined component involving general machine operations / assembly operations. The following points are to be covered. a) Material specifications. b) Material estimate. Sequence of operation along with in process dimensions, gauging, special tools etc.	20
2.	Forecasting technique.	04
3.	Routing and process engineering.	04
4.	Production control, Machine load charts.	04
Total		**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Classroom teaching
2.	Process Planning	Classroom teaching
3.	CAPP	Classroom teaching
4.	Production Forecasting	Classroom teaching, assignments, case study
5.	Production Planning	Classroom teaching, case study
6.	Production Control	Classroom teaching
7.	Production Co-ordination	Classroom teaching, Three lectures by industrial experts.
8.	Resource Engineering	Classroom teaching

Text Books:

Sr. No	Author	Title	Publication
1.	Nil	Nil	Nil

Reference Books:

Sr. No	Author	Title	Publication
1.	E.H. Mac NIECE	Production forecasting, planning and control	John Wiley and sons, New York
2.	V. Kovan	Fundamentals of process engineering	Foreign language publishing house, Moscow
3.	Mayer	Production management	Tata McGraw Hill, New York
4.	Samuel Eilon	Production planning and control	McMillan company, New York
5.	P.C. Moore and T.E. Hendrick	Production / Operations management	McGraw Hill Book Company, New York
6.	Martand Telsang	Ind. Engg. & Production Management	S. Chand & Co. Ltd., New Delhi.
7.	M.P. Groover	Automation Production Systems & CIM	Prentice Hall of India, New Delhi
8.	P.C. Sharma	Production Engineering	S. Chand & Co. Ltd., New Delhi.

Learning Resources: Industrial learning material, Handbooks, Video cassettes No. 361 and 362 of G.P.P. Library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1	Introduction	08	--	--	08
2	Process Planning	--	06	10	16
3	CAPP	04	02	02	08
4	Production Forecasting	--	04	04	08
		12	12	16	40
Section II					
5	Production Planning	04	04	04	12
6	Production Control	04	04	04	12
7	Production Co-ordination	04	04	--	08
8	Resource Engineering	04	04	--	08
		16	16	08	40
TOTAL		**28**	**28**	**24**	**80**

(Prof. V. J. Deshpande
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S. W. Warke)
Chairman, PBOS

Programme : ME

Programme Code : 04
Name of Course : Machine Design & CADD
Course Code : ME 566

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

Design office of Industry is one of the major job areas for Diploma Technicians. To enable a student to work there he should know how to design the simple machine elements. He should also be aware of economic considerations and usual design procedures and selection of appropriate material.

Course Objectives

After studying this course, the student will be able to

- Develop ability to analyze the problem.
- Apply the knowledge of basic science, Applied Mechanics, Strength of Materials in the design of machine elements.
- Select proper materials and processes to achieve economy and efficiency in design.
- Refer design data books, handbooks, ISI reference books etc. to get standard information.
- Design machine elements like levers, joints coupling, springs etc. consisting of 3-4 elements.
- Draw dimensional and production drawings as per the needs of processes in industries.
- Understand various modes of failures and the system approach for design.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
1.	**Revision of fundamental mechanics**			
	1.1	Stress, strain, yield point, strength consideration, stress strain diagram, proof stress	04	06
	1.2	Reversed bending cycle, endurance limit. Dynamic loading concept and Futigue failure.		
	1.3	Crushing and bearing stresses, maximum principle stress theory, shear stress theory		
2.	**Design consideration**			
	2.1	Stress concentration meaning causes and remedies	04	06
		Factors of safety, conditions for selection of F.S., working out principle stresses.		
	2.2	Selection of materials and manufacturing processes. (To be covered in practical with practical examples) Use of design data books, standardizations.		
3.	**Force consideration**			
	3.1	Forces resulting in direct tension, compression, shear,	08	10
	3.2	Design of simple machine parts such as knuckle joint, turn buckle.		

	3.3	Forces resulting in bending, designing lever of lever loaded safety valve, bell crank lever		
	3.4	Forces resulting in combined, direct and bending. Design of C- frame, offset link		
4.	**Forces resulting torsion**			
	4.1	Design of shaft on the basis strength and rigidity. Design of shaft for twisting.	10	08
	4.2	Design of keys.		
	4.3	Types of couplings, construction, muff coupling, flange coupling, bushed pin type flexible coupling		
5.	**Forces resulting in combined bending and twisting**			
	5.1	Forces resulting in combined bending and twisting Line shaft supported on two bearing with one or two pulleys (between the bearings) and with overhung.	06	10
		Total	32	40
		Section II		
6.	**Design of Fasteners**			
	6.1	Bolts of uniform strength. Design of bolted joints, arranged symmetrically and subjected to eccentric loading (about one axis only)	06	10
	6.2	Design of transverse and parallel fillet welded joints		
7.	**Power screw**			
	7.1	Friction between screw and nut. Thread profiles used for power screw.	08	12
	7.2	Design of power screw with consideration of maximum principle and shear stress theory, Efficiency and self locking conditions.		
	7.3	Design of screw jack, screw press, screw clamp. (Numerical problems limited to square threads only)		

8.	**Design of springs**			
	8.1	Classification , application and functions of springs.	08	10
	8.2	Selection of material for springs and specifications of spring.		
	8.3	Wahl's correction factor and its application,		
	8.4	Design of helical springs with circular cross section wire only, railway buffers.		
	8.5	Design of leaf spring,		
9.	**Bearings**			
	9.1	Types of bearings, common bearings used in practice, Types of ball and roller bearings,	06	08
	9.2	static capacity, Dynamic capacity, limiting speed, bearing life.		
	9.2	Selection of bearings from handbook, causes of bearing failures, Mounting.		
10.	**Introduction to CADD**			
	10.1	Introduction to any one design software such as CATIA, PRO-E, UNIGRAPHICS etc.	04	---
	102.	Demonstration of preparing 3D model of simple objects		
			32	**40**
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on question answers based on the topic 1 and topic 2 – min. 15 questions. (Students are expected to find out the answer of questions from Design data book, hand books)	04
2.	Design and Drawing of joint design of lever. Failure mode and its cognigence in design. (Students are expected to- a) Select appropriate materials for the components form data book along with stresses.	04

	- Calculate the various dimensions as per design procedure and prepare its report. - Prepare production drawings for assembly and details.	
3.	Combined Assembly containing minimum 6 machine parts and its production drawings covering topic no 4,5 and 6.	06
4.	Design & drawing of power screw	06
5.	Assignment of question answers type convening topics 8& 9. Minimum 10 questions on the above topics. (Students are expected to draw sketches wherever applicable.)	06
6.	Assignment on Introduction to CADD	06
Total		**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Revision of fundamental mechanics	Lecture
2.	Design Considerations	Lecture, explaining standards used in industry
3.	Force considerations	Lecture, demonstration using model of levers, frames, knuckle joint
4.	Forces resulting torsion	Lecture, demonstration, seminar
5.	Forces resulting in combined bending and twisting and direct.	Lecture, demonstration
6.	Design of fasteners	Self study, lecture
7.	Power screws	Lecture, demonstration of screw clamp, screw press, screw jack
8.	Design of springs	Lecture, demonstration of various types of springs.
9.	Bearings	Lecture with actual bearings, referring product catalogues
10.	Introduction to CADD	Demonstration of software

Text Books:

Sr. No	Author	Title	Publication

1.	P.V. Mandke	Machine Design Practice	Nirali Prakashan, Pune
2.	R.S. Khurmi	Design of machine elements	Eurasia Publ. HS (Pvt.) Ltd., New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	Pandya and Shah	Machine Design	Charotar Publ. Hs. Anand
2.	Abdulla – Sherif	Machine Design	
3.	Spotts	Machine Design	Prentice – Hall Publ.
4.		P.S.G. Design Data and handbook	
5.		I.S.I. data books	
6.	Shigley	Mechanical Engg. Design	Mc Graw Hill Publ.
7.	Shaum series	Machine Design	Hall Holowenko, Laughlin

Learning Resources:

1) P.S.G. Design Data Book

2) I.S. Standards

3) Design handbook

4) Transparencies

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Revision of fundamental mechanics	04	02	--	06
2.	Design considerations	04	02	--	06
3.	Force considerations	04	--	06	10
4.	Forces resulting torsion	--	02	06	08
5.	Forces resulting in combined bending and twisting and direct.	04	--	06	10
	Total	16	06	18	40
Section II					
6.	Design of fasteners	--	--	08	10
7.	Power screws	04	06	--	12
8.	Design of springs	04	04	--	10
9.	Bearings	04	--	02	08
10.	Introduction to CADD	---	---	---	---
		16	14	10	40
	Total	**32**	**22**	**16**	**80**

(Prof. M.S. Deshmukh)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S. W. Warke)
Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Metrology & Quality Control
Course Code : ME 565

Teaching Scheme:

Theory/Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests, each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

The course has been included in the curriculum as inspection and quality control activities are given prime importance in industry. A diploma technician working in the industry has to Identify the variables to be measured, Decide the accuracy required, Select the instrument, Investigate reasons for defects and give suggestions, Decide whether to accept or reject the jobs, Suggest methods of salvaging the defective material manufactured. Therefore, this course attempts to impart the necessary knowledge and develop the required abilities so that he can perform his job efficiently and effectively in modern industry.

Therefore, this course attempts to impart the necessary knowledge and develop the required abilities so that he can perform his job efficiently and effectively in modern industry.

Course Objectives:

After studying this course, the student will be able to

- Understand salient concepts and principles required to develop the ability of using different types of measuring instruments.
- Comprehend the principles, construction and use of various measuring instruments.
- Understand the techniques of handling and maintaining measuring instruments.
- Develop an ability of analysis, interpretation and drawing conclusions, from the data / information / graphs / charts pertaining to the area of inspection and quality control.
- Develop an ability of problem solving and decision making.
- Plot and use quality control charts.
- Use different I.S. standards.
- Suggest measures to improve the quality of product and reduce the cost.
- Understand the techniques of handling and maintaining measuring instruments.
- Develop an ability of analysis, interpretation and drawing conclusions, from the data / information / graphs / charts pertaining to the area of inspection and quality control.
- Develop an ability of problem solving and decision making.
- Plot and use quality control charts.
- Use different I.S. standards.
- Suggest measures to improve the quality of product and reduce the cost.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section I				
1	**Introduction To Metrology**			
	1.4	Definition, Terminology accuracy, presision, measurement, amplification, magnification, errors	06	08
	1.5	Standards in measurement : Line std and end standards.		
2.	**Linear And Angular Measurements Linear And Angular Measurements**			
	2.5	Study (construction, working) and use of vernier calipers, slip gauges, micrometer, bevel protractor, sine bar, angle dekkor, autocollimator use of surface plate, V block, angle plate, spirit level.	08	10
3.	**Limits Fits and Gauges**			
	3.1	Definitions, Types of fits, shaft, hole basis system. Tolerances, Limit gauges. Taylors principle, elementary gauge. Workshop gauge, inspection gauge.	08	12
4.	**Comparators And Testing**			
	4.1	Principles & types of comparators. Applications Mech., Elect., Opt. Dial indicators, straight edge. Esting of flatness, parallelism, roundness, surface finish, surface textures.	10	10
	4.2	Gear inspection and testing, screw thread inspection and testing.		
Section II				
5.	**Quality Control**			
	5.1	Concept of quality, characteristics, Q.C., Quality, Quality Assurance.	12	14
	5.2	Statistical Quality Control : Variations in quality control charts, Attribute charts, other techniques of Q.C. like Regression, Correlation.		

6.	**Quality Management**			
	6.1	Causes of quality variation, quality motivation, mindness, Q.M. Quality circles. ISO 9000.	08	12
	6.2	TQM culture, quality tools, (TQM, 66, 5S), ISO standards in metrology.		
7.	**CAQC : Computer Aided Quality Control**			
	7.1	Measuring equipment management, inward inspection. Coordinate Measuring Machine, Features, Performance and applications.	12	14
	7.2	Computerised analysis of inspection data dimensional analysis using PMI. Use of FM EA in quality control, Advanced product quality planning.		
		Total	**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Assignment	Hrs
1.	Study & use of various basic measuring instruments.	02
2.	Study & use of slip Gauges with Dial indicator	02
3	Study & use of Sine-Bars. Demonstration of angle dekkor / autocollimator.	04
4.	Study & use of pneumatic / mechanical comparator.	02
5.	Study & use of optical profile projector.	02
6.	Measurement of different Parameters of Gear.	02
7.	Study & use of Tool Maker's microscope.	02
8.	Measurement of different Parameters of screw thread.	02
9.	Demonstration of optical flats, Demonstration of Roughness tester	02
10.	Testing of machine tools	04
11.	Study & use of ultrasonic flaw detector.	02
12.	Assignment on quality policies, objectives, quality specifications.	02
13.	Assignment on Statistical Quality Control	04

	• Normal distribution curve • Control charts • O.C. curve.	
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction To Metrology	Classroom teaching, demonstration.
2.	Linear And Angular Measurements	Classroom teaching, on job working.
3.	Limits Fits and Gauges	Classroom teaching, case study.
4.	Comparators And Testing	Classroom teaching.
5.	Quality Control	Classroom teaching, group discussion, seminar.
6.	Quality Management	Classroom teaching, case study.
7.	CAQC : Computer Aided Quality Control	Class rooms teaching, Power point presentation, Demonstrations

Text Books:

Sr. No	Author	Title	Publication
1.	R.K. Jain	Metrology	
2.	Juran	Quality planning and analysis	

Reference Books:

Sr. No	Author	Title	Publication
1.	TTTI, Bhopal	Learning package in Metrology and Instrumentation	
2.	TTTI, Bhopal	Learning package and laboratory manual the industrial engineering	
3.	R.K. Jain	Engineering Metrology	Khanna Publication, New Delhi
4.	H.L. Grant	Quality Control	TATA McGraw Hills, New Delhi
5.	National Productivity Council	Inspection and quality control	
6.	TTTI, Bhopal	Quality Control	TATA McGraw Hills, New Delhi
7.	Helpen	Assurance science	Swan Publication, New Delhi
8.	Sharp	Engineering metrology	Sir Isaac Pitman and sons co. London
9.	K.J. Hume	Engineering metrology	Kalyani Publication, Ludhiyana
10.	I.S. on sampling Random Sampling 4905 Sampling Insp. 2500 (Part – I) Lot sampling		Bureau of Indian Standard, New Delhi
11.	J.B. Zende	Quality Circle	Quality Circle Forum of India, Maharashtra Chapter, Pune.

Learning Resources: Books, film no. 200, Transparency Set no. 202.

Specification Table:

Sr.No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section - I					
1.	Introduction To Metrology	02	02	04	08
2.	Linear And Angular Measurements	02	04	04	10
3.	Limits Fits and Gauges	04	04	04	12
4.	Comparators And Testing	04	02	04	10
	TOTAL	12	12	16	40
Section - II					
5.	Quality Control	04	04	06	14
6.	Quality Management	04	04	04	12
7.	CAQC : Computer Aided Quality Control	04	04	06	14
		12	12	16	40
	TOTAL	**24**	**24**	**32**	**80**

(Prof. V. J. Deshpande)	(Prof. S. B. Kulkarni)	(Prof. Warke S.W.)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme	**:**	**Diploma in ME**
Programme Code	**:**	**04**
Name of Course	**:**	**Production Technology and CAM**
Course Code	**:**	**WS 561**

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Student should be trained about wide range of production processes involved for mass production of engineering components needs to be employed with due consideration of functional and economical aspects.

