SCHEME OF EXAMINATION

AND

COURSE OF STUDY

THREE-YEAR DIPLOMA

IN

MECHANICAL ENGINEERING

(w.e.f. 2024-2025)

Department of Mechanical Engineering

FACULTY OF ENGINEERING & TECHNOLOGY

GURUKULA KANGRI (DEEMED TO BE UNIVERSITY), HARIDWAR

Syllabus

Diploma ME.I Year

(Semester I)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DEM-C101	BSC	Mathematics –I	3	1	0	20	10	30	70	4	100
2	DAP-C101	BSC	Physics –I	3	1	0	20	10	30	70	4	100
3	DAC-C101	BSC	Chemistry	3	1	0	20	10	30	70	4	100
4	DEG-A101	HSMC	Communication Skill in English	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
5	DAP-C151	BSC	Physics -I Lab	0	0	2	20	10	30	70	1	100
6	DAC-C151	BSC	Chemistry Lab	0	0	2	20	10	30	70	1	100
7	DSP-S151	BSP	Physical Training and Yoga	0	0	2	20	10	30	70	1	100
8	DEG-A151	HSMC	Communication Skill in English Lab	0	0	2	20	10	30	70	1	100
			TOTAL	12	4	8	160	80	240	560	20	800

Syllabus

Diploma ME. I Year

(Semester –II)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1.	DEM-C201	BSC	Mathematics – II	2	1	0	20	10	30	70	3	100
2.	DAP-C201	BSC	Physics –II –	2	1	0	20	10	30	70	3	100
3.	DCE-C201	ESC	Introduction to IT system	2	1	0	20	10	30	70	3	100
4.	DEE-C201	ESC	Fundamental of Electrical Engineering and Electronics Engineering	2	1	0	20	10	30	70	3	100
5.	DEN-A201	HSMC	Environmental Science	2	1	0	20	10	30	70	3	100
PRACTICAL / TRAINING / PROJECT												
6.	DAP-C201	BSC	Physics –II Lab	0	0	2	20	10	30	70	1	100
7.	DCE-C251	ESC	IT system Lab	0	0	2	20	10	30	70	1	100
8.	DEE-C251	ESC	Electrical and Electronics Engineering Lab	0	0	2	20	10	30	70	1	100
9.	DME-C251	ESC	Workshop Practices	0	0	2	20	10	30	70	1	100
10.	DME-C252	ESC	Engineering Graphics lab	0	0	2	20	10	30	70	1	100
			TOTAL	10	5	10	200	100	300	700	20	1000

Syllabus

Diploma in ME

(Semester-III)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DME-C301	ESC	Applied Mechanics	3	1	0	20	10	30	70	4	100
2	DME -C302	ESC	Material Science	3	1	0	20	10	30	70	4	100
3	DME -C303	ESC	Workshop Technology-I	3	1	0	20	10	30	70	4	100
4	DME -C304	ESC	Thermodynamics	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
5	DME -C352	ESC	Material Science Lab	0	0	2	20	10	30	70	1	100
6	DME -C353	ESC	Workshop Technology-I Lab	0	0	2	20	10	30	70	1	100
7	DME -C354	ESC	Thermodynamics Lab	0	0	2	20	10	30	70	1	100
8	DME -C355	ESC	Machine Drawing	0	0	2	20	10	30	70	1	100
TOTAL				12	4	8	160	80	240	560	20	800

Syllabus

Diploma in ME

(Semester IV)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DME -C401	ESC	Measurement & Metrology	3	1	0	20	10	30	70	4	100
2	DME -C402	ESC	Fluid Mechanics	3	1	0	20	10	30	70	4	100
3	DME -C403	ESC	I.C.Engines	3	1	0	20	10	30	70	4	100
4	DME -C404	ESC	Strength of Materials	3	1	0	20	10	30	70	4	100
5	DME -C451	ESC	Measurement & Metrology Lab	0	0	2	20	10	30	70	1	100
6	DME -C452	ESC	Fluid Mechanics Lab	0	0	2	20	10	30	70	1	100
7	DME -C453	ESC	I.C.Engines Lab	0	0	2	20	10	30	70	1	100
8	DME -C454	ESC	Fundamental of Computer Applications Lab	0	0	2	20	10	30	70	1	100
TOTAL				12	4	8	160	80	240	560	20	800

Syllabus

Diploma in ME

(Semester-V)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DME -C501	ESC	Dynamics of Machine	3	1	0	20	10	30	70	4	100
2	DME -C502	ESC	CNC Machines and Automation	3	1	0	20	10	30	70	4	100
3	DME -C503	ESC	Workshop Technology - II	3	1	0	20	10	30	70	4	100
4	DME -C504	ESC	Industrial Engineering	3	1	0	20	10	30	70	4	100
5	DME -C551	ESC	Dynamics of Machine Lab	0	0	2	20	10	30	70	1	100
6	DME -C552	ESC	CNC Machines and Automation Lab	0	0	2	20	10	30	70	1	100
7	DME -C553	ESC	Workshop Technology – II Lab	0	0	2	20	10	30	70	1	100
8	DME -C554	ESC	Minor Project	0	0	2	20	10	30	70	1	100
TOTAL				12	4	8	160	80	240	560	20	800

Syllabus

Diploma in ME

(Semester-VI)

S.NO.	COURSE CODE	COURSE OPTED	SUBJECT	Period per week			EVALUATION SCHEME				Credit	Subject TOTAL
							SESSIONAL EXAM.			EXAM. ESE		
				L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS												
1	DME -C601	ESC	CAD (Computer Aided Design)	3	1	0	20	10	30	70	4	100
2	DME -C602	ESC	Refrigeration and Air Conditioning	3	1	0	20	10	30	70	4	100
3	DME -C603	ESC	Productions Management	3	1	0	20	10	30	70	4	100
4	DME -C604	ESC	Maintenance Management	3	1	0	20	10	30	70	4	100
PRACTICAL / TRAINING / PROJECT												
5	DME-C651	ESC	CAD (Computer Aided Design) Lab	0	0	2	20	10	30	70	1	100
6	DME--C652	ESC	Refrigeration and Air Conditioning Lab	0	0	2	20	10	30	70	1	100
7	DME--C653	ESC	Major Project	0	0	4	40	20	60	140	2	200
TOTAL				12	4	8	160	80	24	560	20	800

Course Code: DEM-C 101
Course Name: MATHEMATICS- I

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** To give a comprehensive coverage at an introductory level to the subject ofTrigonometry, Differential Calculus and Basic elements of algebra.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Basic Concepts:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and theirapplications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2), Graphs of sin x, cos x, tan x and e^x**.**	**4**
UNIT-2	*Module-2*	**Complex Numbers:** Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other,	4
UNIT-3	*Module-3*	Conjugate of a com- plex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-movier's theorem,its application.	8
UNIT-4	*Module-4*	**Partial fractions:** Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors.To resolve improper fraction into partial fraction.	8
UNIT-5	*Module-5*	Permutations and Combinations: Value of ${}^nP_r$ and ${}^nC_r$. Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomialapproximation with applications to engineering problems	8
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40thEdition, 2007.
2.	G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9thEdition, 1995.
3.	Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (RevisedEd. 2018)
4.	V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e, vikas Publishing House.
5.	Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, KhannaPublishing House, New Delhi

Course Outcomes: After completing this course the students shall understand thefollowingpoints:

- To acquire necessary background in Determinants and Matrices so as to appreciate theimportance of the determinants.
- To understand the cumulative effect of the original quantity or equation i.e., the Integration.
- To interpret the coordinate geometry that provides a connection between algebra andgeometry through graphs of lines and curves.
- To explain the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.
- To explain the difference between a resultant and a concurrent force to model simple physical problems in the form of a differential equation, analyze and interpret the solutions.

UNIT II

Differential Calculus: Definition of function, Concept of limits, Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to -1} \frac{a^x - 1}{x}$, $\lim_{x \to a} \frac{1}{x}(1 + x)$, Differentiation by definition of **sinx , cosx , tanx ,** e^x**,** $\log_a x$**.** Differentiation of sum, product and quotient of functions. Differentiationof function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.

Course Code: DAP-C 101

Course Name: APPLIED PHYSICS-I

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** aims to give an understanding of this world both by observation and by prediction ofthe way in which objects behave. apply the basic concepts and principles to solve broad-based engineering problemsand to understand different technology based applications.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Optics**: Basic optical laws, reflection and refraction, refractive index, images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects, total internal reflection, critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber.	**6**
UNIT-2	*Module-2*	**Electrostatics:** Coulomb's law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and Potential difference, Gauss law: Application of Gauss's law to find electric field strength of straight charged conductor, Plane charged sheet andcharged sphere. **Capacitor and its working**: Types of capacitors, Capacitance and its units, Capacitance of parallel plate capacitor, Series and Parallel combination of capacitors (related numerical problems), Dielectric and its effect on capacitance, Dielectric break down.	**5**
UNIT-3	*Module-3*	**Current Electricity:** Electric currents and its units, Direct and Alternating currents, Resistance and its units, Specific resistance, Conductance, Specific Conductance, Series and Parallel Combination of resistances, Factors affecting resistance of a wire, Carbon resistances and colourcoding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone Bridge and its applications (Slide wire bridge only), Concept of terminal potential difference and electromotive force (EMF). Heating effect of current, Electric power, Electric energy and its units (related numerical Problem), Advantages of Electric energy over other forms of energy.	**6**

UNIT-4	*Module-4*	**Electromagnetism:** Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and its units, magnetization. **Concept of electromagnetic induction**: Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.	**5**
UNIT-5	*Module-5*	**Semiconductor Physics:** Energy bands in solids, Types of materials (Insulator, semiconductor, conductor), Intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes, Diode as rectifier- half wave and full wave rectifier (centre taped). **Transistor**: Description and three terminals, Types- pnp and npn, some electronic applications (list only). Photo cells, Solar cells; working principle and Engineering applications.	**5**
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
2.	Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
3.	A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand andCompany Ltd.
4.	Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
5.	Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
6.	Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

Course Outcomes: After completing this course the students shall understand the followingpoints:

- State basic optical laws, establish the location of the images formed by mirrors and thinconverging lens,Design and assemble of microscope using lenses combination.
- Describe refractive index of a liquid or a solid and will be able to explain conditions fortotal internal reflection.
- Define capacitance and its unit, explain the function of capacitors in simple circuits andsolve simple problems.
- Differentiate among insulators, conductors and semiconductors and define the terms:potential, potential difference, electromotive force.