Course Objectives

After studying this course, the student will be able to

- Student will gain insight on the production processes and their analytical aspect.
- Student will acquire knowledge as regards structural features, processes, capability and comparative cost benefit of various machine tools and equipments employed in production processes

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section I				
1	**Drilling Machine And Boring Machines**			
	1.1	Classification of machines, Specifications, Tools, Accessories, Attachments,	05	12
	1.2	Drilling and Boring operations		
2	**Milling Machine**			
	2.1	Working principles, classification, Specification	11	12
	2.2	Milling operations		
	2.3	Milling cutters, universal dividing head, different types of indexing methods		
3	**Broaching machine**			
	3.1	Introduction to broaching, classification, broaching tools, principle, application.	04	06
4	**Finishing and super finishing process**			
	4.1	Types of grinding, grinding machines, grinding wheels, abrasive materials, bonding, selection of grinding wheels, dressing, types of dressing,	12	10
	4.2	Super finishing honing, lapping.		
Section II				
5	**Gear production machine**			
	5.1	Gear tooth elements, introduction to gear shaping, working principle of gear shaping machine, gear shaping cutter	10	14
	5.2	Introduction to gear hobbing cutters, working principle of gear hobbing machine, Gear finishing.		
6	**Jigs and Fixtures**			
	6.1	Definition, Utility in production, Comparison, Principles of Locations, Foolproofing	08	10
	6.2	Types of Jigs and fixtures		
	6.3	Job holding devices		

7	**Introduction to CAM**			
	7.1	Manufacturing planning, Manufacturing control, Steps involved in CAM, Process control,	06	08
	7.2	Computer Aided Inspection		
8	**NC Part Programming Using CAM**			
	8.1	G – codes, M – Codes, Methods of part programming	08	08
	8.2	Manual part programming for simple drilled parts, Tool path generation using CAM		
Total			**64**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Polygon milling, One composite job and Journal / Report writing.	14
2.	Gear Milling using involute cutter.	14
3.	Demo of CAM with CNC drilling machine.	04
Total		**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Drilling and boring machine	Common for all topics :Lecture, Explanation, Discussion(group), Diagram, Demonstration, Notes.
2.	Milling machine	
3.	Broaching machine	
4.	Finishing and super finishing processes	
5.	Gear production machine	Common for all topics: Lecture, Explanation, Discussion(group), Diagram, Demonstration, Notes.
6.	Jigs and Fixtures	
7.	Introduction to CAM	
8.	NC Part Programming using CAM	

Text Books:

Sr.	Author	Title	Publication

No			
1.	Nil	Nil	Nil

Reference Books:

Sr. No	Author	Title	Publication
1.	Hajra Chaudhari Vol. II	Workshop Technology	Media Promoter Pvt. Ltd., Mumbai.
2.	O.P. Khanna and Lal	Production Technology	Dhanpat Rai Sons, Delhi.
3.	Chapman Vol II	Workshop Technology	Oxford α I.B.H. Ltd., Delhi
4.	H.S. Bawa Vol II	Workshop Technology	Tata McGraw Hill, Delhi.
5.	E. Paul Degarmo, J.T. Black	Materials and Process in Manufacturing	Prentice Hall of India, New Delhi.
6.	M.P. Groover	Automation, Production Systems and CIM	Prentice Hall of India, New Delhi.

Learning Resources: Video cassettes No. 169,191 to 194, 252 of G.P.P. Library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Drilling and boring machine	06	02	04	12
2.	Milling machine	08	02	02	12
3.	Broaching machine	02	02	02	06
4.	Finishing and super finishing processes	04	02	04	10
		20	08	12	40
Section II					
5.	Gear production machine	06	04	04	14
6.	Jigs and Fixtures	06	02	02	10
7.	Introduction to CAM	04	02	02	08
8.	NC Part Programming using CAM	04	02	02	08
		20	10	10	40
TOTAL		**40**	**18**	**22**	**80**

(Prof. V. J. Deshpande
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof. S. W. Warke)
Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : CNC And Unconventional Advanced Manufacturing
Course Code : WS 562

Teaching Scheme:

Theory/Practical/Tutorial	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**03**	**48**
Tutorial	**--**	

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Rationale:

Student should be made aware of new developments in the area of Manufacturing so as to acquire proficiency in handling new machine tools and equipments such as CNC, FMS, AUTOMATION KITS, JIT & Lean manufacturing.

Course Objectives:

After studying this course, the student will be able to

- Understand the modern trends in manufacturing.
- tackle the challenges posed by new machines, techniques, materials and their inter linkages.
- Appreciate the importance of complexity of new trends
- Name and list the new trends in manufacturing area
- Describe concept /constructional features/ working/ advantages / disadvantages of new trends.
- Utilize available softwares for a given task.
- Perform given experiments on new systems/ subsystems.
- State the industrial applications of a particular m/c tool.
- Write specification of a particular m/c tool or equipment

Course Content:

Chapter No.		Name of Topic/Sub topic	Hrs	Weightage
Section I				
1	**Non Traditional Machining Processes**			
	1.1	Introduction, concept of NCM, need, classification based on energy sources, constructional features, Working principles, industrial applications advantages/disadvantages of EDM,ECM,EBM,LBM and PAM, USM, AJM etc.	08	12
2.	**Manufacturing Operations & Automation**			
	2.1	Manufacturing Industries and products, Manufacturing operations, Costs of manufacturing operation	06	10
	2.2	Basic elements of Automated system, Levels of Automation, Machine, material handling, process automated systems.		
3	**Computer Numerical Control**			
	3.1	Fundamentals of CNC Technology, CNC, DNC, Applications of NC	10	18
	3.2	NC part programming – APT Tool path generation,		

		CNC lathe programming, CNC programming for machining centre, Subroutines, Do loops, Canned cycles.		
Section II				
4.	**Flexible Manufacturing System (FMS)**			
	4.1	Group technology Cellular Mfg, Part families, part classification & coding, cellular manufacturing.	08	16
	4.2	FMS Concept, Component, Application, benefits, FMS planning & Implementation Issues, Quantitative Analysis of FMS – Bottleneck model, Sizing the FMS.		
5	**JIT (Just in Time)**			
	5.1	Introduction, Philosophy of JIT, Elements of JIT, Master schedule, Kanban System, Layout and JIT, Effect on workers, Vendors, Implementation of JIT.	08	12
6	**Lean Manufacturing System**			
	6.1	Introduction, Lean production, Ten steps to Lean Production, Design of linked cell factory, How to design manufacturing cells, Agile manufacturing, Comparison of Lean and Agile manufacturing, 5 - S and virtual factory.	08	12
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Assignment	Hrs
1.	EDM Arc welding/metal using PAM metal machining and micro-finishing of a given job	09
2.	Operations of LSM Controller.	06
3.	Writing programme for a given object, Feeding data (above) to CNC computer and correcting errors. Simulating actual tool path and Operating CNC to perform the above object.	09
4.	Writing individual/ common programme for a given object and performing a given task. Which includes programming, Feeding data, Rectifying errors, Loading workpiece, Simulation of tool path, operating FMS.	12
5.	Study elements of JIT and its Implementation.	06
6.	Studying the steps in Lean production system, and 5 – S.	06
	Total	**48**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Non Traditional Machining Processes	Class rooms teaching, Power point presentation, Demonstrations
2.	Manufacturing Operations & Automation	Class rooms teaching, Power point presentation, Demonstrations
3.	Computer Numerical Control	Class rooms teaching, Power point presentation, Demonstrations
4.	Flexible Manufacturing System (FMS)	Class rooms teaching, Power point presentation, Demonstrations
5.	JIT (Just in Time)	Class rooms teaching, Power point presentation, Demonstrations
6.	Lean Manufacturing System	Class rooms teaching, Power point presentation, Demonstrations

Text Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	Automation Production System and CIM	Mikell P Groover,	Prentice Hall of India Pvt. Ltd. New Delhi – 01, 1998
2.	Non Traditional Etching Processes	Dr. Adhitan	Prentice Hall of India Pvt. Ltd. New Delhi – 01, 1998
3.	Non conventional Machining	R.K. Mishra	Narso Publishing House, New Delhi – 1997
4.	Workshop Technology Volume – 2	A K and S K Chaudhary S K Bose	Media promoters and publishers pvt. Ltd. Mumbai – 7
5.	CNC	Dr. Adhitan & Dabla	
6.	PPC Management	R.K. Garg, V. Sharma	Dhanpat Rai Publishing Co. New Delhi.

Learning Resources: Laboratory manuals received along with Trainer Kits, Modern equipments / Trainer Kits available in the workshop as below-

Flexible Manufacturing System Trainer (FMS), Electric Discharge Machine (EDM) Plasma Cutting Equipment, KROSS – 500 LSM Controller Package, PC base Hydraulics and Pneumatic Trainer, Mechanism Trainer, Industrial Control Unit, Artisan series – IDEAS – OGL, AUTO – CAD software, CNC Mill and lathe trainers, ideo cassettes No. 163,164,165,166,167,168,195 and 196 of G.P.P. Library.

Specification Table:

Sr.No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section - I					
1.	Non Traditional Machining Processes	05	03	04	12
2.	Manufacturing Operations & Automation	04	03	03	10
3.	Computer Numerical Control	06	06	06	18
TOTAL		**15**	**12**	**13**	**40**
Section - II					
4.	Flexible Manufacturing System (FMS)	06	05	05	16
5.	JIT (Just in Time)	06	03	03	12
6.	Lean Manufacturing System	04	04	04	12
		16	12	12	40
TOTAL		**31**	**24**	**25**	**80**

Note – Test marks (20) are not included in the above table, Abbreviations used as follow- Knowledge - K, omprehension, - , Application - A , Oral exam – OR, Term Work -TW, End Examination - EE, Non-conventional Machining - NCM, Computer Numerical Control - CNC , Computer Aided Design / Computer Aided Manufacturing - CAD / CAM Flexible manufacturing systems – FMS

(Prof. V.J. Deshpande) (Prof. S. B. Kulkarni) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in CE/EE/ET/ ME/MT/CM/IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Principles of Management
Course Code : MA661

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 Minutes**	**03 Hrs.**	**---**	**---**	**---**
Marks	**20**	**80**	**---**	**---**	**---**

Course Rationale:

This subject deals with the evolution of manager with respect to different approaches of management such as project planning, strategic planning, corporate planning, long range planning, decision making & creative problem solving. It also deals with the impact of computers and information technology in innovation and organizational design and planning.

Course Objectives:

After studying this course, the student will be able to

- Understand the managerial roll & skills.
- Understand the evolution of management thought and different approaches to management.
- Assimilate the concept of project planning, strategic planning, corporate planning & long range planning.
- Visualize the impact of computers in organization.
- Visualize the impact of information Technology in organizational communication & leadership.

Course Content:

Chapter No.		Name of Topic/Sub topic	Hrs	Weight-age
1.	**Principles & Functional Aspects of Management**			
	1.1	Management – Definition, Principles of Management, Functions of Management-Planning Organizing, Leading ,Controlling, Authority , Decision making Organization charts, Leadership, Organizational structure, Budgeting ,Problem solving ,Group dynamics and team functions, Conflict resolution, Communication ,Change, Organizational theory	**08**	**16**
2.	**Forms of ownership**			
	2.1	Types of ownership, individual ownership, partnership, joint stock companies, co-operative organization, Government undertakings (State ownership), their relative advantages and disadvantages.	**04**	**08**
3.	**Financial Management**			
	3.1	Financial Management- Objectives & Functions	**08**	**12**
	3.2	Capital Generation & Management- Types of Capitals, sources of raising Capital		
	3.3	Budgets and accounts- Types of Budgets, Production Budget Labour Budget, Introduction to Profit & Loss Account, Balance Sheet (only concepts) ;		
	3.4	Introduction to – Excise Tax, Service Tax, Income Tax, VAT, Custom Duty		
4.	**Human Resource Management**			
	4.1	Personnel Management - Introduction, Definition, Functions	**08**	**12**
	4.2	Staffing- Introduction to HR Planning, Recruitment Procedure, Personnel– Training & Development		
	4.3	Types of training- Induction, Skill Enhancement,		
	4.4	Leadership & Motivation- Maslow's Theory of Motivation,		
	4.5	Safety Management- Causes of accident, Safety precautions, industrial hygiene		
	4.6	Introduction to Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act		
5.	**Materials Management**			

	5.1	Industrial management, forecasting, master planning, schedules.	**06**	**08**
	5.2	Inventory Management - Meaning & Objectives		
	5.3	ABC Analysis, Economic Order Quantity		
	5.4	Purchase Procedure- Objects of Purchasing, Functions of Purchase Dept. Steps in Purchasing		
	5.5	Modern Techniques of Material Management- JIT / SAP / ERP		
6.	**Marketing Management**			
	6.1	Definition, concepts of marketing,, benefits of marketing concept, Functions of marketing management, Market research, its objectives and importance, sales forecasting, advertising and sales promotion.	**06**	**12**
7.	**Quality Management**			
	7.1	Concept of quality, standardization, merits and demerits. Types of standards, quality policy. Introduction to ISO 9001-2000, TQM, Kaizen, 6 Sigma	**06**	**08**
8.	**Project Management**			
	8.1	Introduction CPM & PERT Techniques (Simple Numericals)	**02**	**04**
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Principles & Functional Aspects of Management	Class room Teaching
2.	Forms of ownership	Class room Teaching
3.	Financial Management	Class room Teaching
4.	Human Resource Management	Class room Teaching
5.	Materials Management	Class room Teaching
6.	Marketing Management	Class room Teaching
7.	Quality Management	Class room Teaching
8.	Project Management	Class room Teaching

Text Books:

Sr. No	Author	Title	Publication

1.	Koontz	Prescribed Text Essentials of Management	**Tata McGraw Hill**
2.	Saxena	Principles & Practices of Management	Tata McGraw Hill

Reference Books:

Sr. No	Author	Title	Publication
1.	Hannagan.	Management Concepts & Practices	---
2.	Bovee and Schatzman,	Business Communication	Pearson Education
3.	V. S. Rao,	Management Text & Case	Excel
4.	S.A.Sherlekar & V.A. Sherlekar,	Modern Business Organization & Management	Himalaya Publications
5.	O.P.Khanna,	Industrial Organization and Management	Dhanpat Rai and Sons
6.	Banga and Sharma,	Industrial Organization and Management	Khanna Publications
7.	---	Essentials of Management	Tata Mc Graw Hill
8.	---	Principles of practice of Management	Tata Mc Graw Hill

Learning Resources: OHP, LCD, Projector, and Transference, White board.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Principles & Functional Aspects of Management	05	05	02	16
2.	Forms of ownership	05	05	02	08
3.	Financial Management	05	05	02	12
4.	Human Resource Management	05	05	02	12
5.	Materials Management	05	05	02	12
6.	Marketing Management	04	04	04	12
7.	Quality Management	03	02	03	08
8.	Project Management	--	--	--	--
	Total	**32**	**31**	**17**	**80**

(Prof. Dr. S. B. Nikam)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in CE/ EE/ET/ME/MT/CM/ IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Entrepreneurship Development
Course Code : MA662

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 Minutes**	**03 Hrs.**	**---**	**---**	**---**
Marks	**20**	**80**	**---**	**---**	**---**

Course Rationale:

To make the students aware of entrepreneurship as one of the career options and hence to teach them the various aspects of starting a enterprise.

Course Objectives:

After studying this course, the student will be able to

- SWOT analysis.
- Business Environment scanning and opportunity scanning. (Search)
- Market assessment.
- Project formulation.
- Identification of product / Technology / Equipment
- Financial Sources.
- Sales and Marketing
- Reasons of failure of entrepreneurs.

Course Content:

Chapter No.	Name of Topic/Sub topic	Hrs	Weigh - tage
1.	**Entrepreneurship Awareness**		
	Entrepreneurship – need, scope & philosophy Definition of a entrepreneur, attributes & characteristic. Intrapreneuring & Entrepreneurship. Need Analysis: Human Need, SWOT Analysis, goal setting, business environment, emerging trends, Information & collection techniques, opportunities.	08	10
2.	**Starting & Identification of Project**		
	Product and services, demand availability & resource requirement. Market survey technique – Identification of market, marketing trends, market survey techniques, agencies & organizations to be contacted. Product, suppliers of plant, equipment & raw material technology.	08	14
3.	**Preparation of Project report business plan**		
	Structure of project report, purpose of project report. Working & fixed capital, financial institutions, procedures & Norms for financing feasibility criteria, project planning, time management, legal formalities, municipal by laws. Safety considerations, plant layout commissioning of plant & equipment, trial production & quality assurance.	10	16
4.	**Information & support systems**		
	Information needed & their sources. Information related to Project Information related to procedures & formalities. Support systems a) Small scale business planning Requirements b) Govt. & financial Agencies, Formalities. Role of Central Government and State Government in promoting Entrepreneurship- introduction to various incentives ,, subsidies and grants – Export Oriented Units – fiscal and tax concession available.	10	16

5.	**Management of Enterprises**		
	Forms of business Organization. Human behavior, personnel sales Management. Marketing practice, distribution channels, Advertisings, Packaging.	06	12
6.	**Why do entrepreneurs fail**		
	The four entrepreneurial pitfalls (Peter Ducker) Case studies of successful entrepreneur. Women entrepreneurs – Robeson's for low women entrepreneurs, problems & prospectus.	06	12
	Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Entrepreneurship Awareness	**Lecture, market survey, workshops, interviews.**
2.	Starting & Identification of Project	
3.	Preparation of Project report business plan.	
4.	Information & support systems.	
5.	Management of Enterprises :	
6.	Why do entrepreneurs fail.	

Text Books:

Sr. No	Author	Title	Publication
1.	S. Saini, B.S. Rathore	Entrepreneurship – Theory & Practice	

Reference Books:

Sr. No	Author	Title	Publication
1.	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. I	
2.	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. II	
3.	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. III	
4.	Colombo Staff College, Manila	Entrepreneurship Development Plan	TMH, New Delhi
5.	Jerald Greenberg, Robert A. Baron/ Carol A. Sales/ Frances A. Owen / Verlag (1999)	Behaviour in organizations, Pearson Education.	Tata Mcgraw Hill.
6.	The winning Edge, corporate creativity.	Pradip N. Kandwalla	Tata Mcgraw Hill.(2006)
7.	John L. Colley, Jacqueline L. Doyle,	Corporate Governance	Tata Mcgraw Hill. (2003)
8.	Timpe, Dale A	Creativity	M/s. Jaico Publishing House, New Delhi. Tata Mcgraw Hill. (2005),

Learning Resources: Books, Articles, Case studies

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Entrepreneurship Awareness	02	06	02	10
2	Starting & Identification of Project :	04	06	04	14
3.	Preparation of Project report business plan.	03	10	03	16
4	Information & support systems.	04	08	04	16
5	Management of Enterprises :	04	06	02	12
6	Why do entrepreneurs fail.	04	04	04	12
	Total	**21**	**40**	**19**	**80**

(Prof.Smt.P.S.Karyakarte)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in CE/ EE/ ET/ ME/ MT/ CM/ IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Project Management
Course Code : MA663

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	**03 Hrs.**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

In all projects, huge financial investments are made. It is therefore necessary to manage all the resources for effective project implementation. A Diploma technician has to acquire this knowledge as per the job requirements.

Course Objectives:

After studying this course, the student will be able to

- Appreciate the importance of planning, scheduling, and controlling resources.
- Calculate project durations
- Understand the importance of cost – time analysis

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weight -age
1.	**Introduction**			
	1.1	What is Project Management?	**04**	**08**
	1.2	Principles and Functions of Project Management		
	1.3	Project life cycle		
	1.4	Major types of Projects		
	1.5	Role of Project Manager		
2.	**Organising For Project Management**			
	2.1	Organization of project participants	**08**	**12**
	2.2	Types – Line, Line and staff, Functional organization		
	2.3	Merits and demerits of each type		
	2.4	Leadership and Motivation for the project team		
	2.5	Interpersonal behaviour and communication – Its types, barriers in communication		
3.	**Project Planning**			
	3.1	Basic concepts in the development of project plans	**08**	**12**
	3.2	Defining work tasks / activities		
	3.3	Defining precedence relationships among activities		
	3.4	Estimating activity durations		
	3.5	Estimating resource requirements for activities		
4.	**Fundamental Scheduling Procedures**			
	4.1	Critical path method	**10**	**16**
	4.2	Meaning of terms – events, activity, earliest start time, Latest start time, earliest finish time, latest finish time, total float, free float, critical activity, dummy activity, critical path, project duration, .		
	4.3	PERT, Comparison between CPM and PERT		

5.	**Cost – Time Analysis in Network Planning**			
	5.1	Importance of Time – Cost analysis	**04**	**08**
	5.2	Project cost, direct cost, and indirect cost.		
	5.3	Variation of direct cost with time		
	5.4	Normal time, normal cost, crash time, crash cost, cost – slope.		
	5.5	Variation of indirect cost with time.		
6.	**Use of Computers in Project Management**			
	6.1	Computer aids for project. Software available in PJM. Project information – Types and Uses.	**04**	**08**
7.	**Introduction to Important Laws**			
	7.1	Factories Act – Scope and provisions	**04**	**08**
	7.2	Minimum Wages Act – Scope and provisions		
	7.3	Workmen's compensation Act– Scope and Provisions.		
8.	**Safety in Execution Of Works**			
	8.1	Importance of Safety, Causes of accidents at work places. Precautions to avoid accidents, Safety programmes. Terms-Accident cost, Injury frequency rate, Injury severity rate.	**06**	**08**
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Class room teaching
2.	Organizing for project management	Class room teaching
3.	Project planning	Class room teaching
4.	Fundamental scheduling procedures	Class room teaching
5.	Cost – time analysis in network planning	Class room teaching
6.	Use of computers in project Management	Class room teaching
7.	Introduction to important laws	Class room teaching
8.	Safety in execution of works	Class room teaching

Text Books:

Sr. No	Author	Title	Publication
1.	M. Spinner	Elements of Project Management	Prentice Hall Englewood Cliffs, New Jersey
2.	Victor G. Hajek	Project Engineering	McGraw – Hill Book Company

Reference Books:

Sr. No	Author	Title	Publication
1.	Chris Hedrickson and Tung Au.	Project Management for Construction	Prentice Hall Englewood Cliffs, New Jersey
2.		Bar Laws	

Learning Resources: Computer software, OHP, LCD, Projector, and Transference, PPTS, White board

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	04	04	---	08
2.	Organizing for Project Management	04	04	04	12
3.	Project Planning	04	06	02	12
4.	Fundamental scheduling procedures	02	02	12	16
5.	Cost – time analysis in network planning	04	04	--	08
6.	Use of computer in project management	04	--	04	08
7.	Introduction to important laws	04	04	---	08
8.	Safety in execution of works	--	04	04	08
	Total	**26**	**28**	**26**	**80**

(Prof. R. H. Dhorje)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in CE/ EE/ ET/ ME/ MT/ CM/ IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Material Management
Course Code : MA664

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 Minutes**	**03 Hrs.**	**---**	**---**	**---**
Marks	**20**	**80**	**---**	**---**	**---**

Course Rationale:

This course deals with management of materials. Smooth running of any industry depends upon the interdepartmental relations and planning for execution of work jointly. Efficiency of production department also depends upon the availability of raw material of required quality and quantity. Therefore there should be proper co-ordination between production department, production planning, stores department and purchase department. Incorrect materials planning can also lead to higher inventories & high cost.

Course Objectives:

After studying this course, the student will be able to

- To know the importance of materials and inventory management
- To know the different aspects of buying procedure and price forecasting.
- To acquaint with latest techniques in materials management
- To know procedure for giving requisition of materials along with specifications
- To know different features of negotiation technique and management of obsolete and scrap materials.

Course Content:

Chapter No.	Name of Topic/Sub topic	Hrs	Weight -age

1.	**Importance of Materials Management**			
	1.1	Growing importance of Materials Management	**10**	**16**
	1.2	Scope of Materials Management		
	1.3	Objectives and functions of Materials Management		
	1.4	Organising for Materials Management		
	1.5	Introduction to Materials planning		
	1.6	Importance of specifications in Materials Management		
2.	**Inventory Management**			
	2.1	Selective control – ABC Analysis - Purpose and objectives of ABC Analysis Mechanics &	**10**	**16**
	2.2	Advantages of ABC Analysis limitations of		
	2.3	ABC Analysis		
	2.4	Order point – Lead Time, safety stock, Re-order point, standard order. Economic order		
	2.5	Quantity (EOQ), Graphical & Analytical Method		
3.	**Buying procedure**			
	3.1	Sourcing, Buy or lease	**10**	**16**
	3.2	Purchase systems		
	3.3	Problems in relations with supplier		
	3.4	Value Analysis $\rightarrow$ Definition & scope		
	3.5	Selection of products for value analysis		
	3.6	Value analysis framework		
	3.7	Implementation & methodology		
	3.8	Ethics in purchasing		
4.	**Price forecasting**			
	4.1	Importance & Approaches	**06**	**10**
	4.2	Types of forecasting		
	4.3	Elements of good forecasting method		
	4.4	Different price forecasting techniques		
5.	**Latest Techniques in Materials Management**			
	5.1	Just in Time (JIT) zero inventory concept	**05**	**10**
	5.2	Integrated computerised management systems in Materials Management		

6.	**Management of obsolete Surplus and Scrap material**			
	6.1	Definitions, Reasons for generation and accumulation of obsolete Surplus and scrap, Survey committee, presale preparations, sale, auction, sale by tender.	**07**	**12**
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Importance of Materials Management	Class room teaching
2.	Inventory Management	Class room teaching
3.	Buying procedure	Class room teaching
4.	Price forecasting	Class room teaching
5.	Latest Techniques in Materials Management	Class room teaching
6.	Management of obsolete & scrap material	Class room teaching

Text Books:

Sr. No	Author	Title	Publication
1.	Ammer Deans S.	Materials Management	R.D. Irwin Hllions
2.	P. Gopalkrishan and M. Sundaresan	Materials Management An Integrated approach	Prentice – Hall of India Pvt. Ltd. New Delhi.
3.	M.M. Shah	An integrated concept of Materials Management	Tata McGraw Hill Publisher Co. Ltd. New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	P.G. Menon	Materials Management	
2.	A Deb	Materials Management	Academic Publishers
3.	Dobler D.W. and Lee C	Purchasing and Materials Management	---
4.	Brandy C.S.	Materials Handbook	---

Learning Resources: OHP, LCD, Projector, and Transference, White board

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Importance of Materials Management	6	6	4	16
2.	Inventory Management	6	6	4	16
3.	Buying procedure	6	6	4	16
4.	Price forecasting	--	6	4	10
5.	Latest techniques in Materials Management	2	4	4	10
6.	Management of obsolete and scrap materials	6	6	--	12
	Total	**26**	**34**	**20**	**80**

(Prof.R.H.Dhorje)
Prepared By

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Chairman, PBOS

Programme : Diploma in CE/EE / ET/ ME/MT/ CM / IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Supervisory Management
Course Code : MA665

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests, each of 60 Min. duration	03 Hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

The diploma holders are intended to work as a supervisor in the industry. He has to perform a versatile role in the activities of an industry; he has to coordinate his subordinates and the higher personals.
The students are required to understand to function as a supervisor. He should be able to plan, organize, and direct the subordinates to achieve better results within time for a task assigned to him.

Course Objectives:

After studying this course, the student will be able to

- Know the basic duties of a supervisor.
- Plan a particular job by splitting the whole job into pieces and monitoring each step.
- Understand human behaviors, identify skills, utilize skills, and observe safety of workers.
- Achieve better overall efficiency and utilize maximum capacity of machineries.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction**			
	1.1	Management of a job. Necessity for Scientific Management for supervisor. Handling complexity and achieving optimization.	**02**	**04**
2.	**Planning by Supervisor**			
	2.1	Objectives of planning. Planning activities. Planning by supervisor. Detailing and following of each step. Prescribing standard forms for various activities. Budgeting at supervisory level for materials and man power. Planning a programme and actions for a job.	**04**	**08**
3	**Organizing by supervisor**			
	3.1	Organizing physical resources. Matching human needs with job needs. Allotment of tasks to individual and establishing relationship among persons working in a group.	**04**	**08**

4.	**Directions by supervisor**			
	4.1	Need for such directions and instructions to subordinates. Need for clarity, completeness and feasibility of instructions. Reviving of effectiveness of communication. Personal counseling. Advance predictions of possible mistakes. Elaborating decisions. On the spot adjustments during execution of job. Laying disciplinary standards in over all working.	**06**	**10**
5.	**Motivation to subordinates**			
	5.1	Workers participation in management of a job. Achievement motivation. Recognition for devotion. Delegating responsibilities to subordinates. Activities and intensions towards the growth of an individual. Identification of human needs and providing safety to the workers.	**06**	**10**
6.	**Coordination & implementation**			
	6.1	Understanding link between various departments in respect of process and quality standards. Synchronization of duties of subordinates. Control over the performance in respect of quality; quality of production; time and cost. Measuring performance, comparing with standard, correcting unfavorable deviations.	**10**	**14**
7.	**Check list by supervisor**			
	7.1	Introduction to subordinates regarding the job undertaken. Planning the days work suitable for the job. Responsibility survey. Checking possibility for acceptance of assignment from new department.	**08**	**10**

8.	**Moving up in the organization**			
	8.1	Demonstration of job competence. Exhibition of leadership and initiative. Looking for to accept challenging responsibilities and acceptance of the same. Attitude and actions to be followed and avoided. Stressing the value of own contribution. Achievement of trust of subordinates and the higher management.	**08**	**16**
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Planning by supervisor	Lecture method
3.	Organizing by supervisor	Lecture method
4.	Directions by supervisor	Lecture method
5.	Motivation to subordinates	Lecture method
6.	Coordination & implementation	Lecture method
7.	Check list by supervisor	Lecture method
8.	Moving up in the organization	Lecture method

Text Books:

Sr. No	Author	Title	Publication
1	Industrial Management	Shrinivasan	Khanna publisher,New Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	Industrial organization and Engineering Economies	Banga and sharma.	Khanna publisher,New Delhi
2.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai and Sons, New Delhi
3.	What every Supervisor Should Know	Lestec R. Bittel John W. Newstrom	McGraw Hill Publishing Company, (GREGG Division)

Learning Resources: Books, Articles, C.D.'s, Visits, Video Cassettes No. 115 and 120

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	02	02	-	04
2.	Planning by supervisor:	06	01	01	08
3.	Organizing by supervisor	04	02	02	08
4.	Directions by supervisor	05	03	02	10
5.	Motivation to subordinates	05	03	02	10
6.	Coordination & implementation	10	02	02	14
7.	Check list by supervisor	06	02	02	10
8.	Moving up in the organization	08	04	04	16
	Total	**46**	**19**	**15**	**80**

(Prof. P.K.Metkar)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in CE/EE / ET/ ME/MT/ CM / IT
Programme Code : 01/02/03/04/05/06/07/15/16/17/18
Name of Course : Total Quality Management
Course Code : MA666

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical / Tutorial	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests, each of 60 minutes**	**3Hrs.**	**--**	**--**	**--**
Marks	**20**	**80**	**--**	**--**	**--**

Course Rationale:

In today's international market the quality is another name for universal acceptance for product and services .Hence the mechanical engineers must have consciousness about various quality aspects required for manufacturing /service sector.
To fulfill this need this subject about various factors and philosophies in quality development is introduced. So that student will have most of basic inputs before they enter their profession.

Course Objectives:

After studying this course, the student will be able to

- To understand the importance of Quality Standards and consumer need for quality items for price paid by him..
- To understand Quality Management Foundation and introduction to total quality management
- To know about Quality circle, Kaizen and various Quality improvement tools.
- To know about Quality Assurance Systems and Quality Management through ISO 9000 series.
- To know about Toyota way and Six Sigma concepts.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
1.	**Introduction**			
	1.5	Basic concepts related with quality, Various definition of quality. Quality of design and quality of conformance, Service quality Vs product quality.	**06**	**12**
	1.6	Quality policy: definition and objectives. Quality audit.		
	1.7	Quality assurance: - definition, meaning it's various forms and advantages .Quality audit, quality mindedness, inspection and quality control.		
2.	**Quality Management Foundation and introduction to total quality management.**			
	2.1	Strategic quality management (Hoshin Kanri) Strategic quality planning, quality goals. The vision – future state of organization, good understanding by everyone, inspiration, achievable QCDF (Quality Cost Delivery Flexibility), Customer focus, sharing by all values of the leadership, organization and employees.	**08**	**12**
	2.2	Total Quality:- definition ,objectives, eight dimensional model of total quality.		
	2.3	Total Quality management:- definition , need ,mission, initiative and concept. Barriers, implementation and advantages..		