Express electric current as flow of charge, concept of resistance, measurement of theparameters: electriccurrent, potential difference, resistance.

Course Code: DAC-C 101
Course Name: APPLIED CHEMISTRY

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** Solve various engineering problems applying the basic knowledge of atomicstructure andchemical bonding. Use relevant water treatment method to solve domestic and industrial problems. Solve the engineering problems using knowledge of engineering materials andproperties. Use relevant fuel and lubricants for domestic and industrial applications

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Atomic Structure, Chemical Bonding and Solutions**: Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.	**6**
UNIT-2	*Module-2*	**Water:** Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness. Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measure- mentof water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.	**5**
UNIT-3	*Module-3*	**Engineering Materials:** Natural occurrence of metals – minerals, ores of iron, aluminium andcopper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy. Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.	**6**
UNIT-4	*Module-4*	**Chemistry of Fuels and Lubricants**: Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula. **Lubrication** – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties and chemical properties.	**5**

UNIT-5	*Module-5*	**Electro-Chemistry:** Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems. IndustrialApplication of Electrolysis.	**5**
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
2.	Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi,New Del- hi, 2015.
3.	Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
4.	Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
5.	Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. Iand Vol. II,NITTTR, Chandigarh, Publications, 2013-14.
6.	Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

Course Outcomes: After completing this course the students shall understand the followingpoints:

- Understand and assess the suitability of water source for domestic and industrialapplication, effluents and minimize water pollution.
- Qualitatively analyze the engineering materials and understand their properties andapplications.
- Choose fuel and lubricants suitable for economical industrial processing to obtaineco-friendly finished products.

Course Code: DEG-A 101

Course Name: COMMUNICATION SKILLS IN ENGLISH

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	**NOTE:** The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** To develop confidence in speaking English with correct pronunciation. To develop communication skills of the students i.e. listening, speaking, reading and writing skills. To introduce the need for personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Communication-Theory and Practice:** Basics of communication: Introduction, meaning and definition, process of communication etc. Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication. 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous). **Art of Effective communication:** Choosing words, Voice, Modulation, Clarity, Time, Simplification of words, Technical Communication.	**6**
UNIT-2	*Module-2*	**Soft Skills for Professional Excellence:** Introduction: Soft Skills and Hard Skills, Importance of soft skills, applying soft skills across cultures.	**5**
UNIT-3	*Module-3*	**Reading Comprehension:** Comprehension, vocabulary enhancement and grammar exercises.	**6**
UNIT-4	*Module-4*	**Professional Writing:** The art of précis writing, Letters: business and personnel, Drafting e-mail, notices, minutes of a meeting etc.	**5**
UNIT-5	*Module-5*	**Vocabulary and Grammar:** Parts of speech, active and passive voice, tenses etc.,Punctuation.	**5**
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press,1980.
2.	Lindley Murray. An English Grammar: Comprehending Principles and Rules. London:Wilson and Sons, 1908.
3.	Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, NewDelhi (Revised Edition 2018)

4.	Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
5.	M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
6.	John Nielson. Effective Communication Skills. Xlibris, 2008.
7.	Oxford Dictionary
8.	Roget's Thesaurus of English Words and Phrases
9.	Collin's English Dictionary

Course Outcomes: After completing this course the students shall understand the followingpoints:

- Develop basic speaking and writing skills including proper usage of language andvocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facinginterviews and other forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language andgestures.

Course Code: DAP-C 151

Course Name: Applied Physics-I Laboratory

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	To determine velocity of ultrasonic in different liquids usingultrasonic interferometer.	**2**
Experiment-2	To verify laws of reflection from a plane mirror/ interface.	**2**
Experiment-3	To verify laws of refraction (Snell's law) using a glass slab.	**2**
Experiment-4	To determine focal length and magnifying power of a convex lens.	**2**
Experiment-5	To verify Ohm's law by plotting graph between current andpotential difference.	**2**
Experiment-6	To verify laws of resistances in series and parallel combination.	**2**
Experiment-7	To find the frequency of AC main using electrical vibrator.	**2**
Experiment-8	To verify Kirchhoff's law using electric circuits.	**2**
Experiment-9	To study the dependence of capacitance of a parallel plate capacitoron various factors and determines permittivity of air at a place.	**2**
Experiment-10	To find resistance of a galvanometer by half deflection method.	**2**
Experiment-11	To convert a galvanometer into an ammeter.	**2**
Experiment-12	To convert a galvanometer into a voltmeter.	**2**
Experiment-13	To draw V-I characteristics of a semiconductor diode (Ge, Si) anddetermine its knee volt- age.	**2**
Total number of hours		**26**

Course Code: DAC- C 151

Course Name: Applied Chemistry Laboratory

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	Preparation of standard solution of oxalic acid or potassium permanganate.	**2**
Experiment-2	To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.	**2**
Experiment-3	Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by $KMnO_4$ solution.	**2**
Experiment-4	Iodometric estimation of copper in the copper pyrite ore.	**2**
Experiment-5	Volumetric estimation of total acid number (TAN) of given oil.	**2**
Experiment-6	Volumetric estimation of • Total hardness of given water sample using standard EDTA solution. • Alkalinity of given water sample using 0.01M sulphuric acid	**2**
Experiment-7	Determine the conductivity of given water sample.	**2**
Experiment-8	Determination of the Iron contentin given cementsample using colorimeter.	**2**
Experiment-9	Determination of calorific value of solid or liquid fuel using bombcalorimeter.	**2**
Experiment-10	Determination of viscosity of lubricating oil using Redwood viscometer.	**2**
Experiment-11	Determination of flash and fire point of lubricating oil using Able's flash point apparatus.	**2**
Experiment-12	To verify the first law of electrolysis of copper sulfate using copperelectrode.	**2**
Total number of hours		**24**

Course Code: DSP- S 151

Course Name: Physical Training & Yoga

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	Introduction to Physical Education: • Meaning & definition of Physical Education • Aims & Objectives of Physical Education • Changing trends in Physical Education	**2**
Experiment-2	Olympic Movement: • Ancient & Modern Olympics (Summer & Winter) • Olympic Symbols, Ideals, Objectives & Values • Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)	**2**
Experiment-3	Physical Fitness, Wellness & Lifestyle • Meaning & Importance of Physical Fitness & Wellness • Components of Physical fitness • Components of Health related fitness • Components of wellness • Preventing Health Threats through Lifestyle Change • Concept of Positive Lifestyle	**2**
Experiment-4	Fundamentals of Anatomy & Physiology in Physical Education,Sports and Yoga • Define Anatomy, Physiology & Its Importance • Effect of exercise on the functioning of Various Body Systems. (CirculatorySystem, Respi- ratory System, Neuro-Muscular System etc.)	**2**
Experiment-5	Postures • Meaning and Concept of Postures. • Causes of Bad Posture. • Advantages & disadvantages of weight training. • Concept & advantages of Correct Posture.Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders;Lordosis, Ky- phosis, Bow Legs and Scoliosis. • Corrective Measures for Postural Deformities	**2**

Experiment-6	Yoga • Meaning & Importance of Yoga • Elements of Yoga • Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas • Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana& Sha- shankasana) • Relaxation Techniques for improving concentration - Yog-nidra	**2**
Experiment-7	Yoga & Lifestyle • Asanas as preventive measures. • Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana,Bhujangasana, Sharasana. • Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana,Trikonasana, Ardh Matsyendrasana. • Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana. • Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, • Pavan Muktasana, Ardh Matsyendrasana. • Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	**2**
Experiment-8	Training and Planning in Sports • Meaning of Training • Warming up and limbering down • Skill, Technique & Style • Meaning and Objectives of Planning. • Tournament – Knock-Out, League/Round Robin & Combination.	**2**
Total number of hours		**16**

Course Code: DEG-A 151

Course Name: Communication Skills in English Laboratory

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	Listening Skills: Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.	**2**
Experiment-2	Introduction to Phonetics:Sounds: consonant, vowel.	**2**
Experiment-3	Speaking Skills: Standard and formal speech: Group discussion, oralpresentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.	**2**
Total number of hours		**24**

Course Code: DEM-C 201 Course
Name: MATHEMATICS- II

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** To give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus coordinate geometry, Basic elements of vector algebra and First Order Differential Equations.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Determinants and Matrices:** Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.	**4**
UNIT-2	*Module-2*	**Integral Calculus:** Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formula $\int_0^{\pi/2} \sin^n x\,dx$, $\int_0^{\pi/2} \cos^n x\,dx$, and $\int_0^{\pi/2} \sin^m x \cos^n x\,dx$ for solving problems Where m and n are positive integers. Applications of integration for (i) Simple problem on evaluation of area boundedby a curve and axes, (ii)Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).	4
UNIT-3	*Module-3*	**Co-Ordinate Geometry:** Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.General equation of a circle and its characteristics. To find the equation of a circle, given: (i) Centre and radius (ii)Three points lying on it and (iii)Coordinates of end points of a diameter. Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.	8
UNIT-4	*Module-4*	**Vector Algebra:** Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.	8
UNIT-5	*Module-5*	**Differential Equations:** Solution of first order and first-degree differential equation by variable separation method (simple problems). MATLAB – Simple Introduction.	8
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40thEdition, 2007.
2.	G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9thEdition, 1995.
3.	Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (RevisedEd. 2018)
4.	V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e, vikas Publishing House.
5.	Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Course Outcomes: After completing this course the students shall understand thefollowingpoints:

- To acquire necessary background in Determinants and Matrices so as to appreciate the importance of the determinants.
- To understand the cumulative effect of the original quantity or equation i.e., the Integration.
- To interpret the coordinate geometry that provides a connection between algebra and geometry through graphs of lines and curves.
- To explain the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.
- To explain the difference between a resultant and a concurrent force to model simple physical problems in the form of a differential equation, analyze and interpret the solutions.

Course Code: DAP-C202
Course Name: Physics-II

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Measurement and Errors** Definition of Physics ,Fundamental forces in nature Physical quantities Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units) Dimensions of physical quantities. Error in measurement; types of errors, random and systematic errors, propagation of errors, significant figures.	**6**
UNIT-2	*Module-2*	**Force and Motion** Force: Newton's laws of motion, Types of inertia and its examples. Linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc. Lever and its uses Concept of Scalar and Vector quantities – examples, types of vectors. Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of two vectors) and its physical significance, addition of vectors (Parallelogram law) Friction: Types of friction and its application. Circular motion: Angular displacement, angular velocity and angular acceleration Relation between linear and angular velocity,linear and angular acceleration Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists Application of various forces in lifts	**5**
UNIT-3	*Module-3*	**Rotational Motion** Concept of translatory and rotating motion with examples Definitions of torque, angular momentum and their relationship Conservation of angular momentum (qualitative) and its examples Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only). Application of rotational motion in transport vehicles, trains and aeroplane turbine/engine.	**6**

UNIT-4	*Module-4*	**Work, Power and Energy** Work: definition and its SI units Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application Power: definition and its SI units, calculation of power with numerical problems Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation Work -Energy Theorem Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application	**5**
UNIT-5	*Module-5*	**Properties of Matter** Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications. Engineering applications of Elasticity Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure. Pascal's law (concept only). Bernoulli's Theorem (concept and examples only). Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension Viscosity and coefficient of viscosity: Stoke's Law and terminal velocity, effect of temperature on viscosity.	**5**
Total No. of Hours			**40**

Course Code: DCE-C 201

Course Name: INTRODUCTION TO IT SYSTEMS

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** To make new students comfortable with computing environment Learning basic computer skills, Learning basic application software tools, Understanding Computer Hard- ware, Cyber security awareness

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Basic Internet skills:** Understanding browser, efficient use of search engines, awareness aboutDigital India portals (state and national portals) and college portals. General understanding of various computer hardware components – CPU, Memory, Display,Key- board, Mouse, HDD and other Peripheral Devices.	**4**
UNIT-2	*Module-2*	**Linux:** OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.	4
UNIT-3	*Module-3*	**HTML:** HTML4, CSS, making basic personal webpage	8
UNIT-4	*Module-4*	**Office Tools:** Open Office Writer, Open Office Spreadsheet (Calc), Open Office Impress.	8
UNIT-5	*Module-5*	Information security best practices	8
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	R.S. Salaria, Computer Fundamentals, Khanna Publishing House
2.	Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna PublishingHouse
3.	Online Resources, Linux man pages, Wikipedia
4.	Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting,and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Course Outcomes: After completing this course the students shall understand the followingpoints: Able to comfortably work on computer, install and configure OS, assemble a PC. Able to connect it to external devices, write documents, create worksheets, preparepresentations, protect information and computers from basic abuses/attacks.

Course Code: DEE-C 201

Course Name: Fundamentals of Electrical and Electronics Engineering

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questionsSec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** • To provide basic knowledge of the different elements and concepts of electrical engineering field. • To learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications. • To understand digital electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Overview of Electrical & Electronic Components:** Passive-Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, aver- age, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.	**4**
UNIT-2	*Module-2*	**Overview of Digital Electronics & Analog Circuits:** Introduction to Boolean Algebra, Gates-Functional Block Approach, Storage elements-Flip Flops, Counters: Ripple, Up/down and decade, Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Applications of Op-Amp.	4
UNIT-3	*Module-3*	**Electric and Magnetic Circuits:** EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hyster- esis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits	8
UNIT-4	*Module-4*	**AC Circuits:** Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-	8

		C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.	
UNIT-5	*Module-5*	**Transformer and Machines:** General construction and principle of different type of trans- formers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.	8
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2.	Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015,ISBN : 978-0-07-0088572-5.
3.	Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge UniversityPress, latest edition ISBN : 9781107464353.
4.	Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015,ISBN: 9788121924405.
5.	Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015,ISBN: 9788121924375.
6.	Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press,New Delhi 2015 ISBN : 9780195425239.
7.	Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi,2015, ISBN : 97881236529513
8.	Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13:978-8121927833.
9.	Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, NewDelhi,2015, ISBN-13: 0070634244-978.
10.	Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi,2014, ISBN-13-9788121924504.

Course Outcomes: After completing this course the students shall understand the followingpoints:

- To analysis of Single-Phase AC Circuits, the representation of alternatingquantitiesand determining the power in these circuits.
- To acquire knowledge about the interconnection of elements in a system,classificationof signals and basic operations on signals.
- To analysis of resistive circuits and two terminal element relationships for inductorsand capacitors in electric and magnetic circuits.
- To apply the knowledge of mathematics, science and engineering principles formodeling, analyzing and solving electrical and electronics engineering problems.
- To understand and demonstrate the practical use of transformer and electrical machines.

Course Code: DEN-A 201

Course Name: ENVIRONMENT SCIENCE

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questions Sec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** • Solve various engineering problems applying ecosystem to produce eco – friendly products. • Use relevant air and noise control method to solve domestic and industrial problems. • Use relevant water and soil control method to solve domestic and industrial problems. • To recognize relevant energy sources required for domestic and industrial applications. • Solve local solid and e-waste problems.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Ecosystem: Structure of ecosystem, Biotic & Abiotic components, , Food chain and food web, Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle. Global warming: Causes, effects, process, Green House Effect, Ozone depletion	**4**
UNIT-2	*Module-2*	Air and, Noise Pollution: Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refriger- ants, I.C., Boiler). Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator	4
UNIT-3	*Module-3*	Water and Soil Pollution: Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation	8
UNIT-4	*Module-4*	Renewable sources of Energy: Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate col- lector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass, Wind Energy.	8
UNIT-5	*Module-5*	Solid Waste Management & Environmental Management: Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio- medical waste, Metallic wastes and Non-Metallic wastes	8
Total No. of Hours			**40**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
2.	Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
3.	O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House,New
4.	Rao, C. S., Environmental Pollution Control and Engineering, New Age InternationalPublic 2007, ISBN: 81-224-1835-X.
5.	Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi,1988, ISI 07- 451871-8.
6.	Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, NewYork ; ISBN: 9780070354760.
7.	Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, AcademicPress O UK; 2013. ISBN: 9780123978257.

Course Outcomes: After completing this course the students shall understand thefollowingpoints:

- Understand the ecosystem and terminology and solve various engineering problemsap- plying ecosystem knowledge to produce eco – friendly products.
- Understand the suitable air, extent of noise pollution, and control measures and acts.
- Understand the water and soil pollution, and control measures and acts.
- Understand different renewable energy resources and efficient process of harvesting.
- Understand solid Waste Management, ISO 14000 & Environmental Management.

Course Code: DCE-C 251

Course Name: IT Systems Laboratory

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shallnot exceed 20 students.