	2.4	TQM Models :- Juran trilogy , Deming programme , Mckinsey model, Crosby program..		
3.	**Quality Management Processes**			
	3.1	**Quality planning** Quality culture (Kaizen and Quality circle) Quality Circle: - concept, objective, structure, steps in formation of quality Circle. Roles of people involved in quality Circle. advantages of quality Circle.	**12**	**16**
	3.2	What is Kaizen. - The concept, meaning and definition ,areas for Kaizen - 10 ground rules for change. - Traditional methods Vs Kaizen , Kaizen Vs innovation - Types of waste and Waste elimination, value added work, hidden waste and obvious waste, Identification of wastes. - 5S in housekeeping and their meaning - Improvement in work methods. Achievement after Kaizen		
	3.3	Quality improvement Old statistical and analytical tools for quality. i) Tally-sheet ii) Graphs iii) Histograms iv) Stratification v) Scatter diagram vi) Control chart vii) Pareto diagram		
	3.4	New tools of quality i) Ishikawa diagram ii) Arrow diagram iii) Relations diagram iv) Tree diagram v) Affinity diagram vi) Matrix diagram		

	3.5	Additional tools of quality improvement i) Brains storming ii) Flow charts iii) 5W & 1H iv) 5 WHYS		
4.	**Quality Management Infrastructure**			
	4.1	History of ISO 9000. European economic community (EEC), need for quality system standards, International organization for standardization (ISO) adopted by Bureau of Indian Standards (BIS)	**12**	**16**
	4.2	ISO 9000: 2000 Quality system ISO 9000 series standards, ISO 9000 elements understanding requirement, assessment with respect to quality system. Documentation and implementation, quality manual, structure, internal quality audit, external audit and certification.		
	4.3	Various Quality Systems Vocabulary and features ISO 9001: Requirements for a quality management system ISO 9004 : Guidelines for the effectiveness and efficiency of the quality management system IS 14000: 2004 series, its importance ISO 19011: guidance on auditing and environmental management systems.		
5.	**Principles of the Toyota way**			
	5.1	Introduction to Toyota way, Toyota production system (TPS), lean production, '4' P model of Toyota way.	**04**	**12**
	5.2	Toyota way principles and their meaning.		

6.	**Six Sigma**			
	6.1	Introduction to six sigma, Psychology of six sigma,	**06**	**12**
	6.2	Six sigma DMAIC process		
	6.3	The six sigma players, their roles and Responsibilities. Champions , Master black Belts, Black belts, Green belts.		
	6.4	Factors to be considered while selecting a project for six sigma, Do's and Don'ts for making six sigma effective. Advantages of six sigma. The zero defects concept.		
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Quality Management Foundation and introduction to total quality management.	Lecture method
3.	Quality Management Processes	Lecture method, Transparencies, Internet surfing.
4.	Quality Management Infrastructure	Lecture method, Transparencies, Internet surfing.
5.	Principles of the Toyota way	Lecture, Ppt & Discussion
6.	Six Sigma	Lecture method, Ppt & Discussion

Text Books:

Sr. No	Author	Title	Publication
3.	Dr. K.C.Arora	Total Quality Management	S.K.Kataria and sons
4.	B.Janakiraman and R.K. Gopal	Total Quality Management Text and cases	Prentice Hall of India pvt. Ltd. New Delhi.
5.	Subburaj	Total Quality Management	Tata Mc - Graw Hill Co., New Delhi.
6.	Gupta, Srinivas N & B Valarmathi	Total Quality Management	Tata Mc - Graw Hill Co., New Delhi.

Reference Books:

Sr. No	Author	Title	Publication
4.	Peter S.Pande Robert P. Neuman Roland R.Cavanagh	Six Sigma way	Tata Mc - Graw Hill Co., New Delhi.
5.	Jeffrey K. Liker	The Toyota Way	Tata Mc - Graw Hill Co., New Delhi.
6.	Suganthi and Samuel	Total Quality Management	Prentice Hall of India pvt. Ltd. New Delhi

Learning Resources: Books, journals, Internet searches.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	12	--	--	12
2.	Quality Management Foundation and introduction to total quality management.	08	04	--	12
3.	Quality Management Processes	08	08	--	16
4.	Quality Management Infrastructure	08	08	--	16
5.	Principles of the Toyota way	08	04	--	12
6.	Six Sigma	08	04	--	12
	Total	**52**	**28**	--	**80**

(Prof. P.U.Garge) Prepared By

(Prof. S. B. Kulkarni) Secretary, PBOS

(Prof.C.C. Dandvatimath) Chairman, PBOS

Programme : Diploma in CE/ EE/ ET/ME/MT/CM/IT
Programme Code : 01/ 02/ 03 / 04 / 05 / 06 /07/15/16/17/18
Name of Course : Software Project Management
Course Code : MA667

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 Minutes**	**03 Hrs.**	**---**	**---**	**---**
Marks	**20**	**80**	**---**	**---**	**---**

Course Rationale:

This subject forms the foundation of Software Project Management. It is essential to know these fundamentals to understand the concept of Project Management.

Course Objectives:

After studying this course, the student will be able to

- Understand the core concept of Software Project Management.
- Understand how to create the software projects.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weight-age
1.	**Starting Your Software Project**			
	1.1	Examining the Big Picture of Project Management • Understanding Universal Constraints (Time, Cost, and Scope) • Understanding What Makes Software Project Management So Special	08	14
	1.2	Initiating a Software Project • Identifying the Project Purpose • Moving from Here to There • Living with Stakeholders • Understanding How Executives Select Projects • Making Your Project Wish List		
	1.3	Creating the Software Scope • Understanding Product Scope and Project Scope • Understanding Product Scope and Project Scope • Building the Software Scope • Creating the Project Scope • Creating a Work Breakdown Structure		
2.	**Planning Your Software Project**			
	2.1	Planning for Communications • The Importance of Communicating Effectively • Avoiding Communication Breakdowns • Building an Effective Communication Management Plan Defining Who Needs What Information, Defining When Communication Is Needed, Defining Communication Modalities	16	24
	2.2	Planning for Software Project Risks • Identifying Pure and Business Risks • Managing Risks in Your Organization • Using Software Models for Risk Management • Preparing a Risk Response Plan • Examining Risk Responses and Impacts		

	2.3	Planning for Software Quality • Defining Quality • Working with a Quality Policy • Balancing Time, Cost, and Quality		
	2.4	Building the Project Team • Determining Your Project Needs • Asking the Right Questions • Determining Who Is Really in Charge		
	2.5	Creating Project Time Estimates • Preparing to Create Your PND • Identifying Activity Duration Influencers • Making the Project Duration Estimate • Understanding the Way PND Paths Interact • Creating the Project Schedule		
	2.6	Building Your Project Budget • Creating Cost Estimates • Controlling Project Costs • Following simple strategies to manage project expenses • Having More Project than Cash		
3.	**Executing Your Software Project Plan**			
	3.1	Working the Project Plan • Authorizing the Project Work • Managing Software Project Risks	**08**	**14**
	3.2	Working with Project People • Examining the Phases of Team Development • Managing Project Conflicts • Using Your Super Magic Project Manager Powers		
	3.3	Procuring Goods and Services • Finding a Vendor • Selecting the Vendor • Negotiating for the Best Solution • Administering Contracts • Closing the Vendor Contract		

4.	**Controlling Your Software Project**			
	4.1	Managing Changes to the Software Project • Controlling the Project Scope • Controlling Project Costs • Controlling the Project Schedule	**08**	**14**
	4.2	Using Earned Value Management in Software Projects • Defining Earned Value Management • Playing with Values		
		Tracking Project Performance • Planning Project Metrics • Implementing a Tracking Plan • Tracking Project Performance • Communicating Project Performance		
5.	**Closing Your Software Project**			
	5.1	Finalizing the Project Management Processes • Closing the Software Project • Completing the Project • Releasing project team members from the project team	**08**	**14**
	5.2	Documenting Your Software Project • Completing the Lessons Learned Documentation • Organizing Your Lessons Learned Document • Creating the User Manual & Help System		
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Class room teaching
2.	Organizing for project management	Class room teaching
3.	Project planning	Class room teaching
4.	Fundamental scheduling procedures	Class room teaching
5.	Cost – time analysis in network planning	Class room teaching
6.	Use of computers in project Management	Class room teaching
7.	Introduction to important laws	Class room teaching
8.	Safety in execution of works	Class room teaching

Text Books:

Sr.	Author	Title	Publication

No			
1.	Teresa Luckey	Software Project Management For Dummies	John Wiley and Sons

Reference Books:

Sr. No	Author	Title	Publication
1.	Software Project Management	Bob Hughes, Mike Cotterell	--

Learning Resources: OHP, LCD, Projector, and Transference, White board.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Starting Your Software Project	08	04	02	14
2.	Planning Your Software Project	11	07	06	24
3.	Executing Your Software Project Plan	07	05	02	14
4.	Controlling Your Software Project	06	06	02	14
5.	Closing Your Software Project	**07**	05	02	14
	Total	**39**	**27**	**14**	**80**

(Prof.Smt.T. A. Kumbhare)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in CE/ EE/ET/ ME/MT/ CM /IT
Programme Code : 01/02/03/04/05/06 /07/15/16/17/18
Name of Course : Management Information System
Course Code : MA668

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term work**
Duration	Three class tests, each of 60 Min. duration	**03 Hrs.**	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale:

MIS is a concept continuous to evolve, emerging trend consistent with the evolution of the MIS concept endures computing. It is the power of computers, which makes MIS feasible. From this point of view, the course is introduced.

Course Objectives:

After studying this course, the student will be able to

- Understand the role of MIS in various functional areas of management.
- Understand the determination of requirement and analysis it to design information system necessary.
- Understand the supporting role of MIS in decision-making.

Course Content:

Chapter No.		Name of Topic/Sub topic	Hrs	Weightage
1.	**Information and Management**			
	1.1	Types of information, why do we need a computer based information system? Management structure, Management and information requirements, qualities of information. Examples of Information Systems Various functions in organizations, Information processing for a store- An overview, Varieties of information systems. Information Systems Analysis Overview:	**04**	**10**
	1.2	Overview of design of an information system. The role and tasks of systems analysts, Attributes of systems analyst, Tools used by system analyst.		
2.	**Information Gathering**			
	2.1	Strategy to gather information, Information sources, Methods of searching for information, Interviewing techniques, Questionnaires, Other methods of information search, Case example-Hostel information system.	**04**	**10**
	2.2	System Requirements Specification: System requirements specification: Example, Data dictionary, Steps in Systems Analysis, Modularizing requirements specifications, Conclusions.		
3.	**Feasibility Analysis**			
	3.1	Deciding on project goals, Examining alternative solutions, Evaluating proposed solution, Cost-benefit analysis, Pay back period, Feasibility report, and System proposal.	**08**	**15**
	3.2	Data flow diagrams Symbols used in DFD's Describing a system with a DFD, Good conventions in developing DFDs Leveling of DFDs, Logical and Physical DFDs.		
	3.3	Process Specifications Process specification methods, structured English Some examples of process specification.		

4.	**Decision Tables**			
	4.1	Decision table terminology and development, Extended entry decision tables, Establishing the logical correctness of decision tables, Use of Karnaugh maps to detect logical errors in decision tables, Eliminating redundant specifications. Importance of Logical Database Design in MIS	**08**	**15**
	4.2	Entity-relationship model, Relationship cardinality and participation, relations, Normalizing relations, Why do we normalize a relation? Second normal form relation. Third normal form, Boyce-Codd normal form (BCNF), Fourth and Fifth normal forms, Some examples of Database design.		
	4.3	Data input Methods: Data input, Coding techniques, Detection of error in codes, Validating input data, interactive data input.		
5.	**Database and Database Management Systems for MIS**			
	5.1	Problem with file based systems, -Objectives of Database management, -Overview of database management systems,	**12**	**15**
	5.2	Database administrator,		
	5.3	Database design, Conclusions		
	5.4	Object Oriented System Modeling		
	5.5	Object and their properties, Implementation of classes, Identifying objects in an application, Modeling systems with objects, Conclusions.		
	5.6	Object Oriented System Modeling: Object and their properties, implementation of classes, Identifying objects in an application, Modeling systems with objects, Conclusions.		
	5.7	Designing Outputs: Output devices, objectives of output design, Design of output reports, Design of screens, Use of business graphics.		

6.	**Control, Audit and Security of Information Systems**			
	6.1	Control in information systems, Audit of Information Systems, Testing of Information Systems, Security of Information Systems.	**12**	**15**
	6.2	Electronic Commerce What is E-Commerce? Advantages and Disadvantages of E-Commerce, E-Commerce System architecture, Electronic data interchange, Security in E-commerce, Electronic payment systems, Conclusions.		
	6.3	System Design Example: A system for journal acquisition, Document and Data flow diagrams, Feasibility of the system, System specification, Database design, Control, audit and test plan, implementation plan, conclusions.		
		Total	**48**	**80**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Information and Management	Class room teaching for all
2.	Information Gathering	
3.	Feasibility Analysis	
4.	Decision Table	
5.	Database Management Systems (DBMS)	
6.	Control Audit and security of information systems	

Text Books:

Sr. No	Author	Title	Publication
1.	V Rajaraman	Analysis & design of Information system	PHI

Reference Books:

Sr. No	Author	Title	Publication
1.	Gordon B. Davis and Margeth H. Olson	MIS	
2.	Kroenke Davis	Management information System	2nd edition
3.	Sein	MIS	
4.	Jawadekar W.S.	MIS	
5.	Millind Oka	MIS	
6.	Jayashankar	Decision Support Systems	
7.	Lucas	Information System Concepts for Management	4th edition

Learning Resources: OHP, LCD Projector and Transparency.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Information and Management	04	04	02	10
2.	Information Gathering	04	02	04	10
3.	Feasibility Analysis	02	08	05	15
4.	Decision Table	02	08	05	15
5.	Database Management Systems (DBMS)	06	04	05	15
6.	Control Audit and security of information systems	04	05	06	15
	Total	**22**	**31**	**27**	**80**

(Prof.Smt.T. A. Kumbhare)
Prepared By

(Prof. S. B. Kulkarni)
Secretary, PBOS

(Prof.C.C. Dandvatimath)
Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Project and Seminar
Course Code : ME 761
Prerequisite : 90 Credits

Teaching Scheme:

Tutorial/ Practical	Hours /Week	Total Hours
Theory	**--**	**--**
Tutorial	**02**	**32**
Practical	**06**	**96**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Seminar/Oral	Term work
Duration	--	--	--	--	--
Marks	--	--	--	**50**	**50**

Course Rationale:

- In institution students learn many theoretical aspects but there remains a large gap between theory and actual industrial practices. If students are exposed to industrial practices they can co-relate their theoretical knowledge with practical aspects. They will understand their roles in industries. They will develop confidence to work as technician.
- A technician has to face a number of problematic situations in his professional life. He requires scientific approach to handle the situation and ability to solve the problems at work. This helps him to develop his competence. Additionally, it develops skills in interacting with the available group of people, as well as in searching and obtaining the information required for problem solving from a number of sources and reporting and presenting the matter.

Course Objectives:

After studying this course, the student will

- Be able to co-relate theory with practical aspects.
- Be exposed to industrial environment, work culture.

- Be involved in day to day problem solving & handling human resources.
- Prepare a training report.
- Record systematically their experiences.
- Observe modern equipments & processes.
- Develop the skills to identify the problem and to take the steps towards seeking the solutions to the problems.
- Develop the skill of preparing reports for presentation.
- Develop the skill to communicate the problem and solutions by seminar.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weight-age
One project will be selected on any one of the following heads :				
1	**Fabrication**			
	1.1	e.g. Gobar gas plant, Solar cooker, Heater, Solar collector, Wind mill, Water cooler, Washing machine, Air cooler etc. or any other assembly approved by the guide.	32	--
2	**Survey / Investigation**			
	2.1	Small scale industry / industries, Market survey of product	32	--
3	**Quality Audit**			
	3.1	Quality control technique used in industry, maintenance, quality circles. Production techniques cost estimation P.P.C., starting a new small scale industry	32	--
4	**Modification, Innovation**			
	4.1	Existing machine may be modified or new invention of machine or mechanism.	32	--
5	**Design**			
	5.1	Design related mechanical engineering discipline in depth.	32	--
6	**Advance Study**			
	6.1	Advance study Related to mechanical discipline, welding techniques, PERT, CPM, Work-study, latest technological development, Kaizen, JIT, Pokayoke te, TQM etc.	32	--
Total			**32**	**--**

Note: Every student will prepare a project report in duplicate (typed) one with him and one with the institute. A logbook (manuscript) is to be maintained by each student which is to be assessed by the Project Guide from time to time. This typed project report should be based on this manuscript. A seminar is to be conducted where his communication skill will be tested. Every student will give a seminar talk on various aspects of his project. Project involves computer work – simple software programme developed by students. A batch should be of maximum four students.

List of Project Head/Experiments/Assignments:

Sr. No.	Name of Project Head/Experiment/Assignment	Hrs
1.	Fabrication	96
2.	Survey / Investigation	96
3.	Survey / Investigation	96
4.	Quality Audit	96
5.	Modification, Innovation	96
6.	Design	96
7.	Advance Study	96
	Total	**96**

Instructional Strategy:

Sr. No.	Project Head/ Topic	Instructional Strategy
1.	Fabrication	Lecture, Internet, G.D., case study
2.	Survey / Investigation	Lecture, Internet, G.D., case study
3.	Survey / Investigation	Lecture, Internet, G.D., case study
4.	Quality Audit	Lecture, Internet, G.D., case study
5.	Modification, Innovation	Lecture, Internet, G.D., case study
6.	Design	Lecture, Internet, G.D., case study
7.	Advance Study	Lecture, Internet, G.D., case study

Text Books:

Sr. No	Author	Title	Publication
2.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Learning Resources: Magazines, Journals, Books, Models, Internet

(Prof. B. Prasad)	(Prof. S. B. Kulkarni)	(Prof. Warke S.W.)
Prepared By	**Secretary, PBOS**	**Chairman, PBOS**

Programme : Diploma in ME
Programme Code : 04
Name of Course : Robotics & Mechatronics
Course Code : ME 762

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**3**	**48**
Practical	**2**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Modern manufacturing industries have complex processes.A technician working in production department has to deal with various complex processes related to automation& control for the same to increase the productivity.

This course is being introduced so as to enable the students to get the knowledge & design of robots & various mechatronics systems.

Course Objectives:

After studying this course, the student will be able to

- Acquire knowledge of robot elements.
- Know different applications of robot.
- Know various programming methods of robots.
- Know the signal conditioning in mechatronics.
- Know various mechatronics systems.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
	SECTION -I			
1	**Introduction to Robotics**			
	1.1	Introduction, history	**04**	**08**
	1.2	Laws of robotics, definitions		
	1.3	Robotic system, Six axes PUMA robot, SCARA robot		
	1.4	Robot manipulator arm		
	1.5	Revolute pair		
2	**Construction of Robot**			
	2.1	Robot co-ordinate systems, work envelopes	**10**	**16**
	2.2	Robot wrists		
	2.3	Robot end effectors-Mechanical grippers, magnetic grippers, vacuum grippers, adhesive grippers		
	2.4	Robot actuators-pneumatic, hydraulic, electric		
	2.5	Robotic control systems-non-servo system, positional servo system		
	2.6	Motion control of robots- PTP & continuous path control		
3	**Programming methods &applications of robot**			
	3.1	Programming methods-lead through, teach pendent, textual programming	**10**	**16**
	3.2	Robot sensors-Tactil , non-tactile		
	3.3	Robot I/O interfaces, Human systems & robotics		
	3.4	Specification of robots,		
	3.5	Safety measures in robotics		
	3.6	Applications of robots in industry-Pick & place, machine loading & unloading, assembly, inspection, welding		
	3.6	Accuracy & repeatability of robot		
	3.7	Cost justification of robot		

	SECTION -II			
4	**Introduction to mechatronics**			
	4.1	Roll of mechatronics, scope,	**08**	**14**
	4.2	Basic design elements		
	4.3	Sensors & transducers-classification, selection ,		
	4.4	Types- LVDT,strain gauges, thermistors, pressure transducers-bellows, piezoeletric		
5	**Signal conditioning**			
	5.1	Need, types	**08**	**14**
	5.2	OPAMP- inverting, voltage follower,adder,subtractor, integrator		
	5.3	Convertors,maintenance of circuit		
	5.4	Actuators- mechanical, hydraulic, pneumatic,stepper motors, servomotors		
6	**Mechatronics Systems**			
	6.1	MEMS (Micro electro mechanical systems)	**08**	**12**
	6.2	Elements of MEMS		
	6.3	Applications,advantages of MEMS		
	6.4	Micromachining		
	6.5	Microprocessors,I/O systems		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on PUMA & SCARA robot	02
2.	Assignment on elements of robot& control systems of robot	06
3.	Assignment on programming methods & applications of robot	06
4.	Assignment on sensors & transducers	06
5.	Assignment on OPAMP & actuators	06
6.	Assignment on mechatronic system	06
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to Robotics	Lecture, Demonstration & Discussion
2.	Construction of Robot	Lecture, Demonstration & Discussion
3.	Programming methods & applications of robots	Lecture, Demonstration & Discussion
4.	Introduction to mechatronics	Lecture, Demonstration & Discussion
5.	Signal conditioning	Lecture, Demonstration & Discussion
6.	Mechatronic systems	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
3.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	S.R.Deb	Robotics Technology& Flexible Automation	Mc - Graw Hill Co., USA
2.	Yorem korean	Robotics for Engineers	Mc - Graw Hill Co., USA
3.	Groover,Weiss	Industrial Robotics	Mc - Graw Hill Co., USA
4.	K.S.Fu, C.S.G.Lee	Robotics	Mc - Graw Hill Co., USA
5.	M.P.Groover	Automation,Production systems & CAM	Prentice Hall
6.	J.G.Joshi	Mechatronics	

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
SECTION -I					
1.	Introduction to Robotics	08	--	--	08
2.	Construction of Robot	06	06	04	16
3.	Prog. Methods & Applications of Robots	04	04	08	16
	Total	18	10	12	40
SECTION -II					
4	Introduction to mechatronics	08	06	--	14
5	Signal conditioning	06	04	04	14
6	Mechatronics systems	04	04	04	12
	Total	18	14	08	40
	Total	**36**	**24**	**20**	**80**

(Prof. V.J. Deshpande)
Prepared By

(Prof. Kulkarni S. B.)
Secretary, PBOS

(Prof. Warke S.W.)
Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Refrigeration and Air Conditioning
Course Code : ME 763

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Refrigeration and Air conditioning is one of the most meaningful job areas for diploma holders in Mechanical Engineering. Considering the wide and increasing use of Refrigeration and Air conditioning for domestic and commercial applications and the challenges put by the use of Refrigeration and air conditioning equipments in existing stage, it is absolutely necessary that Diploma technicians should learn this course. They should know the processes, equipments, systems of Ref. and A/C with their functioning, maintenance and repairs and measures to meet the challenges of the near future in the area.

Course Objectives:

After studying this course, the student will be able to

- Understand types of refrigeration system, calculations involved in finding performance of refrigeration system
- Use various charts and tables used in refrigeration and air conditioning
- Know properties of refrigerants and their applications.
- Know various components and controls used in refrigeration and air conditioning.
- Understand various air conditioning systems and their applications
- Prepare load estimates
- Know trouble shooting and maintenance procedures

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section-I				
Refrigeration				
1	**Introduction**			
	1.1	Introduction to refrigeration, Methods of refrigeration	**02**	**00**
	1.2	Concept of Heat pump, Refrigerator.		
	1.3	Concept of COP, Refrigerating effect, Units of Refrigeration.		

2	**Refrigeration Systems**			
	2.1	**Vapor Compression System**: Principle of working, Basic Components of Vapor compression systems (VCC) , Representation of simple and actual cycle on P-V, T-S and P-H Charts, effect of superheating and subcooling. Calculations of Refrigeration effect, work done, COP, Mass flow of refrigerant, Refrigeration Capacity using Refrigerant Charts only.	**08**	**12**
	2.2	**Vapor Absorption Systems:** Principle, components and working of Ammonia- water Vapor Absorption System. Principle, components and working of Lithium Bromide- Water Vapor Absorption System. Principle, components and working of Electrolux Refrigerators. Comparison of VCC and absorption systems,		
3	**Vapor Compression System Components:**			
	3.1	**Compressor:** Construction, working and applications of Open Type, Hermetically sealed, Centrifugal, Screw type compressors	**08**	**20**
	3.2	**Condenser:** Construction and working of air cooled (forced and natural convection), water cooled (double tube, shell tube, shell coil) and evaporative condensers		
	3.3	**Evaporators:** Types of evaporators such as bare tube, plate surface, finned tube, flooded type, dry expansion type, Selection of evaporators		
	3.4	**Expansion Devices:**Construction and working of various types of expansion devices such as capillary tube, automatic expansion, thermostatic expansion valves.		
	3.5	**Controls:** LP/HP control, thermostats, overload protectors, relays.		
4	**Refrigerants:**			
	4.1	**Classification of Refrigerants:** Primary Refrigerants, Secondary Refrigerants	**06**	**08**

	4.2	**Desirable properties of a Good Refrigerant:** Thermodynamic properties, Chemical properties, Physical properties.		
	4.3	Effect of CFC on Ozone depletion and Global Warming, Montreal Protocol , Kyoto Protocol		
	4.4	Alternative Refrigerants		
Section- II				
Air-conditioning				
5	**Psychometry**			
	5.1	Definition, necessity of air-conditioning, concept of dry air, moist air and saturated air.	**04**	**08**
	5.2	Psychometric properties of air: DBT, WBT, DPT, absolute humidity, specific humidity, relative humidity, sp. Volume, enthalpy.		
	5.3	Psychometric processes: Psychometric chart, representation of psychometric processes such as sensible heating, sensible cooling, latent heating, latent cooling, heating and humidification, cooling and humidification, evaporative cooling.		
	5.4	Numerical relating to finding the properties after the air undergoes certain processes (Using Psychometric chart only), bypass factor of cooling coil.		
6	**Air-conditioning Systems and Equipments**			
	6.1	Unitary System: Window air conditioner, Split air conditioner	**08**	**16**
	6.2	Central air conditioning systems		
	6.3	Package, Summer, winter and Year-round year conditioner systems		
	6.4	Types of filters, Humidifiers ,humidistat		
	6.5	Insulation: Type of insulating materials used in refrigeration system, properties required and applications.		

7	**Air Distribution Systems**			
	7.1	Room air distribution, Concept of draft, throw, drop, induction ratio or entrainment ratio and spread.	**06**	**8**
	7.2	Types of supply air outlets, return outlets, sealing diffusers, grills registers, fixed/ adjustable louvers, low/high wall outlets, floor baseboard and sealing outlets Considerations for selection and location of outlets		
	7.3	Ducts: Flow through Ducts , Static & Dynamic Losses, Duct Design–Equal Friction Method , Duct Balancing , Fan Arrangement Variable Air Volume systems , Air Handling Units and Fan Coil units.		
8	**Principles of Load Calculations**			
	8.1	Human comfort: Body heat regulation, concept of effective temperature, human comfort chart.	**06**	**08**
	8.2	Concept of sensible, latent heat and total heat load, Sensible heat factor, Sources of heat load, Calculation of cooling load and determination of refrigeration capacity.		
	8.3	Summer Air conditioning , Winter Air conditioning Load due ventilation air and infiltration , Grand total heat load, Grand sensible heat factor, ERSHF. (No Numerical)		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in groups.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Study of domestic refrigerator: (construction, working , refrigerants used, its trouble shooting and remedies.)	4
2.	Study and performance of a ice plant	4
3.	Study and performance of a Water cooler	2
4.	Study of vapor absorption system	4
5.	Study of window air conditioner and its trouble shooting and remedies.	4
6.	Study of tools used in refrigeration and air conditioning system.	4
7.	Cooling load calculation and demonstration of software on load calculation.	2
8.	Demonstration of evacuation, pressure testing and charging of refrigeration system. not to be included in term work file, questions can be asked in oral examination	2
9.	Demonstration of tube bending, flaring, soldering, brazing, cutting etc. not to be included in term work file, questions can be asked in oral examination.	2
10.	Visit to ice plant / air conditioning plant / cold storage	4
	Total	**32**

Note: Assignments based on the above topics (at least one for each)

Mini project: Group of 4 to 6 students. (Use of information on internet, research papers, proceedings of conferences, etc can be made)

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Refrigeration Systems	Lecture method, Demonstration
3.	Vapor Compression System Components	Lecture method, Transparencies
4.	Refrigerants	Lecture method, Transparencies
5.	Psychometry	Lecture, Demonstration & Discussion
6.	Air-conditioning Systems and Equipments	Lecture method, Demonstration
7.	Air Distribution Systems	Lecture method, Demonstration, visits
8.	Principles of Load Calculations	Lecture method, assignments

Text Books:

Sr. No	Author	Title	Publication
1.	R.S. Khurmi and J.K. Gupta	Refrigeration and Air conditioning	Eurasia publishing house, New Delhi
2.	Arora / S. Domkundwar	Refrigeration and Air conditioning	Dhanpat Rai & Sons
3.	C.P. Arora	Refrigeration and Air conditioning	Tata McGraw Hill
4.	Ballney	Refrigeration and Air conditioning	Khanna Publication
5.	Ananthnarayanan	Basics of Ref. and A/C	Tata McGraw Hill

Reference Books:

Sr. No	Author	Title	Publication
1.	V.K. Jain	Refrigeration and Air conditioning	
2.	Jordan and Priester	Refrigeration and Air conditioning	Prentice Hall
3.	Sarao and Gabbi	Refrigeration and Air conditioning	Satya Prakashan, New Delhi
4.	Dossat	Principles of Refrigeration	Prentice Hall

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section- I					
1.	Introduction	0	0	0	0
2.	Refrigeration Systems	02	04	06	12
3.	Vapor Compression System Components	04	8	04	16
4.	Refrigerants	04	08	0	12
	Total				**40**
Section- II					
5.	Psychometry	04	00	04	08
6.	Air-conditioning Systems and Equipments	04	04	04	12
7.	Air Distribution Systems	04	04	04	08
8.	Principles of Load Calculations		04	08	12
Total					**40**

(Prof. V.S.Sonawne) **(Prof. S. B. Kulkarni)** **(Prof. Warke S.W.)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Programme : Diploma in ME
Programme Code : 04
Name of Course : Computer Integrated Manufacturing
Course Code : ME 764

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

In modern manufacturing, use of computer systems plays vital role to achieve quality components. Complex processes related to automation and control for the same is essential to increase productivity.

This course has been introduced to enable the students to get the knowledge of product development, conceptual shape design, Dat base of CIM and new trends related

Course Objectives:

After studying this course, the student will be able to

- Understand CIM system
- Acquire knowledge of product development through CIM
- Understand conceptual shape design
- Know CIM data base
- Know collaborative engineering concept
- Know computer control in CIM

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section-I				
1	**Introduction to CIM**			
	1.1	Introduction, definition of CIM, types of manufacturing	**04**	**08**
	1.2	Evaluation of CIM		
	1.3	CIM hardware and CIM software		
	1.4	Nature and role of elements of CIM system		
	1.5	Development of CIM		
2	**Product Development through CIM**			
	2.1	Introduction , product development cycle	**10**	**16**
	2.2	Sequential engineering, concurrent engineering, implementation of concurrent engineering , concurrent engineering and information technology		
	2.3	Soft and hard prototyping		
	2.4	Characteristics of concurrent engineering, key factors influencing success of concurrent engineering, examples of concurrent engineering		
	2.5	Group technology and cellular system		
3	**Conceptual Shape Design**			
	3.1	Introduction ,Design process	**10**	**16**
	3.2	Sketching the geometry, understanding curve and surface design		

	3.3	Other features useful for conceptual design		
	3.4	Data transfer to other software		
Section II				
4	**CIM Data Base**			
	4.1	Introduction, database requirement of CIM	**10**	**16**
	4.2	Database management, features of DBMS (Database Management Systems), Database models, DBMS Architecture		
	4.3	Query Language, structured query language(SQL), SQL and knowledge based query language		
	4.4	Product data management (PDM), advantages of PDM		
5	**Collaborative Engineering**			
	5.5	Introduction, faster design throughput	**10**	**16**
	5.6	Web based design, changing design approaches		
	5.7	Extended enterprises, enterprise- wide product visualization		
6	**Computer Control in CIM**			
	6.1	Functions of computer in CIM, CIM data files	**08**	**08**
	6.2	System reports, benefits of CIM		
	6.3	CIM models- ESPRIT,CIM, OSA model		
	6.4	IBM concept of CIM		
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on CIM hardware and CIM software	4
2.	Assignment on product development through CIM	6
3.	Assignment on conceptual shape design	6
4.	Assignment on CIM database	6
5.	Assignment on collaborative engineering	6
6.	Assignment on computer controls and CIM	4
	Total	**32**

Note: NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in groups.