Experiment	Course Content
Experiment-1	Browser features, browsing, using various search engines, writingsearch queries
Experiment-2	Visit various e-governance/Digital India portals, understand their features, servic of- fered
Experiment-3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
Experiment-4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
Experiment-5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
Experiment-6	Practice HTML commands, try them with various values, make your own Webpage
Experiment-7	Explore features of Open Office tools, create documents using thesefeatures do it multi- ple times
Experiment-8	Explore security features of Operating Systems and Tools, try usingthem and se what happens.
Total number of hours	

Course Code: DEE- C 251

Course Name: Electrical & Electronics Engineering Laboratory

MM: 100 **Tim** **e: 2** **Hr.L** **T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shallnot exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	To measure voltage, current and power in 1-phase circuit with resistiveload.	**2**
Experiment-2	Verification of Kirchhoff's laws.	**2**
Experiment-3	Calibration of voltmeter and ammeter.	**2**
Experiment-4	To connect single phase transformer and measure input and outputquantities.	**2**
Experiment-5	To connect resistors in series and parallel combination on bread board.	**2**
Experiment-6	Test the performance of Zener diode.	**2**
Experiment-7	Test the performance of LED.	**2**
Experiment-8	Use multimeter to measure the value of given resistor.	**2**
Experiment-9	Determine the value of given resistor using digital multimeter toconfirm with colour code.	**2**
Experiment-10	Test the performance of PN-junction diode.	**2**
Experiment-11	To determine the permeability of magnetic material by plotting its B-Hcurve.	**2**
Experiment-12	Use LCR-Q tester to measure the value of given capacitor andinductor.	**2**
Total number of hours		**24**

Course Code: DME-C 251

Course Name: Workshop Practices

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	Course Content	No. of Hours
Experiment-1	**Carpentry:** • Demonstration of different wood working tools / machines. • Demonstration of different wood working processes like plaining, marking, chiseling, grooving ,turning of wood etc. • One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.	**2**
Experiment-2	**Fitting:** • Demonstration of different fitting tools and drilling machines and power tools • Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. • One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc	**2**
Experiment-3	**Welding:** • Demonstration of different welding tools / machines. • Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding ofbroken parts with welding. • One simple job involving butt and lap joint	**2**
Experiment-4	**Sheet Metal Working:** • Demonstration of different sheet metal tools / machines. • Demonstration of different sheet metal operations like sheet cutting, bending, edging, endcurling, lancing, soldering, brazing, and riveting. • One simple job involving sheet metal operations and soldering and riveting.	**2**
Experiment-5	• **Electrical House Wiring:** • Practice on simple lamp circuitsone lamp controlled by one switch by surface conduit wiring, • Lamp circuits- connection of lamp and socket by separate, switches. • Connection of Fluorescent lamp/tube light,	**2**

	• Simple lamp circuits-install bedroom lighting. • Simple lamp circuits- install stair case wiring.	
Total number of hours		**24**

Course Code: DME-C 252 Course Name:
Engineering Graphics Laboratory

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	The question paper shall consist of two sections (Sec.-A and Sec.-B). Sec.-A shall contain ten questions of six marks each and student shall be required to attempt five questions Sec.-B shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper. **Course Objectives:** To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs. To develop drafting and sketching skills, to know the applications of drawing equipments, and get familiarize with Indian Standards related to engineering drawings. To develop skills to visualize actual object or a part of it, on the basis of drawings. To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles. To understand the basic commands and develop basic skills related to computer aided drafting, of how to draw, modify, and edit basic shapes (2D), using AUTOCAD.

Experiment	Course Content	No. of Hours
Experiment-1	**Basic elements of Drawing:** Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications. Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale. Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning. Geometrical and Tangency constructions. (Redraw the figure)	**2**
Experiment-2	**Orthographic projections:** Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination). Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only).	**2**
Experiment-3	**Isometric Projections:** Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection. Illustrative problems related to objects containing lines, circles and arcs shape only. Conversion of orthographic views into isometric view/projection.	**2**
Experiment-4	**Free Hand Sketches of engineering elements:** Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, Locking arrangements. (For branches other than mechanical Engineering, the teacher	**2**

	should select branch specific elements for free hand sketching), Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)	
Experiment-5	**Computer aided drafting interface:** Computer Aided Drafting: concept, Hardware and various CAD software available. System requirements and Understanding the interface. Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon. File features: New file, saving the file, Opening an existing drawing file, Creating templates,Quit, Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action. Computer aided drafting: Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates. Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers. Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous,Diameter, Radius, Angular Dimensions. Dim scale variable. Editing dimensions. Text:Single line Text, Multiline text. Standard sizes of sheet. Selecting Various plottingparameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plotarea, print preview.	**2**
Total number of hours		**10**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Bureau of Indian Standards. Engineering Drawing Practice for Schools and CollegesIS: Sp-BIS. Government of India, Third Reprint.
2.	Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat.
3.	Dhawan, R. K. Engineering Drawing. S. Chand and Company, New Delhi.
4.	Shah, P. J. Engineering Drawing. S. Chand and Company, New Delhi.
5.	Autodesk. AutoCAD User Guide. Autodesk Press, USA

Course Outcomes: After completing this course the students shall understand thefollowingpoints:

- Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
- Draw views of given object and components.
- Sketch orthographic projections into isometric projections and vice versa.
- Apply computer aided drafting tools to create 2D engineering drawings.

Course Code: DAP-C252 Course Name:
Applied Physics-II Lab

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

NOTE:	1. In practical examination the student shall be required to perform one experiment. 2. A teacher shall be assigned 20 students for daily practical work in laboratory. 3. No batch for practical class shall consist of more than 20 students. 4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.

Experiment	**Course Content**	**No. of Hours**
Experiment-1	Conversion of Galvanometer into an Ammeter of given range.	**2**
Experiment-2	Conversion of Galvanometer into Voltmeter of given range.	**2**
Experiment-3	To verify ohm's laws by drawing a graph between voltage and current.	**2**
Experiment-4	To verify laws of resistances in series and in parallel connection.	**2**
Experiment-5	To draw characteristics of a pn junction diode and find resistance of diode.	**2**
Experiment-6	Verification of Kirchhoff's Laws.	**2**
Experiment-7	Determination of resistivity by Meter bridge	**2**
Experiment-8	To assemble the components of a given electrical circuit.	**2**
Experiment-9	To identify a Diode, LED, transistor, Resistor, Capacitor from mixed collection ofsuch items and draw their notation.	**2**
Total number of hours		**26**

Course Code: DME-C301

Course Name: Applied Mechanics

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction & Laws of Forces Introduction: Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics. Definition of basic and derived quantities. Basic units and derived units. Different systems of units (FPS, CGS, MKS & SI) and their conversion from one to another for density, velocity, acceleration, force, pressure, work, power. Concept of rigid body. Laws of Force: Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & uniformly distributed force, effects of force, characteristics (elements) of a force. Lami's theorem (concept only).	6
UNIT-2	*Module-2*	Moment Concept of moment. Moment of a force and units of moment. Varignon's theorem (definition only). Principle of moment and its applications (Levers– simple and compound, steel yard, safety valve, reaction at support). Parallel forces (like and unlike	6

		parallel force), calculating their resultant. Concept of couple, its properties and effects. General conditions of equilibrium of bodies under coplanar forces. Position of resultant force by moment.	
UNIT-3	*Module-3*	Friction Definition and concept of friction, types of friction, force of friction. Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack.	6
UNIT-4	*Module-4*	Centre of Gravity & Moment of Inertia Centre of Gravity: Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies-cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed. Moment of Inertia: Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations).	6
UNIT-5	*Module-5*	Simple Machines Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines. Simple and compound machine (Examples). Definition of ideal machine, reversible and self locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double winch crab.	6
Total No. of Hours			**30**

Learning Outcomes:	1. To provide a comprehensive knowledge of force, work and energy to calculate work done, power required and efficiency for various simple machines. 2. To understand the importance and application of various laws of Mechanics 3. At the end of of the course students will able to understand the importance and application of various laws of mechanics **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Applied Mechanics By TL Singla, Harbhajan Singh Parmod Kumar Singla Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2.	A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3.	Text Book in Applied Mechanics by MM Malhotra, R Subramanian, PS Gahlot and BS Rathore; Wiley Eastern Ltd., New Delhi.

Course Code: DME-C302

Course Name: Material Science

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction Introduction and importance of engineering materials in industry, Classification of engineering materials, Properties of engineering materials; UTS, Ductility, Toughness, Hardness, Malleability, Electrical conductivity and Thermal conductivity. Structure of Metals: Space lattice, Unit cell, BCC, FCC and CPH Structure of important metals, Crystallization (T-T diagram) of a pure metal, Grains, grain size and grain boundaries, Effect of grain size on properties of metals, Elastic and plastic deformation of metals. Imperfection in crystal structure Iron Carbon Diagram Cooling curve of iron and its allotropic forms. Constituents of iron and carbon: Ferrite, cementite, pearlite, austenite and ledeburite. Simplified iron – carbon diagram showing various phases and critical temperatures	**6**
UNIT-2	*Module-2*	Ferrous Metals & Alloys Principal ferrous materials – CI, steel and wrought iron. Main properties of different types of cast irons such as grey, white, mottled, malleable and ductile cast irons. Properties and composition of wrought iron. Classification, properties and uses of plain carbon steels Effect of alloying elements such as aluminum, chromium, nickel, cobalt, manganese, molybdenum, tungsten, vanadium, silicon, sulphur and phosphorous on steels, Importance of alloy steels over plain carbon steels, Composition, properties and uses of stainless steels and high speed steels,	6
UNIT-3	*Module-3*	Non-Ferrous Metals & Alloys Properties and uses of copper, aluminium, tin, zinc and lead. Composition and use of copper alloys, such as cartridge brass, muntz metal, phosphor	6

		bronze, gun metal and aluminium bronze. Composition and uses of cast aluminium-alloys & wrought alminium-alloys.	
UNIT-4	*Module-4*	Other Important Materials Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics & their uses and grades. Composite materials.Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica. Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt. Sound insulating materials: Cork, fibre boards.abrication materials: Wood, plywood, rubber – natural and synthetic, Glass – plate glass, toughened glass, safety glass. Refractory materials: General characteristics and uses of dolomite, ceramics. Protective coating materials: Paints, primers, varnishes, enamels, putti, electroplating materials, rubasil, teflon coating. Sealant and adhesives – Application and availability of sealant and adhesives for industrial user.	6
UNIT-5	*Module-5*	Heat Treatment of Steels & Testing of Material Introduction and importance of heat treatment of steel. Main features of the heat treatment processes such as annealing, normalizing, hardening, tempering, surface hardening and case hardening. Different types of heat treatment furnaces. Description of identification tests such as appearance, sound, spark, weight, magnetic, bend and filing. Introduction and importance of non-destructive tests such as X-ray, gamma ray, magnaflux and ultrasonic. Study of microstructure using optical microscope, SEM	6
Total No. of Hours			**30**

Learning Outcomes:	1. Be able to apply core concepts in Materials Science to solve engineering problems. 2. Interpret about material fundamental and material processing. 3. Distinguish the defects in crystal and its effect on crystal properties. 4. Figure out the different mechanical properties of material by studying different destructive and non- destructive testing. 5. Articulate and utilize corrosion prevention strategies and estimate corrosion behavior of materials and components 6. Acknowledge the importance of surface modification and study the different surface modification methods. 7. Perceive the basics of Powder metallurgy and application of powder metallurgy 8. Select proper metal, alloys, non metal and powder metallurgical component for specific **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Advances in Material Science by Dr RK Dogra and Dr AK Sharma; SK Kataria and Sons, Nai Sarak, New Delhi.
2.	Physical Metallurgy by Y Lakhtin; Mir Publication, Moscow.
3.	Metallurgy by A Guleav, Mir Publication, Moscow.
4.	Material Science by RK Rajput, Laxmi Publications, Daryaganj, New Delhi.