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to CIM	Lecture method
2.	Product Development through CIM	Lecture method, Demonstration
3.	Conceptual Shape Design	Lecture method,
4.	CIM Data Base	Lecture method,
5.	Collaborative Engineering	Lecture, Discussion
6.	Computer Control in CIM	Lecture method

Text Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	P. Radhakrishnan, V.Raju	CAD/CAM/CIM	New-Age International(P) Ltd New Delhi
2.	M.P. Grover	CAD/CAM	Prentice HALL of India pvt Ltd New Delhi
3.	P.N. Rao	CAD/CAM- Prnciples and applications	TATA Mc Graw Hill
4.	Dr. Surendra Kumar, Dr A. K. Jha	CAD/CAM	Dhanpatrai and Co.

Learning Resources: Books

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section- I					
1.	Introduction to CIM	08	--	--	08
2.	Product Development through CIM	08	04	04	16
3.	Conceptual Shape Design	08	04	04	16
		24	08	08	40
Section- II					
4.	CIM Data Base	08	04	04	16
5.	Collaborative Engineering	08	04	04	16
6.	Computer Control in CIM	04	04	--	08
		20	12	08	40
Total		**44**	**20**	**16**	**80**

(Prof. V. J. Deshpande) **(Prof. S. B. Kulkarni)** **(Prof. Warke S.W.)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Programme : Diploma in ME
Programme Code : 04
Name of Course : Instrumentation and Control
Course Code : ME 765

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**64**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

The art of measurement plays an important role in all branches of engineering. With advances in technology, measurement techniques & sensor have also taken rapid strides, with many types of instrumentation devices, innovations, and refinements. The course aims at making a Mechanical Engineering student familiar with the principles of instrumentation, transducers & measurement like temperature, pressure, flow, force ,level and strain etc.

Course Objectives:

After studying this course, the student will be able to

- Know the fundamentals of instrumentation and control system.
- Know the classification and selection of transducers
- Know the fundamentals of control systems
- Know the various measurements such as Pressure , flow measurement

Displacement , Strain , Level , Force ,Torque and temperature measurement

- Know the programmable logic controllers and their application.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig ht age
	Section I			
1	**Introduction**			
	1.1	Fundamental of Instrumentation**:** introduction**,** purpose of instrumentation. Types of measurement, Significance of measurement. Classification of instruments.	**06**	**10**
	1.2	Characteristics of instruments : Static characteristics such as range and span, accuracy and precision, reliability, calibration, hysteresis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity. Dynamic characteristics- speed of response, fidelity, lag and dynamic errors, overshoot.		
	1.3	Types of error- and sources of error. Comparison of hydraulic, Pneumatic and electronic systems, Servomechanism.		
2	**Transducers**			
	2.1	Definition and classification of transducers.	**10**	**16**
	2.2	Characteristic of transducer and Selection criteria for transducer.		
	2.3	Types of transducers: - – Strain Gauge, LVDT, RVDT, Capacitive, Resistive, Piezoelectric – Principle of Working, Advantages, Disadvantages and Applications.		

3	**Fundamentals of Control Systems**			
	3.1	Block diagram of automatic control system, closed loop system, open loop system, and feed back control system.	**08**	**14**
	3.2	On-off, cascade, P, PI, PID and feed-forward controls		
	3.3	Applications of measurements and control setup for boilers, air conditioners, and motor speed control.		
Section II				
4	**Pressure and flow measurement**			
	4.1	Pressure Measurements: Methods of measuring pressure, elastic transducer tester. Pressure sensor (solid state) ,piezoelectric pressure sensor.	**08**	**12**
	4.2	Flow Measurements: Rota meter(basic concepts only), mechanical meter (turbine type), ultrasonic flow meter, electromagnetic flow meter, thermal flow meter		
5	**Displacement , Strain and Level Measurement**			
	5.1	Displacement Measurement Potentiometer, LVDT, Eddy current generation type, encoder, incremental and absolute type. Ultrasonic displacement.	**08**	**14**
	5.2	Strain Measurement Types of strain gauges, strain gauge materials, mounting of gauges, resistance strain gauge- bonded and unbonded, types (foil, semiconductor, wire wound gauges), load cells, rossets.		
	5.3	Level Measurement Mechanical type & Electrical type (float, gauge), level measurement of solid substance.		

6	**Force ,Torque and temperature measurement**			
	6.1	Force Measurement: Force measurement by Accelerometer, measurement with elastic elements, load cell using strain gauges.	**08**	**14**
	6.2	Torque Measurement: Torque Measurement using mechanical dynamometer, electric dynamometer, and transmission dynamometer.		
	6.3	Temperature Measurements : Bimetallic Thermometers, RTDs and thermistor– PTC, NTC. Thermocouple- elements of thermocouple, Seeback & Peltier Effect law of intermediate temperature, law of intermediate metals. Use of thermocouple for temperature measurement, thermopile. Pyrometer-radiation and optical.		
		Total	**48**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practical/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on instrument characteristic & types of error.	2
2.	Study of various types of transducers	4
3.	Verification of PID controller action	2
4.	Pressure Measurement by using strain gauge OR To study pressure sensing elements (Bourdon tube, Diaphragm etc) OR Verify characteristics of a basic strain gauge.	4
5.	Flow rate Measurement by using Rotameter	2
6.	Level Measurement by using air purge system	2
7.	To plot the Characteristics of RTD (PT-100) and Thermocouple	4

8.	Speed Measurement by using Tachometer	2
9.	Measurement of force & weight by using a load cell.	2
10	Displacement Measurement by using LVDT OR Displacement or Position Measurement by using rotary encoder OR Verify characteristics of LVDT	4
11	Temperature calibration by using Thermocouple	4
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method, Demonstration
2.	Transducers	Lecture method, Demonstration
3.	Fundamentals of Control Systems	Lecture method, Transparencies, Demonstration
4.	Pressure and flow measurement	Lecture method, Transparencies, Demonstration
5.	Displacement , Strain and Level Measurement	Lecture, Demonstration
6.	Force ,Torque and temperature measurement	Lecture method, Demonstration
7.	Programmable logic controller (PLC)	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	Earnest O Deobelin	Measurement systems – Application and Design	McGraw Hill Publication
2.	A.K.Sawhney	Mech. Measurements & Instrumentation'	Dhanpat Rai and Sons, Delhi 110006.
3.	D.Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill
4.	R.K.Jain	, 'Mechanical & Industrial Measurements',	Khanna Publications, New Delhi
5.	R.V. Jalgaonkar	Mechanical Measurement & Control'	Everest Publishing House, Pune
6.	D.S.Kumar	Mechanical Measurements & Control',	Metropolitan Publi., New Delhi.

Reference Books:

Sr. No	Author	Title	Publication
1	B.C.Nakra K.K.Chawdhry	Instrumentation Measurement and Analysis	Tata McGraw Hill
2	Rangan Mani Sharma	Instrumentation systems and devices	Tata McGraw Hill
3	Bela Liptak Kriszta Venczel	Process Measurement Instrument Engineers Handbook	Chilton Book Company
4	C.S. Narang	Instrumentation Devices & Systems'	Tata McGraw Hill Publications, New Delhi

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Introduction	06	02	02	10
2.	Transducers	04	04	08	16
3.	Fundamentals of Control Systems	06	04	04	14
Section II					
4.	Pressure and flow measurement	04	02	06	12
5.	Displacement , Strain and Level Measurement	04	02	08	14
6.	Force ,Torque and temperature measurement	04	02	08	14
	Total	**24**	**20**	**36**	**80**

(Prof. P.U.Garge) (Prof. S. B. Kulkarni) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Tool Engineering
Course Code : ME 766

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Modern manufacturing industries use complex production processes. A technician working in production department comes across various problems involving metal cutting processes, forming processes, Jigs and Fixtures for mass production to increase productivity of company.

This course is introduced so as to enable the students to get the knowledge of cutting tools , jigs and fixtures etc. to enter into the practical field of engineering

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
Section-I				
1	**Mechanics of Metal Cutting**			
	1.4	Introduction, mechanics of chip formation	**04**	**08**
	1.5	Single point tool geometry- ASA System, ORS System, importance of tool angles		
	1.6	Methods of machining- orthogonal and oblique cutting		
	1.7	Types of chips, tool materials		
	1.8	Machinability – index, chip breakers		
2.	**Design of Single Point Cutting Tool**			
	2.1	Shear angle and its determination	**10**	**18**
	2.2	Velocities in metal cutting processes, determination of un-deformed chip thickness		
	2.3	Force relations, merchant's circle, theory of Lee and Shaffer, cutting power, MRR, energy consideration in metal cutting, oblique cutting		
	2.4	Tool wear- types, tool life- definition, criteria, variables affecting tool life		
	2.5	Types of single point cutting tools- solid tools, tipped tools, dimensions of tool shank		
	2.6	Economics of metal cutting (problems on tool angles and on tool life		
3	**Design of Multipoint Cutting Tool & Cutting Fluids**			
	3.1	Design of milling cutter	**10**	**14**
	3.2	Design of drills		
	3.3	Design of reamers		
	3.4	Cutting fluids- requirement, types, application, selection of cutting fluids		
Section II				
4	**Jigs and Fixtures**			

	4.1	Introduction, definition, principle of pin location, design principle for location purposes	**06**	**12**
	4.2	Clamping- principles devices		
	4.3	Design principles for jigs and fixtures		
	4.4	Drilling jigs- design principles, bushes, types		
	4.5	Design principles of milling fixtures, lathe fixtures, assembly fixtures,		
	4.6	Indexing jigs and fixtures		
	4.7	Jigs and fixture construction- casting, fabrication, welding and comparison		
5.	**Press working and Cutting Dies**			
	5.1	Introduction, definitions of various press operations, types of press, press working terminology	**10**	**16**
	5.8	Cutting dies- types, principle , scrap strip layout, clearance applications, cutting forces, methods to reduce cutting forces , minimum diameter of piercing		
	5.9	Blanking dies- types, die block, die block thickness, die opening, fastening of die block, punch, backup plate, centre of pressure		
	5.10	Strippers- types, stock stop- latch stop, automatic stop, solid stop, strip feeding, knock-outs		
	5.11	Piercing dies- mounting, piercing punches, pilots- types		
6	**Forming Dies**			
	6.1	Drawing dies- design consideration, types, no. of draws, drawing pressure, blank holding pressure, redraw dies	**08**	**12**
	6.2	Bending dies- bending methods, design principles,		

		spring back, bending pressure		
	6.3	Forging dies- open die forging and closed die forging		
	6.4	Forging design factors- draft, fillet, parting line, shrinkage and die wear, mismatch, finish allowances, tolerance, webs and ribs		
		Total	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on tool geometry and Machinability	4
2.	Assignment on merchant circle, tool wear, tool types	6
3.	Assignment on multipoint cutting tool- milling cutters, drills and cutting fluids	6
4.	Assignment on jig or fixture design for sample part	6
5.	Assignment on cutting dies	6
6.	Assignment on forming dies	4
	Total	**32**

Note: NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in groups.

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Mechanics of Metal Cutting	Lecture method
2.	Design of Single Point Cutting Tool	Lecture method, Demonstration
3.	Design of Multipoint Cutting Tool & Cutting Fluids	Lecture method,
4.	Jigs and Fixtures	Lecture method,

5.	Press working and Cutting Dies	Lecture, Discussion
6.	Forming Dies	Lecture method

Text Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	G. B. S. Narang	Machine Tool Engineering	S. Chand & Co. New Delhi
2.	Lindberg	Manufacturing Engineering and Processes	Tata Mc Graw HILL N. Delhi
3.	P.C. Sharma	Production Engineering	S. Chand & Co. New Delhi

Learning Resources: Books

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section- I					
1.	Mechanics of Metal Cutting	08	--	--	08
2.	Design of Single Point Cutting Tool	08	06	04	18
3.	Design of Multipoint Cutting Tool & Cutting Fluids	06	04	04	14
		22	10	08	40

Section- II					
4.	Jigs and Fixtures	06	04	02	12
5.	Press working and Cutting Dies	08	04	04	16
6.	Forming Dies	04	04	04	12
		18	12	10	40
		40	**22**	**18**	**80**

(Prof. V. J. Deshpande) **(Prof. S. B. Kulkarni)** **(Prof. Warke S.W.)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Name of Programme : ME
Programme Code : 04
Name of Course : Quality Function Deployment
Course Code : ME767

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

EvaluationScheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Three class tests of 60 Min. duration	--	--	--	--
Marks	**20**	**80**	--	**25**	**50**

Course Aim:

A structured planning process that systematically incorporates the voice of the customer into product design, Quality Function Deployment (QFD) has proven itself a highly effective development tool for creating globally competitive products - in software, hardware, services, and many other industries.

Course Objectives

After studying this course, the student will be able to

- Understand the concepts of QFD, and its link between an organization and the outside needs; the voice of the customer.
- Develop and constructs a QFD which enable them to convert users' needs (or customers' demand) into substitute quality characteristics for use in the design stage
- Deploy the substitute quality characteristics identified at the design stage to the production or service activities, thereby establishing the necessary control and checks points prior to production or service start-up

Course Contents:

Chapter No		Name of the Topic / subtopic	Hrs	Weightage
SECTION - I				
1	**Introduction to Practical Quality Function Deployment**			
	1.1	History, General Description and Objective of QFD Relevance to New ISO Standard Definitions and Terms	**04**	**06**
2	**Overview of the "House of Quality"**			
	2.1	Introduction to "House of Quality" Key Elements of the Top Level House of Quality A) Customer Inputs B) Product/Service Specifications C) Competitive Benchmarking QFD Critical Path Plan – Illustrated Necessary Prerequisites Opportunities for Concurrent Effort	**06**	**10**

3	**QFD Execution Phase I – Obtain "Voice of the Customer"**			
	3.1	Market Definition- Specify Target Market Segments, Identify Key Competitors	**07**	**12**
	3.2	Qualitative "Voice of the Customer"- Team Preparation and Participation, Developing the Survey, Implementing Customer Visits, Organizing VOC Information		
	3.3	Implementing the Quantitative Survey- Survey Guidelines, Designing the Survey, Methods for Obtaining the Data,		
	3.4	Review Execution Phase I-Key Elements of Phase I, QFD Critical Path Plan		
4	**QFD Execution Phase II – Internal Specification Validation**			
	4.1	**Develop Product/Service Specifications** A) Focus on Functionality B) Establish Performance Measures **C)** Define Units and Desired Optimum	**07**	**12**
	4.2	Competitive Benchmarking A) Quantitative Testing **B)** Measured Versus Perceived Performance		
	4.3	Review Execution Phase II A) Key Elements of Phase II B) QFD Critical Path Plan		
SECTION – II				
5	**QFD EXECUTION PHASE III – ESTABLISH CUSTOMER CENTRIC SPECIFICATIONS**			
	5.1	**Complete the House of Quality** A) Mathematical Approaches to Model "Relative Product Value" **B)** Establish Critical Performance Measures	**07**	**12**
	5.2	**Identify Performance Gaps and Opportunities** A) Functional "Best in Class" B) World Wide Gap – Opportunity C) Perceived Performance Gap **a.** Competitive Advantage (temporary) **b.** Competitive Disadvantage		
	5.3	Define Product Platform and Option Opportunities		
	5.4	Establish Customer Centric Performance Targets		

	5.5	Review Execution Phase III A) Key Elements of Phase III **B)** QFD Critical Path Plan		
6	**QFD EXECUTION PHASE IV – DESIGN DEPLOYMENT**			
	6.1	ESTABLISH OVERALL SYSTEM ARCHITECTURE A) Define Subsystems **B)** Correlate Product Functionality with Subsystems **C)** Design Concept Selection	**07**	**12**
	6.2	**Subsystem Decomposition** A) Correlate Subsystems and System Performance Measures B) Establish Subsystem Performance Targets **C)** Planning for Potential Subsystem Level Faults		
	6.3	**Component Decomposition** A. Correlate Components with Subsystem Performance Targets B. Identify Critical Components and Specifications C. Evaluation of Component Level Failure Modes		
	6.4	**Review Execution Phase IV** A) Key Elements of Phase IV **B)** QFD Critical Path Plan		
7	**QFD Execution Phase V – Process Deployment**			
	7.1	PREREQUISITES FOR PROCESS DEPLOYMENT A. Manufacturing Process Routing Defined B. Process Capability Understood		
	7.2	**Process Decomposition** A) Correlate Critical Components with Manufacturing Processes B) Evaluate Process Capability Against the Design C) Develop Manufacturing Quality Plan	**06**	**10**

8	**Practical Quality Function Deployment – Summary Review**			
	8.1	**QFD Critical Path Plan**	**04**	**06**
	8.2	**Review of Key Concepts** A) Preparing for Implementation B) Obtaining Voice of the Customer C) Design and Process Deployment		
	8.3	**Supporting Quality Tools – Overview & Timing** A) Pugh Concept Selection B) Target Costing C) Triz Theory of Inventive Problem Solving D) Fault Tree Analysis E) Failure Modes and Effects Analysis F) Statistical Process Control (Cp, Cpk)		
	8.4	**Benefits and Limitations of the Process**		
		Total	**48**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on Practical Quality Function Deployment	02
2.	Assignment on Overview of the "House of Quality"	02
3.	Assignment on particular Product with following QFD Phases	
	Phase I – Obtain "Voice of the Customer"	06
	Phase II – Internal Specification Validation	04
	Phase III – Establish Customer Centric Specifications	06
	Phase IV – Design Deployment	06
	Phase V – Process Deployment	06
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1	Introduction to Practical Quality Function Deployment	Class rooms teaching
2	Overview of the "House of Quality"	Class rooms teaching, Power point presentation, Demonstrations
3	QFD Execution Phase I – Obtain "Voice of the Customer"	Class rooms teaching, Power point presentation, Demonstrations
4	QFD Execution Phase II – Internal Specification Validation	Class rooms teaching, Power point presentation, Demonstrations
5	QFD Execution Phase III – Establish Customer Centric Specifications	Class rooms teaching, Power point presentation, Demonstrations
6	QFD Execution Phase IV – Design Deployment	Class rooms teaching, Power point presentation, Demonstrations
7	QFD Execution Phase V – Process Deployment	Class rooms teaching, Power point presentation, Demonstrations
8	Practical Quality Function Deployment – Summary Review	Class rooms teaching, Power point presentation, Demonstrations

Text Books:

Sr. No	Author	Title	Publisher
1.	Yoji Akao	Quality Function Deployment: Integrating Customer Requirements into Product Design	Productivity Press, ISBN 0-915299-41-0
2.	Shigeru Mizuno, Yoji Akao	QFD: The Customer-Driven Approach to Quality Planning & Deployment	ISBN 9283311221
3.	Larry Shillito	Advanced QFD: Linking Technology to Market and Company Needs	ISBN 0-471-03377-4
4.	Louis Cohen, QFD Practictitioner	Quality Function Deployment: How to Make QFD Work for You	Prentice Hall, 1995

Specification Table:

Sr. No.	Topic / subtopic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1	Introduction to Practical Quality Function Deployment	04	02	--	06
2	Overview of the "House of Quality"	06	04	--	10
3	QFD Execution Phase I – Obtain "Voice of the Customer"	06	04	02	12
Section II					
4	QFD Execution Phase II – Internal Specification Validation	04	04	04	12
5	QFD Execution Phase III – Establish Customer Centric Specifications	04	04	04	12
6	QFD Execution Phase IV – Design Deployment	06	--	06	12
7	QFD Execution Phase V – Process Deployment	06	--	04	10
8	Practical Quality Function Deployment – Summary Review	06	--	--	06
Total		**42**	**18**	**20**	**80**

(Prof. S. B. Kulkarni)	(Prof. S. B. Kulkarni)	(Prof. S. W. Warke)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : MRP I & II
Course Code : ME 768

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**3**	**48**
Practical	**2**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

In modern manufacturing industries planning of various resources is crucial. For efficient planning of resources like material, manufacturing machines & it's capacity, inventory etc. technician has to use planning techniques effectively. Thus knowledge of various MRP techniques helps to prepare plans according to requirements of industry.

Course Objectives:

After studying this course, the student will be able to

- Know aggeregate planning
- Know MRP inputs & outputs
- Know capacity planning
- Know shop floor control systems
- Know manufacturing resource planning

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig-htage
SECTION- I				
1	**Introduction to MRP**			
	1.1	Introduction	**06**	**08**
	1.2	Aggregate production planning, production control		
	1.3	Development of MRP, benefits of MRP		
2	Material requirement planning inputs			
	2.1	Definition	**10**	**16**
	2.2	Type of inventory systems		
	2.3	MRP system		
	2.4	Master production schedule		
	2.5	Externally originating orders for components		
	2.6	Forecasts for items of independent demand		
	2.7	Inventory record file-item master data,inventory status, subsidiary data		
	2.8	Bills of materials,lead times, operations routing,time		
3	**MRP outputs**			
	3.1	How MRP works	**08**	**16**
	3.2	Time phased order point		
	3.3	Lot sizing policies-Fixed order quantity,EOQ,lot for lot,fixed periopd requirements,period order quantity, least unit cost, least total cost		
	3.4	Part period balancing		
	3.5	Lot size adjustments		
SECTION- II				
4	**Capacity planning**			
	4.1	Definition	**08**	**14**
	4.2	Capacity planning for short term & long term		
	4.3	Production capacity utilization & availability		
	4.4	Manufacturing lead time		

5	**Shop floor control**			
	5.1	Introduction	**10**	**14**
	5.12	Shop floor control system phases- order release, order scheduling, order progress		
	5.13	Factory data collection system (FDC systems)- manual data input techniques,semi automated & automated data collection systems		
	5.14	Inventory control- Order point inventory systems, reorder point systems, WIP system		
6	**Manufacturing resource planning**			
	6.1	Introduction	**06**	**12**
	6.2	MRP-II, closed loop MRP-II		
	6.3	Application modules of MRP-II		
	6.4	ERP,		
	6.5	Customer- oriented manufacturing management system (COMMS)		
	6.6	Manufacturing execution systems (MES)		
	6.7	Customer oriented management systems (COMS) – elementary level introduction		
		Total	**48**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
5.	Assignment on aggeregate production planning	02
6.	Assignment on MRP input	06
7.	Assignment on MRP output	06
8.	Assignment on capacity planning	06
9.	Assignment on FDC system, Inventory control	06
10.	Assignment on MRP-II	06
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
7.	Introduction to MRP	Lecture method
8.	Material requirement planning Inputs	Lecture, Demonstration & Discussion
9.	Material requirement planning Outputs	Lecture, Demonstration & Discussion
10.	Capacity planning	Lecture, Demonstration & Discussion
11.	Shopfloor control	Lecture, Demonstration & Discussion
12.	Manufacturing resource planning	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
4.	Nil	Nil	Nil

Reference Books:

Sr. No	Author	Title	Publication
7.	M.P.Groover	Automation production systems & CIM	Prentice Hall of India Ltd.New Delhi
8.	R.K.Garg & V.Sharma	Production Planning & Control Management	Dhanpat Rai & Sons Pub.New Delhi

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
SECTION – I					
7.	Introduction to MRP	08	--	--	08
8.	Material requirement planning Inputs	06	05	05	16
9.	Material requirement planning Outputs	06	05	05	16
	TOTAL	20	10	10	40
SECTION - II					
10.	Capacity planning	06	04	04	14
11.	Shop floor control	06	04	04	14
12.	Manufacturing resource planning	04	02	06	12
	TOTAL	16	10	14	40
Total		**36**	**20**	**24**	**80**

(Prof. V.J.Deshpande) Prepared By

(Prof. Kulkarni S. B.) Secretary, PBOS

(Prof. Warke S.W.) Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04/18
Name of Course : Product Life cycle Management
Course Code : ME769

Teaching Scheme:

	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**---**	**---**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	**Three class tests of 60 Minutes**	**03 Hrs.**	**---**	**---**	**---**
Marks	**20**	**80**	**---**	**---**	**---**

Course Rationale:

This course will present the latest material on PLM and its impact on the organization. The course will consist of an overview of the current thinking on the principles, strategies, practices, and applications of Product Lifecycle Management followed by an in-depth look at specific areas of PLM that are the focus of today's innovative organizations.

This course will present both the conceptual underpinnings of PLM, along with the newest industry views on PLM applications. There will be a particular emphasis on initiating PLM projects at the beginning of the lifecycle in engineering and manufacturing and its impact on the rest of the organization. The course will also present frameworks to provide economic justifications for PLM projects and explain the pit falls of a piecemeal approach to PLM

Course Objectives:

After studying this course, the student will be able to

- Assess, prepare, and plan for the role of PLM
- Review new developments in PLM within the context of practical applications
- Integrated, information driven approach to all aspects of a product's life from its design inception, through its manufacture, deployment and maintenance, and culminating in its removal from service and final disposal.
- Simulate plant floor processes without rearranging a single piece of equipment.
- Search through parts libraries and model parts for fit and function without touching a physical part
- linking these math-based representations with their physical counterparts for the life of the product

Course Content:

Chapter No.		Name of Topic/Sub topic	Hrs	Weight-age
SECTION -I				
1.	**Introduction to PLM**			
	1.1	What is PLM, Reasons for adopting PLM strategies and methods	**08**	**10**
	1.2	Building a business case justification for PLM		
	1.3	PLM's impact on corporate strategy, structure and operations		
	1.4	Readiness assessment for PLM		
2.	**Implications of PLM**			
	2.1	Challenges to implementing PLM	**04**	**08**
	2.2	Globalization considerations for PLM		
	2.3	General strategies and principles for the successful implementation of PLM		
	4.2	Unfavorable cannibalization		
	4.3	Offensive Cannibalization strategies		
	4.4	Defensive cannibalization strategies		
3.	**Product life cycle management system**			
	3.1	Functionality of system	**08**	**12**
	3.2	Use of product lifecycle management systems in different organization		

	3.3	Product development & engineering		
	3.4	Production. sales & marketing, sub contracting		
	3.5	Sourcing & procurement, after sales		
4.	**Product Life cycle technique**			
	4.1	Product cannibalization	**08**	**10**
SECTION -II				
5.	**Integration of PLM system with other applications**			
	5.1	Different ways of integrate PLM systems	**04**	**08**
	5.2	Transfer file-Database integration		
	5.3	System roles, ERP, CAD, Configurators, EAI		
6.	**Deployment of PLM**			
	6.1	Different stages of deployment -leading a PLM project, understanding the need for change	**08**	**16**
	6.2	**Study of present & objective processes, PLM maturity model, choosing system**		
	6.3	Realization stage of Project-Start up group, Steering group, Project group, project manager,		
7.	**Business benefits of PLM system**			
	7.1	Factors leading to PLM	**08**	**16**
	7.2	Benefits of PLM system in product lifecycle management		
	7.3	Measuring business benefits in daily operation, material costs: reducing inventory tied capital, improving productivity, costs of quality		
	7.4	PLM as a tool to support decision making		
	7.5	Analyzing the cost o acquisition & deployment of PLM system		
		TOTAL	**48**	**80**

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment based on Product life cycle management system	06
2.	Assignment based on Product Life cycle technique	06
3.	Assignment based on Integration of PLM system with other applications	08
4.	Assignment based on Deployment of PLM	08
5.	Assignment based on Business benefits of PLM system	04
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to PLM	Class room Teaching
2.	Implications of PLM	Class room Teaching
3.	Product life cycle management system	Class room Teaching
4.	Product Life cycle technique	Class room Teaching
5.	Integration of PLM system with other applications	Class room Teaching
6.	Deployment of PLM	Class room Teaching
7.	Business benefits of PLM system	Class room Teaching

Text Books:

Sr. No	Author	Title	Publication
1.	Antti Sääksvuori, Anselmi Immonen	Product life cycle management	**Springe**

Reference Books:

Sr. No	Author	Title	Publication
1.	Stark, John	Product Lifecycle Management: Paradigm for 21st Century Product Realisation	Springer-Verlag, 2004
2.	Grieves, Michael	Product Lifecycle Management	McGraw-Hill, 2006

Learning Resources: LCD Projector, and White board.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction to PLM	05	05	--	10
2.	Implications of PLM	04	04	--	08
3.	Product life cycle management system	05	05	02	12
4.	Product Life cycle technique	06	--	04	10
5.	Integration of PLM system with other applications	04	04	--	08
6.	Deployment of PLM	04	04	08	16
7.	Business benefits of PLM system	04	04	08	16
	TOTAL	**32**	**26**	**22**	**80**

(Prof. S. B. Kulkarni) **(Prof. S. B. Kulkarni)** **(Prof. S.W. Warke)**

Prepared By **Secretary, PBOS** **Chairman, PBOS**

Name of Programme : ME
Programme Code : 04
Name of Course : Supply Chain Management
Course Code : ME 770

Teaching Scheme:

Theory/Practical	Hrs/Week	Total Hrs
Theory	3	48
TERM WORK/ PRACTICAL	2	32

Evaluation:

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term work**
Duration	Two class tests of 60 Min. duration	--	--	--	--
Marks	**20**	**80**	**--**	**25**	**25**

Course Rational:

This course provides an understanding and appreciation of the management of the supply chain, including critiquing global supply chain management principles and practices. The program develops core leadership, team work and management competencies required by contemporary supply chain managers and their organisations.

Course Objectives:

After studying this course, the student will be able to

- Apply a framework to model the supply chain from purchasing through production to distribution
- Analyse pipeline mapping as a tool to monitor operating activity and inventory movements
- Plan distribution requirements
- Evaluate: the nature and extent of electronic data interchange; transportation as a key element in the supply chain; international considerations in supply chain management; the business processes in the supply chain to reduce costs and remove waste; and the use of electronic transfer and e-commerce in the management of the supply chain
- Manage the supply chain to meet challenging customer demands, with speed, reliability, transparency and responsiveness

Course Content:

Chapter No	Name of Topic / subtopic		Hrs	Weightage
SECTION – I				
1	**Introduction and Supply Chain Strategy**			
	1.1	Definition-Business logistics and supply chain management (SCM). Significance of SCM and its importance to the success of a firm. Key SCM activities and processes, SCM scope, dimensions, and trends. Supply chain decisions - strategic, tactical, and operational. Concept of implied demand uncertainty, and contrast supply chain efficiency with supply chain responsiveness. Drivers of supply chain performance	**08**	**12**

2	**Transportation Decisions in the Supply Chain**			
	2.1	Role of transportation in the supply chain and raise various tradeoffs for designing and operating a transportation network.	**09**	**14**
	2.2	Domestic and international transportation and different modes and their performance characteristics.		
	2.3	Rate types, profiles, and stop-off privileges schemes.		
	2.4	Link between transportation and inventory costs in the design of transportation networks.		
	2.5	Study a variety of quantitative tools that are useful in mode/service selection, freight consolidation, and vehicle routing and scheduling decisions.		
3	**Sourcing Decisions in the Supply Chain**			
	3.1	Role of sourcing in a supply chain. identify dimensions of supplier performance and their impact on costs strategic and tactical issues in supplier selection and rating, purchasing leverage, order quantity allocation.	**09**	**14**
	3.2	Variety of purchasing types including speculative, forward, hand-to-mouth, volume/quantity discounts, dollar averaging, deal buying.		
	3.3	Advances in sourcing such as vendor-managed inventory, electronic data interchange, E-sourcing and global purchasing.		
SECTION – II				
4	**Supply Chain Network Design**			
	4.1	Role of distribution within a supply chain, identify key factors of distribution networks, and the strengths and weaknesses of various distribution options.	**08**	**14**
	4.2	International issues in global supply chain network design and develop a framework for facility location decisions that allows for a multi-plant, multi- warehouse network to supply a large and diverse customer base.		
	4.3	Study a variety facility location models to optimally structure the distribution network, taking into account cost and customer service factors.		