Course Code:DME-C303

Course Name: Workshop Technology-I

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Welding Principle of welding, Welding positions and techniques, symbols.- Gas Welding - Types of gas welding flames and their applications, Gas welding equipments- Gas welding torch, Oxy – acetylene cutting torch, Blowpipe, Pressure regulators, Filler rods and fluxes. Arc Welding - Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes: Classification, B.I.S. specification and selection, Flux for arc welding. Other Welding Processes - Principle of resistance welding, working and applications of spot welding, seam welding, projection welding and percussion welding, Welding defects and inspection of welded joints.	**6**
UNIT-2	*Module-2*	Pattern Making and Moulding Types of pattern, Pattern material, Pattern allowances. Pattern codes as per B.I.S., Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores. Moulding Sand - Properties of moulding sand, their impact and control of properties	6

		viz. moisture, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of moulding sand. Mould Making - Introduction to moulding tools, Types of moulds, Step involved in making a mould, Moulding boxes, hand tools used for mould making, Moulding processes: Bench moulding, floor moulding, pit moulding and machine moulding,	
UNIT-3	*Module-3*	Casting Principles, working and applications of Dies casting: hot chamber and cold chamber, Centrifugal castin. Gating and Risering System - Elements of gating system, Pouring basin, sprue, runner, gates, Types of risers, location of risers, Directional solidification.Casting Defects - Different types of casting defects, Testing of defects: radiography, magnetic particle inspection, and ultrasonic inspection..	6
UNIT-4	*Module-4*	Lathe Description and function of various parts of a lathe. Classification and specification of various types of lathe. Work holding devices. Lathe operations: - Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling. Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time, tool life formula. Lathe accessories:- Centers, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder.tools like side-tools and V-shape tools	6
UNIT-5	*Module-5*	Cutting Tools and Cutting Materials Various types of single point cutting tools and their uses.Single point cutting tool geometry, tool signature. Multipoint cutting tool. Properties of cutting tool material. Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, stellite, ceramics and polycrystalline diamond,Various failures of cutting tool, Cutting fluid – their types, importance, properties & advantages and applications.	6
Total No. of Hours			**30**

Learning Outcomes:	1. Learn the process of metal casting. 2. Understand different sheet metal operations 3. Explain the concept of different metal forming operations. 4. Learn about different welding processes.

	5. The ability to select manufacturing processes appropriate for particular applications; 6. Further develops interpersonal understanding, teamwork and communication skills working on group assignments.

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	A Text Book of Welding Technology by O.P. Khanna
2.	Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons, Delhi
3	Workshop Technology by RC Jindal; Ishan Publication Ambala city
4	Elements of Workshop Technology by S.K.Choudhary and Hazara; Asia Publishing House.

Course Code:DME-C304

Course Name: Thermodynamics

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective A diploma holder in this course is supposed to maintain steam generators, turbines, compressors and other power plant equipment. Therefore, it is essential to impart him basic concepts of thermodynamics, steam generators, steam turbines, compressors and about IC engines.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Fundamental Concepts Thermodynamic state and system, boundary, surrounding, universe, thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy Definition of gases, explanation of perfect gas laws – Boyle's law, Charle's law, Avogadro's law, Renault's law, Universal gas constant, Characteristic gas constants, derivation. Specific heat at constant pressure, specific heat at constant volume of gas, simple problems on gas equation	**6**
UNIT-2	*Module-2*	Thermodynamic Processes and Heat Transfer Types of thermodynamic processes – isochoric, isobaric, isothermal, isentropic, polytropic and throttling processes, equations representing the processes. Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes Introduction to Heat Transfer: Modes of	6

		heat transfer, Fourier's law, steady state conduction, composite structures, Natural and forced convection, thermal radiation	
UNIT-3	*Module-3*	Laws of Thermodynamics Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems – Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, evaporators, limitations. Heat source and heat sinks, statement to second laws of thermodynamics; Kelvin Planck's statement, Classius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, (PMM1, PMM2), Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy.	6
UNIT-4	*Module-4*	Properties of Steam and Steam Boiler Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of stream, entropy of water, entropy of steam, T-S diagrams, Mollier diagram (H – S Chart). Quality of steam (dryness fraction),measurement of dryness fraction, throttling calorimeter, separating and cylce, Rankine cycle Course throttlingcalorimeter, Carnot vapour Steam Boiler: Water and fire tube boilers, construction and working of lancashire, babcock and Wilcox boilers. Various mounting and accessories of boilers.	6
UNIT-5	*Module-5*		
Total No. of Hours			**30**

Learning Outcomes:	1. Students will be able to explain the basic principles and applications of the thermody0mics to the various real life systems. 2. Students will be able to describe fundamental laws of thermody0mics. 3. Students will be able to apply the concepts such as Entropy, Energy Balance also the calculations of heat, work and other important thermodynamic properties for various ideal gas processes. 4. Students will be able to estimate performance of various thermody0mic gas power cycles and gas refrigeration cycle and availability in each case. 5. Students will be able to examine the condition of steam and performance of vapour power cycle and vapour compression cycle. **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi
2.	Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi
3.	Basic Thermodynamics by PB Joshi and US Tumne; Pune Vidyarthi Grah Prakashan

Course Code: DME-C352

Course Name: Material Science Lab

MM: 50	Sessional: 15

Time: 2 Hr. **L T P** **0 0 2**	**ESE: 35** **Credit : 1**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	***Objective*** *Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of drawing skills in the students.*

Experiment	Course Content	No. of Hours
Experiment-1	Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.	**2**
Experiment-2	Material identification of say 50 common items kept in a box.	2
Experiment-3	Study of corrosion and its effects.	2
Experiment-4	Other tests such as shear, bend tests on UTM.	2
Experiment-5	Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines	2
Experiment-6	Spring index testing on spring testing machine	2
Experiment-7	Torsion testing of a rod on torsion testing machine.	2
Experiment-8	To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.	2
Total number of hours		**16**

Course Code: DME-C353

Course Name: Workshop Technology-I Lab

MM: 50	**Sessional: 15**

Time: 2 Hr. L T P 0 0 2	ESE: 35 Credit : 1

Experiment	Course Content	No. of Hours
Experiment-1	To prepare a half T joint of given dimensions. Molding Shop	**2**
Experiment-2	To prepare a mould of half bearing.	2
Experiment-3	To prepare a butt joint of MS strips using Arc welding.	2
Experiment-4	To prepare a T joint of MS strips using Oxy Acetylene gas welding.	2
Experiment-5	To prepare a rectangular piece with slant edge of given size from M.S.	2
Experiment-6	To prepare a job on Lathe machine of given shape and size.	2
Experiment-7	To prepare a job on Shaper machine of given shape and size	2
Experiment-8	To prepare a job on Milling machine of given shape and size.	2
Total number of hours		**16**

Course Code: DME-C354

Course Name: Thermodynamics Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Study of Fire Tube boiler model.	**2**
Experiment-2	Study of Water Tube boiler model.	2
Experiment-3	Study and working of Two stroke petrol Engine	2
Experiment-4	Study and working of Two stroke Diesel Engine	2
Experiment-5	Study and working of Four stroke petrol Engine	2
Experiment-6	Study and working of Four stroke Diesel Engine	2
Experiment-7	Study of Impulse & Reaction turbine	2
Experiment-8	Study of Steam Engine model.	2
Total number of hours		**16**

Course Code :DME -C355

Course Name: Machine Drawing-I

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	***Objective*** *Diploma holders in Mechanical Engineering are required to interpret drawings and therefore it is essential that they have skills of preparing drawings and sketches of mechanical components. This subject aims at development of drawing skills in the students.*