5	**Supply Chain Coordination**			
	5.1	Information system issues within the supply chain. Identify the role of various information systems as well as some current considerations in the industry.	**08**	**14**
	5.2	Importance of sharing information throughout the supply chain by means of a computerized simulation of the Beer Distribution Game.		
	5.3	Bullwhip Effect and means by which to minimize its intensity in the supply chain.		
6	**Closed-Loop Supply Chains and Reverse Logistics**			
	6.1	Recovery of used products and their remanufacturing into new ones is gaining justifiable popularity among many companies worldwide.	**08**	**12**
	6.2	Impact of product recovery and remanufacturing on the design and operations of supply chains and examine the roles of closed-loop networks and reverse logistics in facilitating product returns and remanufacturing.		
Total			**48**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment based on Transportation Decisions in the Supply Chain	06
2.	Assignment based on Sourcing Decisions in the Supply Chain	06
3.	Assignment based on Supply Chain Network Design	08
4.	Assignment based on Supply Chain Coordination	08
5.	Assignment based on Closed-Loop Supply Chains and Reverse Logistics	04
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1	Introduction and Supply Chain Strategy	Class rooms teaching
2	Transportation Decisions in the Supply Chain	Class rooms teaching, Power point presentation, Demonstrations
3	Sourcing Decisions in the Supply Chain	Class rooms teaching, Power point presentation, Demonstrations
4	Supply Chain Network Design	Class rooms teaching, Power point presentation, Demonstrations
5	Supply Chain Coordination	Class rooms teaching, Power point presentation, Demonstrations
6	Closed-Loop Supply Chains and Reverse Logistics	Class rooms teaching, Power point presentation, Demonstrations

Text Books:

Sr. No	Author	Title	Publisher
1	Sunil Chopra and Peter Meindel	Supply Chain Management: Strategy, Planning, and Operation	Prentice Hall of India, 2002.
2	J.J Coyle, E.J. Bardi and C.J. Langley.	The Management of Business Logistics	
3	Edward A. Silver, David F. Pyke, and Rein Peterson.	Inventory Management and Production Planning and Scheduling	
4	D.J. Bowersox, D.J. Closs, O.K. Helferich	Logistical Management	
6	John Mentzer.	Fundamentals of Supply Chain Management	
7	R.B. Handfield and E.L. Nochols, Jr	Introduction to Supply Chain Management	Prentice Hall, 1999.
8	David Simchi Levi, Philip kaminsky, and Edith Simchi Levi.	Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies	Irwin McGrawHill, 2000.

Specification Table:

Sr. No.	Topic / subtopic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1	Introduction and Supply Chain Strategy	06	04	02	12
2	Transportation Decisions in the Supply Chain	06	04	04	14
3	Sourcing Decisions in the Supply Chain	06	04	04	14
Section II					
4	Supply Chain Network Design	06	04	04	14
5	Supply Chain Coordination	06	04	04	14
6	Closed-Loop Supply Chains and Reverse Logistics	06	06	--	12
Total		**36**	**26**	**18**	**80**

(Prof. S. B. Kulkarni)	(Prof. S. B. Kulkarni)	(Prof. S. W. Warke)
Prepared By	Secretary, PBOS	Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Reliability Engineering
Course Code : ME 771

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Students should be made aware of reliability concepts in the manufacturing of parts in handling new machine tools &equipments as well as about the different operations performed on it.

Course Objectives:

After studying this course, the student will be able to

- Understand the reliability concepts.
- Estimate the reliability of the system.
- Understand main tenability concept.
- Know various reliability tests.
- Know recent trends in reliability.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weightage
	SECTION - I			
1	**Introduction to Reliability**			
	1.1	Introduction, definition of reliability, probability	**04**	**08**
	1.2	Probability & reliability, reliability & quality, Failure & reliability		
	1.3	Types of failure, failure rate, Bath tub curve		
	1.4	Constant failure rate case,		
	1.5	Reliability equations & curves for constant failure rate ,Mortality curve		
	1.6	MTTF, MTBF, useful life, Wearout, early life		
2	**Mathematics of Reliability**			
	2.1	Histogram, Probability density distribution functions	**10**	**14**
	2.2	Imperical probability, Conditional probability		
	2.3	Binomial & Poisson distribution, Normal distribution		
	2.4	Measurement of central tendency & dispersion,		
	2.5	Weibull distribution & Gamma distribution.		
3	**Estimation of Reliability**			
	3.1	Types of systems- series, parallel, combined series & parallel systems (problems on above systems)	**10**	**18**
	3.2	Standby systems, Multi unit standby system		
	3.3	Fault tree analysis		
		SECTION - II		
4	**System Maintenance & Inspection**			
	4.1	Effects of inspection & overhaul on reliability	**10**	**14**
	4.2	Main tenability, availability, dependability		
	4.3	MTTR		
	4.4	Main tenability effectiveness		

5	**Reliability testing**			
	5.1	Introduction, objectives	**10**	**18**
	5.15	Types of tests, Principal elements of tests		
	5.3	Sample size & test duration		
	5.4	Accelerated testing, sequential testing (elementary level)		
6	**Recent trends in reliability**			
	6.1	Role of design, manufacturer & user in achieving reliability	**04**	**08**
	6.2	Condition or health monitoring		
	6.3	Manufacturing aspects of reliability		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assignment on basic reliability terms	03
2.	Assignment on problems on reliability	06
3.	Assignment on problems on reliability systems	06
4.	Assignment on system maintenance	06
5.	Assignment on reliability testing	06
6.	Assignment on condition monitoring	03
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Introduction to reliability	Lecture , Discussion
2.	Mathematics of reliability	Lecture, Demonstration
3.	Estimation of reliability	Lecture Demonstration
4.	System maintenance &inspection	Lecture Demonstration
5.	Reliability testing	Lecture, Demonstration & Discussion
6.	Recent trends in reliability	Lecture method, Demonstration

Text Books:

Sr. No	Author	Title	Publication
1.	L.S.Srinath	Concepts in reliability engineering	Affiliated east west press
2.	C, Singh & B. S. Dhillon	Engg. Reliability- New techniques & applications	John Wiley & sons

Reference Books:

Sr. No	Author	Title	Publication
1.	A.D.S.Carter	Mechanical Reliability	Macmillan Madras
2.	Rhys Lewis	Reliability Engineering	Mc - Graw Hill Co., london
3.	R.Thomason	Introduction to Reliability & quality	Machinery pub. Co. ltd. London
4.	Charles O. Smith	Introduction to Reliability in design	Mc - Graw Hill Co.,New Delhi

Learning Resources: Books, Models

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
SECTION - 1					
1.	Introduction to reliability	08	--	--	08
2.	Mathematics of reliability	06	04	04	14
3.	Estimation of reliability	06	06	06	18
	Total	20	10	10	40
SECTION - 2					
4.	System maintenance & Inspection	04	06	04	14
5.	Reliability testing	06	06	06	18
6.	Recent trends in Reliability	04	04	--	08
	Total	14	16	10	40
	Total	**34**	**26**	**20**	**80**

(Prof.V.J.Deshpande) (Prof. Kulkarni S. B.) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : **Diploma in ME**
Programme Code : **04**
Name of Course : **Hybrid Power Management and Emerging Power Applications**
Course Code : **ME 772**

Teaching Scheme:

Theory/Practical/Tutorial	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**
Tutorial	**--**	

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

With the advent of industrial revolution the use of energy is increasing as more and more industries are set up Total Commercial Energy Consumption has been growing tremendously since last decade. Aim of this subject is to expose students to basics & advancements in energy field.

Students will also learn state of the art in field of alternate energy sources wind energy, hydrogen cell and solar energy. Students are expected to learn recent trends and advancements in these areas from internet. Students will also be exposed to environmental aspects of energy and energy conservation.

Course Objectives:

After studying this course, the student will be able to

1. Understand importance of energy conservation and energy management.
4. Know construction working of wind mill.
5. Compare alternate fuels with conventional fuels.
6. Understand working of hybrid car.
7. Know solar power and photovoltaics.
8. Search and study recent developments in above mentioned topics on internet.

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig htage
Section I				
1.	**Introduction**			
	1.7	Energy scenario in India & world. Quoto Protocol, concept of carbon credits.	06	10
	1.8	Environmental impact of energy sources, concept of energy conservation, energy management, Energy Audit.		
2.	**Review of Alternate Energy Sources**			
	2.1	Alternate fuels like LPG, CNG, bio-diesel & their comparison with conventional fuels,	06	12
	2.2	concept of HCCI (Homogeneous Combustion Compression Ignition)		
3.	**Hydrogen Cell**			
	3.1	Construction working & application of hydrogen cell, Advantages & limitations of hydrogen cell.	04	08
	3.2	Hydrogen cell cars, two wheelers.		
4.	**Hybrid Car**			
	4.1	Construction, Working of hybrid car, Gasoline – Electric hybrid car, Benefits of hybrid cars.	06	10
Section II				
5.	**Wind Energy & Wind Power**			

	5.1	Economic viability	10	16
	5.2	Types constructional details & working of wind mill. Controls used in wind mills storage,		
	5.3	wind energy scenario in India.		
6.	**Advances in solar energy & solar power**			
	6.1	Economical aspects of solar heating, solar refrigeration & air conditioning,	08	12
	6.2	Technologies for converting solar energy to electricity, Photovoltaics.		
7.	**Recent Developments**			
	7.1	Recent developments related to above topics of emerging power, (This topic is for self study students are expected to search from internet).	08	12
			48	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Assignment	Hrs
1.	Two assignment on topic 1 as per the instructions of lecturer	06
2.	One assignment on topic 2 as per the instructions of lecturer	04
3.	One assignment on topic 3 as per the instructions of lecturer	04
4.	One assignment on topic 4 as per the instructions of lecturer	04
5.	One assignment on topic 5 as per the instructions of lecturer	04
6.	Three assignments on topic 6 as per the instructions of lecturer	10
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
SECTION I		
1.	Introduction	Classroom teaching, demonstration, Internet.
2.	Review of Alternate Energy Sources	Classroom teaching, Internet.
3.	Hydrogen Cell	Classroom teaching, case study.
4.	Hybrid Car	Classroom teaching.
SECTION II		
5.	Wind Energy & Wind Power	Classroom teaching, group discussion, seminar.
6.	Advances in solar energy & solar power	Classroom teaching, case study.
7.	Recent Developments	Seminar

Text Books:

Sr. No	Author	Title	Publication
1.	NIL	NIL	NIL

Reference Books:

Sr. No	Author	Title	Publication
1.	S.P. Sulkhatme	Solar energy	Tata McGraw Hill
2.	G.D. Ral	Solar energy utilization	Khanna Publication
3.	S.A. Abbasi, Naseema Abbasi	Renewable Energy Sources and Their Environmental Impact.	Printice – Hall of India Pvt. Ltd.

Reference Web Sites: www.google.co.in, www.howstuffworks.com

Learning Resources: Chart of Engines, Photovoltaic cells etc., **V**ideo cassette no.131,365 of G.P.P. library, Literature from Industry, Internet.

Specification Table:

Sr.No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section - I					
1.	Introduction	04	02	04	10
2.	Review of Alternate Energy Sources	04	04	04	12
3.	Hydrogen Cell	02	02	04	08
4.	Hybrid Car	04	02	04	10
		14	**10**	**16**	**40**
Section - II					
4.	Wind Energy & Wind Power	08	04	04	16
5.	Advances in solar energy & solar power	06	04	02	12
6.	Recent Developments	04	02	06	12
		18	10	12	40
	TOTAL	**32**	**20**	**28**	**80**

(Prof. V.J. Deshpande) (Prof. S. B. Kulkarni) (Prof. Warke S.W.)

Prepared By Secretary, PBOS Chairman, PBOS

Programme : Diploma in ME
Programme Code : 04
Name of Course : Automobile Engineering
Course Code : ME 773

Teaching Scheme:

Theory/ Practical	Hours /Week	Total Hours
Theory	**03**	**48**
Practical	**02**	**32**

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale:

Due to transport needs of society, the urban areas like Pune are presently under great influence of automobiles.

A Mechanical Engineer should have at least basic knowledge of this field before he enters in profession. This course aims to :

- Make the student capable to work in various shops of an automobile industry.
- Create consciousness about problems created due to wide use of automobiles e.g. Pollution and its control.
- Create awareness about new standards used in modern automobile industry.

Create awareness about new technologies used in modern automobile industry.

Course Objectives:

After studying this course, the student will be able to

- Know components of different systems and their construction and working.

- Calculate resistance to vehicle motion.
- Know the vehicle stability.
- Know about pollution and its control.
- Know the comparative study of two and four wheelers.
- Know maintenance and repairs of different automobiles.
- Know the various new standards adopted in modern automobile industry.
- Know new technologies used in modern automobile industry

Course Content:

Chapter No.	Name of Topic/Sub topic		Hrs	Weig-htage
Section I				
1	Introduction			
	1.1	Classification of Automobile.	**02**	**04**
	1.2	Resistance to vehicle motion – rolling resistance, air resistance, Gravitation resistance, inertia resistance.		
2	**Transmission system I**			
	2.1	Automobile clutches – construction and working of single plate, multi-plate, cone clutch, centrifugal clutch. Faults and remedies/repairs of clutches. (Brief Despriptia)	**10**	**16**
	2.2	Gear Box – Construction and working of sliding mesh, constant mesh, synchro-mesh, epicyclic gear box, torque converter, Faults and remedies/repairs of gear box.		
3	**Transmission System II**			
	3.1	Propeller shaft and U joint – construction and working of Universal joint, Rzeppa joint, C.V. joint.	**08**	**12**
	3.2	Differential - function, construction, working.		
	3.3	**Rear axle and bearing** – types, semi-float, full float bearing, three quarter floating axle.		
	3.4	**Wheels and tyres** – requirements of automobile wheels, disk wheel, wire wheel. Functions and desirable properties of tyres. Conventional tube and tubeless tyres, car-case types. Considerations in trade		

		design, tyre wear.		
4	**Electric Systems**			
	4.1	Construction and working of dynamo and alternator specifications, testing. Cutouts, relay and regulator.	**04**	**08**
	4.2	Starting system. Bendix drive and over running clutch drive.		
Section II				
5	**Steering**			
	5.1	Front axle, types of stub axle, steering geometry, Ackerman's mechanism. Under steer, over steer, steering linkage for rigid and independent suspension.	**06**	**10**
	5.2	Type of steering gears – worm and wheel, re-circulating ball type, rack and pinion. Power steering. Faults and remedies of steering, wheel alignment.		
6	**Braking System**			
	6.1	Types, drum brakes, disk brakes. Mechanical, hydraulic, air brakes. Brake trouble shooting, antiskid system.	**06**	**12**
7	**Suspension and shock absorber**			
	7.1	Types of suspension springs – leaf spring, coil spring, torsion bar.	**06**	**12**
	7.2	Shock absorber.		
	7.3	Independent suspension – Wishbone, Mac-Pherson strut type.		
	7.4	Pitching, rolling, bouncing.		
8	**Automobile emission and its Control**			
	8.1	Introduction, Complete and Incomplete Combustion, Constituents of Exhaust Gases.	**06**	**06**
	8.2	Pollutant Formation.		
	8.3	Effect of Air Fuel Ratio on Exhaust Emission.		
		Total	**48**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals/Experiments/Assignments:

Sr. No.	Name of Practical/Experiment/Assignment	Hrs
1.	Assembling and dismantling of clutch.	04
2.	Assembling and dismantling of Automobile gear box.	04
3.	Study and demonstration of differential.	04
4.	Tracing of starter circuit. Safety, comfort & convenience	04
5.	Assembling and dismantling of mechanical, hydraulic, and air braking system.	04
6.	To study independent & conventional Suspensions system.	04
7.	Conduct trail on petrol and diesel gas Analyzer & analyze results.	04
8.	Study PUC Regulations in the Central Motor Vehicle Act 1988. Sections 115, 116.	04
	Total	**32**

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
	Section I	
1.	Classification of Automobile. Resistance to vehicle motion	Classroom teaching, Laboratory demonstration, Industrial visits, Seminar, Group Activity, Assignments.
2.	Transmission system I	
3.	Transmission system II	
4.	Electric Systems	
	Section II	
5.	Steering	Classroom teaching, Laboratory demonstration, Industrial visits, Seminar, Group Activity, Assignments.
6.	Braking System	
7.	Suspension and shock absorber	
8.	Automobile emission and its Control	

Text Books:

Sr. No	Author	Title	Publication
1.	Kirpalsing	Automobile Engg. Vol I & II	Standard Publishers Distributors
2.	GBS Narang	Automobile Engineering	Khanna Publishers
3.	H.M. Sethi	Automotive Technology	Tata McGraw Hill

Reference Books:

Sr. No	Author	Title	Publication
1.	Crouse Anglin	Automotive Mechanics	McGraw Hill International
2.	Newton Garrett	The Motor Vehicle	Butterworth International

Learning Resources: Manuals of different vehicles, Models, Video cassettes No. 132,133,137,138 a&b,259,262,265,274 and 382 of G.P.P. Library

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Classification of Automobile. Resistance to vehicle motion	04	02	--	06
2.	Transmission system I	04	06	06	16
3.	Transmission system II	05	05	--	10
4.	Electric Systems	04	04	--	08
		17	17	06	40
Section II					
5.	Steering	02	04	04	10
6.	Braking System	03	--	06	09
7.	Suspension and shock absorber	06	03	--	09
8.	Automobile emission and its Control	04	04	04	12
		15	11	14	40
Total		**32**	**28**	**20**	**80**

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Prepared By Secretary, PBOS Chairman, PBOS