Experiment	Course Content	No. of Hours
Experiment-1	Limits and fits (03 sheets) Maximum limit of size, minimum limit of size, tolerance, allowance, deviation, upper deviation, lower deviation, fundamental deviation, clearance, maximum clearance, minimum clearance. Fits – clearance fit, interference fit, transition fit. Hole basis system, shaft basis system, tolerance grades, calculating values of clearance, interference, hole tolerance, shaft tolerance with given basic size for common assemblies like H7/g6, H7/m6, H8/p6 Introduction to drawing office equipment through a visit to modern drawing office of an industry.	**2**
Experiment-2	Bearings Bushed Bearing (Assembled Drawing) Ball Bearing and Roller Bearing (Assembled Drawing) Plummer Block (Detailed Drawing) Plummer Block (Assembled Drawing) Foot step Bearing (Assembled Drawing)	**2**
Experiment-3	Bracket (01 sheets) Wall bracket (orthographic views). Pulleys (03 sheets) Stepped Pulley, V. Belt Pulley Fast and loose pulley (Assembled Drawing). Pipe Joints (03 sheets) Expansion pipe joint (Assembly drawing), Flanged pipe and right angled bend joint (Assembly Drawing), Spigot and Socket joint.	2
Experiment-4	Lathe Tool Holder (Assembly Drawing) (01 sheets)	2
Experiment-5	Reading of mechanical components drawings (01 sheets)	**2**
Experiment-6	Sketching practice of bearing, bracket and pulley(02 sheets)	**2**
Experiment-7	Drilling Jig (Detail and Assembly) (02 sheets)	**2**
Experiment-8	Machine Vice (Detail and Assembly) (02 sheets)	**2**
Total number of hours		**16**

Learning Outcomes:	**1.** First angle projection should be followed, 20% of drawings may be prepared in third angle projection. **2.** SP-46-1988 should be followed **3.** The drawing should include discussion with tolerances, whenever necessary and material list as per BIS / ISO specifications. INSTRUCTIONAL STRATEGY 1. Teachers should show model of the components/part whose drawing is to be made 2. Emphasis should be given to cleanliness, dimensioning, layout of sheet 3. Teachers should ensure use of IS codes related to drawing Focus should be on the proper selection of drawing instrument and its proper use

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Lakshminarayanan, V., and Mathur, M.L., "Text Book of Machine Drawing (with Computer Graphics)", 12th Ed., Jain Brothers,ISBN: 8186321330.
2.	Sidheswar, N., "Machine Drawing", McGraw-Hill, ISBN-10: 9780074603376.

Course Code: DME-C401

Course Name: Measurement & Metrology

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Metrology is the science of measurement, Diploma holders in this course are responsible for ensuring process and quality control by making measurements and carrying out inspection of various parameters. For this purpose, knowledge and skills about various measuring instruments are required. The aim of this subject is to develop knowledge and skills regarding various measuring instruments amongst the students.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction Definition of metrology. Standard of measurement. Types of Errors - Controllable and random errors. Precision, accuracy, sensitivity, hystersis, response time, repeatability, calibration, uncertainty of measurement. Standardization and standardizing organizations Limits, Fits and Tolerances: Definition and terminology of limits, fits and tolerances.Hole basis and shaft basis systems. Type of fits. Limit gauges	**6**
UNIT-2	*Module-2*	Linear Measurement Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block. Construction features and use of instruments for precision measurements: vernier calipers, vernier height and depth gauges, micrometers. Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges. Cylinder bore gauges, feeler and wire gauges. Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic comparator.	6
UNIT-3	*Module-3*	Angular Measurement Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angle	6

		dekker.Optical instruments for angular measurement, auto collimator. Measurement of Surface Finish: Terminology of surface roughness. Concept of primary texture and secondary texture. Factors affecting surface finish. CLA, RMS and RA value.Principle and operation of stylus probe instruments. Tomlinson surface meter and Taylor surface talysurf. Measurements of Screw threads and Gears. Measurement of screw threads- Introduction, measurements of external and core diameters, checking of pitch and angle of threads with gauges.	
UNIT-4	*Module-4*	Instrumentation Various types of instruments used for mechanical quantities such as displacement, velocity, acceleration, speed and torque. Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers. Strain gauge – use of strain gauge and load cells. Liquid level and viscosity – liquid level measuring methods and devices, viscometer – plate and cone viscometer, two float viscometer, Rheo viscometer. Temperature measurement – Various types of thermometers, thermocouples, pyrometer (radiation and optical type) Inspection: Necessity of inspection, their advantages. Types of inspection: remedial, preventive and operative inspection, incoming inspection, in-process and final inspection	6
UNIT-5	*Module-5*	Quality Control Definition of quality, importance of quality, quality control, Basic statistical concepts, empirical distribution and histograms. Frequency, mean, mode, standard deviation, normal distribution, binomial and poisson (No mathematical derivations). Introduction to control charts, - X, R, P and C charts and their applications. Sampling plans, selection of sample size, method of taking samples. Concept of TQM	6
Total No. of Hours			**30**

Learning Outcomes:	**1.** To understand the basic measurement units and able to calibrate various measuring devices. **2.** To express error and correction factors of various measuring devices. **3.** To use measuring tools such as Sine Bar, Sine Center, Bevel

	Protractor, **4.** Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats **NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana.
2.	Engineering Metrology by RK Jain; Khanna Publishers, New Delhi.
3.	A Text Book of Production Engineering by RC Sharma; S Chand and Company, New Delhi
4.	Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh.
5.	Statistical Quality Control by M. Mahajan: Dhanpat Rai and Sons, Delhi

Course Code:DME-C402

Course Name: Fluid Mechanics

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holders in this course are required to deal with problems of fluid and use of hydraulics and pneumatics in power generation. For this purpose, knowledge and skills about fluid mechanics and machinery, hydraulics and pneumatics systems are required to be imparted for enabling them to perform above functions

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction and Pressure Measurment Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility and their units. Pressure and its Measurement: Concept of Pressure (Atmospheric Pressure, gauge pressure, absolute pressure), Pascal's Law, Static Pressure, Units. Pressure measuring devices: peizometer tube, manometers - simple U-tube, differential single column, inverted U-tube, micro manometer. Bourdon pressure gauge. Simple problems.	**8**
UNIT-2	*Module-2*	Flow of Fluids Types of fluid flow-steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; Bernoulli's theorem (without proof) and its applications, Discharge measurement with the help of venturimeter, orifice meter and pitot tube, energy of fluid –K.E., P.E., simple problems	8
UNIT-3	*Module-3*	Flow through Orifices and Pipes Cc, Cv, Cd, flow through drowned, partially drowned orifices, time for emptying a tank through a circular	8

		orifice. Simple problems. Flow through pipes: Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; Chezy's equation and Darcy's equation of head loss. Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings, Simple problems.	
UNIT-4	*Module-4*	Hydraulic Devices Description, operation and application of hydraulic machines – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, selection of specifications of above machines.	6
Total No. of Hours			**40**

Learning Outcomes:	**1.** Student should be able to apply hydraulic and pneumatic system knowledge in modern equipments and machines to improve the efficiency with low cost. **2.** Student should be able to know concepts of fluid mechanics and governing laws in hydraulic and pneumatic systems. **3.** Student should be able to understand operating principle of different components used in hydraulic and pneumatic systems. **4.** Student should be able to select various components for hydraulic and pneumatic systems. **5.** Student should be able to use hydraulic and pneumatic circuits in various Industrial applications. **6.** Student should be able to understand low cost automation by using pneumatic systems. **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Hydraulics and Fluid Mechanics by Jagdish Lal; Metropolitan Book Company Ltd., Delhi.
2.	Fluid Mechanic, Hydraulics and Hydraulic Machines by K.K. Arora; Standard Publishers Distributors, Delhi
3.	Fluid Mechanics, Hydraulics and Fluid Machines by S. Ramamruthan; Dhanpat Rai and Sons, Delhi

Course Code: DME-C403

Course Name: I.C.Engines

MM: 100	**Sessional: 30**

Time: 3 Hr. **L T P** **3 0 0**	**ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective: A diploma holder in this course is supposed to know about testing of IC Engines, fuel supply, ignition system, cooling and lubrication of engines and gas turbines. Hence this subject

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Hypothetical & Actual Indicator Diagram of Two-Stroke and FourStroke (Petrol and Diesel) Engines./ /	**6**
UNIT-2	*Module-2*	Valve Timing Diagram of Two-Stroke and Four-Stroke (Petrol and Diesel) Engines. Brief Description of I.C. Engine Combustion (SI & CI), Firingorder of Multi-cylinder I.C. Engine, Scavenging, Preignition, Detonation, Supercharging, Turbo-charging, Simple Carburetor, M.P.F.I. and Fuel Injection Pump.	8
UNIT-3	*Module-3*	Basic Concept of Governing of I.C Engine, Lubrication of I.C Engine and Cooling of I.C Engine. Performance of I. C Engine – Indicator Power, Brake Power, Morse Test, Mechanical Efficiency, Thermal Efficiency, Relative Efficiency (Efficiency Ratio), Volumetric Efficiency, Specific Fuel Consumption and Heat Balance Sheet. (Simple numerical)	8
UNIT-4	*Module-4*	Pollutants in Exhaust Gases of Petrol and Diesel Engines, their effects on environment and possible ways of reducing the Pollutants in the Exhaust Gases.	6
Total No. of Hours			**30**

Learning Outcomes:	**5.** To understand the basic measurement units and able to calibrate various measuring devices. **6.** To express error and correction factors of various measuring devices. **7.** To use measuring tools such as Sine Bar, Sine Center, Bevel

	Protractor, 8. Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, New Delhi.
2.	Thermal Engineering by PL.Ballaney; Khanna Publishers, New Delhi.
3.	Engineering Thermodynamics by Francis F Huang; MacMillan Publishing Company

Course Code:DME-C404

Course Name: Strength of Materials

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holders in this course are required to analyze reasons for failure of different components and select the required material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts, columns and springs. It is expected that efforts will be made to provide appropriate learning experiences in the use of basic principles in the solution of applied problems to develop the required competencies

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Stresses, Strains and Instantaneous Stress Concept of load, stresses and strain. Tensile, compressive and shear stresses and strains. Concept of elasticity, elastic limit and limit of proportionality. Hooke's Law, Young's Modulus of elasticity, Yield point, plastic stage, Strain hardening, Stress strain diagram, Ultimate strength and breaking stress, Percentage elongation, shear stress, shear modulus, Proof stress and working stress. Factor of safety, Bars of varying cross-section, Temperature stresses and strains, Composite sections under compression and tension, Lateral strain, Poisson's ratio, Numerical Problems. Resilience and Instantaneous Stress: Concept of resilience, proof resilience and co-efficient of resilience. Modes of loading: gradual loading, sudden loading and falling load Calculation of instantaneous stress induced due to gradual loading, sudden load and falling loads. Numerical problems on the above.	**8**
UNIT-2	*Module-2*	Beams and Types of Loads Concept of beams, Types of beams, Types of loading, Concept of end supports – Roller, hinged and fixed, Concept of bending moment and shearing force, Bending moment and shearing force diagram for cantilever and simply supported beams with and without overhang	8

		subjected to concentrated and UDL. Point of contra flexure. Numerical problems.	
UNIT-3	*Module-3*	Bending Stress Concept of bending stresses, Theory of simple bending, assumptions made in bending theory, Use of equation □/y=M/I=E/R,Concept of moment of resistance, Bending stress diagram, Calculation of maximum bending stress in beams of rectangular, I and T sections,Permissible bending stress, section modulus for rectangular, circular and symmetrical I sections.	8
UNIT-4	*Module-4*	Columns Concept of column, modes of failure, Types of columns, Buckling load, crushing load, Slenderness ratio, Factors effecting strength of a column, End restraints, Effective length, Strength of column by Euler Formula without derivation, Rankine Gourdan formula (without derivation),Direct and eccentric loading, Direct and bending stresses and their combination, Numerical problems.	8
UNIT-5	*Module-5*	Torsion and Springs Determination of number of plates, Maximum bending stress and deflection, Closed coil helical spring subjected to axial load, Stress deformation, Stiffness and angle of twist and strain energy, Falling loads on springs, Numerical problems Torsion: Concept of torsion, difference between torque and torsion, Use of torque equation, Comparison between solid and hollow shaft with regard to their strength, weight and shear stress diagram, Power transmitted by shaft, Concept of mean and maximum torque, Numerical problems.	8
Total No. of Hours			**40**

Learning Outcomes:	**1.** Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit. **2.** Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope an deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure **3.** Apply knowledge of mathematics, science for engineering applications **4.** Design and conduct experiments, as well as to analyze and interpret data **5.** Design a component to meet desired needs within realistic constraints of health and safety

	6. Identify, formulate, and solve engineering problems 7. Practice professional and ethical responsibility 8. Use the techniques, skills, and modern engineering tools necessary for engineering practice **NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Strength of Materials by R.S. Khurmi; S. Chand and Company, Delhi.
2.	Strength of Materials by DR Malhotra, Satya Prakashan, Delhi.
3.	Strength of Materials by RK Rajput, SK Kataria and Sons, Delhi
4.	Strength of Materials by Birender Singh
5.	Strength of Materials by Dr. Sadhu Singh.

Course Code: DME-C451

Course Name: Measurement & Metrology Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up.	**2**
Experiment-2	Test and calibration of a thermocouple.	2
Experiment-3	Measurement with height gauge and depth gauge.	2
Experiment-4	Measurement of flatness with dial indicator.	2
Experiment-5	Measurement with combination set and bevel protector.	2
Experiment-6	Study and use of slip gauges.	2
Experiment-7	Measurement of angle with sine bar.	2
Experiment-8	Measurement of surface roughness of a surface.	2
Total number of hours		**16**

Course Code: DME-C452

Course Name: Fluid Mechanics Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	1. Measurement of pressure head by employing i) Piezometer tube ii) Single and double column manometer iii) Pressure gauge	**2**
Experiment-2	To find out the value of coefficient of discharge for a venturimeter	**2**
Experiment-3	Measurement of flow by using venturimeter	**2**
Experiment-4	Verification of Bernoulli's theorem	**2**
Experiment-5	To determine the coefficient of friction of pipe using Darcy's equation	**2**
Experiment-6	Study the working of a pelton wheel and Francis turbine	**2**
Experiment-7	Dismantling and assembly of a single stage centrifugal pump to study its constructional details, operation including fault diagnosis.	**2**
Experiment-8	Study of characteristics curve for centrifugal pump and plot its curves	**2**
Total number of hours		**16**

Course Code: DME-C453

Course Name: I.C.Engines Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Understand working principle and construction of four-stroke Petrol and Diesel Engine.	**2**
Experiment-2	Understand working principle and construction of two-stroke Petrol and Diesel Engine.	**2**
Experiment-3	Conduct trial on I.C. Engine Test Rig to find out the Heat Balance in an I.C. Engine.	2
Experiment-4	Study of valve timing diagram of four-stroke Petrol and Diesel Engine.	2
Experiment-5	Determination of I.P., B.P., Mechanical Efficiency and Thermal Efficiency of an I.C. Engine through suitable method.	2
Experiment-6	Conduct Morse Test on Multi-cylinder Diesel / Petrol Engine.	2
Experiment-7	Study of Cooling System generally installed in four-stroke (single / multi-cylinder) I.C. Engine.	2
Experiment-8	Study of Lubrication System generally installed in two-stroke I.C. Engine.	2
Total number of hours		**16**

Course Code: DME-C454

Course Name: Fundamental of Computer Applications Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	*Given a PC, name its various components and list their functions Identification of various parts of a computer and peripherals*	**2**
Experiment-2	Practice in installing a computer system by giving connection DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP	2
Experiment-3	Exercises on entering text and data (Typing Practice using any tutor)	
Experiment-4	Features of Windows as an operating system - Start - Shutdown and restore - Creating and operating on the icons - Opening closing and sizing the windows - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file - Creating and operating on a folder - Changing setting like, date, time color (back ground and fore ground) - Using short cuts Using on line help	2
Experiment-5	MS-Word - File Management: Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file - Page Set up: Setting margins, tab setting, ruler, indenting - Editing a document: Entering text, Cut, copy, paste using tool- bars - Formatting a document: Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods - Aligning of text in a document, justification of document, Inserting bullets and numbering - Formatting paragraph, inserting page breaks and column breaks, line spacing Use of headers, footers: Inserting footnote, end note, use of comments - Inserting date, time, special symbols, importing graphic images, drawing tools - Tables and Borders:	2

	Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table - Print preview, zoom, page set up, printing options - Using Find, Replace options - Using Tools like: Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and labels - Using shapes and drawing toolbar, - Working with more than one window in MS Word, - How to change the version of the document from one window OS to another Conversion between different text editors, software and MS word	
Experiment-6	MS-Excel - Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets - Menu commands: Create, format charts, organize, manage data, solving problem by analyzing data, and exchange with other applications. Programming with MS-Excel, getting information while working - Work books: Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet - Creating a chart: Working with chart types, changing data in chart, formatting a chart, use chart to analyze data - Using a list to organize data, sorting and filtering data in list	2
Experiment-7	1. MS PowerPoint a) Introduction to PowerPoint How to start PowerPoint Working environment: concept of toolbars, slide layout, templates etc. Opening a new/existing presentation Different views for viewing slides in a presentation: normal, slide-sorter etc. b) Addition, deletion and saving of slides e) How to view the slide show? Viewing the presentation using slide navigator Slide transition Animation effects etc.	2
Experiment-8	2. Internet and its Applications a) Log-in to internet b) Navigation for information seeking on internet	2

	c) Browsing and down loading of information from internet d) Sending and receiving e-mail - Creating a message - Creating an address book - Attaching a file with e-mail message - Receiving a message , Deleting a message	
Total number of hours		**16**

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Fundamentals of Computer by V . Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi.
2.	Computers Today by SK Basandara, Galgotia Publication Pvt ltd. Daryaganj, New Delhi
3.	MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi

Course Code:DME-C501

Course Name: Dynamics of Machine

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Basic Concepts:** Definition of statics, dynamics, kinetics, and. kinematics, Rigid body and resistant body., Links, its classification, Kinematics chain and their types, Kinematics pairs and it's classification, Mechanism. Machine, Structure & Inversion, Degree of freedom, Types of joints, Constrained motion, and it's classification , Classification of mechanisms, Four bar chain and it's inversion, Single slider crank chain and its inversions. Fly Wheel: Turning moment diagram plotting and its purpose, Turning moment diagram for single cylinder single acting steam engine, Fluctuation of energy & fluctuation of speed of Flywheel, Applications of fly wheel, Types of fly wheels,Mass and size calculations in different cases	06
UNIT-2	*Module-2*	Governors: Functions of governor, Classification of governors - elementary knowledge of porter governor, Watt governor, Proell governor, Porter governor, Terminology used in governors, Governors effort and power, Hunting, isochronism, stability, sensitiveness of a governor, Simple problems related to watt, porter and proell governor, Applications of governors Cams:Definition of cam, Classification of cams, Followers and their classification, Applications of cam, Basic definition related to cams, Construction of displacement diagram of follower performing uniform velocity, Construction of displacement diagram of follower performing SHM	06
UNIT-3	*Module-3*	Power Transmission Devices (Belt, Rope and Chain Drive): Introduction, Belt, Rope and Chain drives ,Material for Belt, and Rope, Open and crossed belt drives, action of belt on pulleys, velocity ratio, Slip and Creep in belts ,Length of belt in case of open and	06

		cross belt, Ratio of tensions in case of flat and V belt, Power transmitted and maximum power transmitted by belt, Centrifugal force and its effect on belt tension, Initial tension and its effect on the transmission of maximum.	
UNIT-4	*Module-4*	Gear Drive: Functions of gear, Classification of gears and Gear material, Gear nomenclature, Simple, compound, reverted and epicyclic gear train, Horse power transmitted by a gear train, Selection of gear trains- simple and epicyclical	06
UNIT-5	*Module-5*	Brakes and Dynamometers: Introduction and Classification of brakes, Brief description of different types of Mechanical Brake such as block or shoe brake Simple and Differential band brake, Definition and types of dynamometers, prony brake dynamometer, rope brake dynamometers, hydraulic dynamometer, belt transmission dynamometer. Clutches:Function of clutch, Classification of clutches, Principle of working of Single Disc clutch and Cone clutch with simple line diagram, Principle of working of Multi plate clutch and Centrifugal clutch	06
Total No. of Hours			**30**

Learning Outcomes:	**NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Vinogradov, O., "Fundamentals of Kinematics and Dynamics of Machines and Mechanisms", CRC Press, ISBN 9780849302572. .
2.	Massie, H.H., and Reinholtz, C.F., "Mechanisms and Dynamics of Machinery, 4th Ed., John Wiley & Sons, ISBN: 978-0-471-80237-2

Course Code:DME-C502

Course Name: CNC Machine And Automation

MM: 100 **Time: 3 Hr.** **L T P** **3 0 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holders are required to supervise and handle specialized machines and equipment like CNC machines. For this purpose, knowledge and skills about NC machines, part programming in NC machines and tooling for CNC machines are required to be imparted for enabling them to perform above functions. This subject aims at development of knowledge and skills about CNC machines, tools, equipment and use of high tech machines for increased productivity and quality.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Introduction Introduction to NC, CNC & DNC, their advantages, disadvantages and applications, Machine Control Unit, input devices, selection of components to be machined on CNC machines, Problems with conventional NC, New developments in NC, Axis identification, PLC Control and its components. Its advantages and disadvantages.	06
UNIT-2	*Module-2*	**Construction and Tooling** Design features, specification Chart of CNC machines, use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices, various cutting tools for CNC machines, overview of tool holder, different pallet systems and automatic tool changer system, management of a tool room.	06
UNIT-3	*Module-3*	**Part Programming** Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rational components, part programming using conned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation.	06
UNIT-4	*Module-4*	**System Devices, Problems in CNC Machines ,Automation and NC system** Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters, potentiometers for linear and angular position, encoder and decoder, axis drives, open loop system, close loop system.	08

		Common problems in mechanical, electrical, pneumatic, electronic and PC components of NC machines, diagnostic study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines. Role of computer in automation, emerging trends in automation, automatic assembly, manufacture of magnetic tape, manufacture of printed circuit boards, manufacture of integrated Circuits, Overview of FMS, Group technology, CAD/CAM and CIM.	
UNIT-5	*Module-5*	**Robot Technology** Introduction to robot technology, basic robot motion, robot applications.	04
Total No. of Hours			**30**

Learning Outcomes:	1. Investigate; understand new and ongoing developments in the area of numerical control of machine tool. 2. Understand basic concepts of machines operated through numerical control. 3. Understand the principles of computer numerical control (CNC) and machine Structures. 4. Be able to interpret a component specification and produce an operational plan for its manufacture. 5. Develop simple part programs with the help of programming languages and manufacture a component **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi.
2.	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill, New Delhi.
3.	CNC Machine by Bharaj; Satya Publications, New Delhi.

Course Code:DME-C503

Course Name: Workshop Technology-II

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective *As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met*.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Carpentry and Painting Shop-II Introduction to joints, their relative advantages and uses. Job I Preparation of Dovetail joint and glued joint. Job II Preparation of Mitre Joint Job III Preparation of a lengthening Joint Job 1V Preparation of at least one utility job with and without lamination.. Demonstration of job showing use of Rip Saw, Bow saw and Tramme, method of sharpening various saws. Demonstration of job on Band Saw and circular saw, chain and diesel universal wood working machine, saw resharpening machine, Saw Brazing unit. Demonstration of various methods of painting wooden items. Job V Preparation of surface before painting. Job VI Application of primer coat Job VII Painting wooden items by brush/roller/spray.	06
UNIT-2	*Module-2*	Fitting and Plumbing Shop-II Description and demonstration of various types of drills, taps and dies Selection of dies for tapping. Types of taps, tapping, dieing and drilling operations. Job I Making internal and external threads on a job by tapping and dieing operations	06

		(manually) Precautions while drilling soft metals, specially aluminum and lead. Job II Drilling practice on soft metals (Aluminum, Brass and lead) Care and maintenance of measuring tools like calipers, steel rule, try square, vernier, micrometer, height gauge, combination set, reading gauge. Handling of measuring instruments, checking of zero error, finding of least count. Job III Preparation of a job by filing on non-ferrous metal. Job IV Production of a utility job involving all the above operations. Job V Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow T - Union, socket, stopcock, taps, etc Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.	
UNIT-3	*Module-3*	**Welding Shop-II** Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment. Job I Practice in handling gas welding equipment and welding practice. Common welding joints generally made by gas welding. Job II Preparation Butt joint by gas welding. Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding. Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves). Job V Exercise job on spot/seam welding machine. Demonstration of various methods adopted for painting steel items. Job VI Painting steel items by brush/roller/ spray	06
UNIT-4	*Module-4*	**Sheet metal & Machine shop** Introduction to sheet metal process and tools. Job I Making sheet metal joints Job II Making sheet metal trey or a funnel or a computer chassis Job III Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering Job IV Prepare a lap riveting joint of sheet metal pieces Introduction to various machines used in machine shop. Job V Exercise on simple turning	06

		Job VI Exercise on taper turning Job VII Marking and drilling practice on mild steel piece Job VIII Marking and drilling practice on aluminium piece Job IX Demonstration of various functions of CNC Machine	
UNIT-5	*Module-5*	**Electric Shop-II** Importance of three phase wiring and its effectiveness. Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine. Estimating and costing power consumption. Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy. Job III Checking continuity of connection (with tester and bulbs), location of faults with a multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing. Demonstration of dismantling, servicing and reassembling of a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geaser, electric oven etc. Job IV Dismantling, serving and reassembling of any of the above electrical Job V Demonstration of testing single phase/three phase electrical motor by using voltmeters ammeter clip on meter technometer etc. Job VI Reversing the rotation of motor.	06
Total No. of Hours			**30**

Learning Outcomes:	1)Student will be able to choose machining processing to manufacture any component Manufacturing Industries. 2)To Estimate machining time for milling and drilling process 3) To understand finishing processes 4)To calculate forces during orthogool metal cutting. 5) To explain principle and applications of advanced machining to develop part program for turning. design jig and fixture for given component

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2.	Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

Course Code:DME-C504

Course Name: Industrial Engineering

MM: 100	Sessional: 30

Time: 3 Hr. **L T P** **2 1 0**	**ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	**Objective:** 1. Basic understanding of Industrial process like type of industry, optimization of production process, reduction of inventory, organization structure and modern manufacturing practices like JIT . 2.To apply knowledge of mathematics, science, and engineering for process mapping and productivity enhancement

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Productivity:** Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System. **Work Study:** Meaning and benefits of work study, time & motion study. Micromotion study P.M.T.S. man machine Diagram flow chart. Motion economy	6
UNIT-2	*Module-2*	**Method Study**: Objectives and scope of method study, recording techniques, micromotion study and memo-motion study, fundamental motion and therbligs, principal of motion economy, critical examination	6
UNIT-3	*Module-3*	**Work Measurement:** Objectives of work measurement, work measurement techniques, procedure. Work sampling, determining the sample size, determining time standards by work sampling. Absolute error or desired absolute accuracy	6
UNIT-4	*Module-4*	**Inventory Control:** Inventory, function, cost, deterministic models. Introduction to MRP, supply chain Management.	6
UNIT-5	*Module-5*	**Plant Layout and Materials Handling:** Plant location, type of layout, principles of facility layout principles of material handling, Material Handling eqpts. **Production Planning and Control:** Objectives, Forecasting, product design and development functions, steps in PPC. Planning roating, scheduling, Dispatching &	6

		follow-up, Effectiveness of PPC, Introduction of JIT.	
Total No. of Hours			**30**

Learning Outcomes:	1. An ability to identify, formulate, and solve complex problems related to productivity.. 2. An ability to apply engineering design to produce solutions that meet specified needs 3. with consideration of public health, safety, and welfare, as well as global, cultural, social, 4. Environmental, and economic factors 5. An ability to function effectively on a team whose members together provide leadership for development of an organization. 6. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies..

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Buffam E.S,Modern production operations Management, Wiley eastern.
2.	O.P. Khanna.,Industrial Engg. & Management, ISBN-10-818992835X

Course Code:DME-C551

Course Name: Dynamics of Machine Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Study of simple links/models/mechanisms.	**2**
Experiment-2	Study of various commonly used mechanisms and its inversions in machines	**2**
Experiment-3	Study of various types of models of cam and follower arrangements.	**2**
Experiment-4	Study of various models of gear trains arrangements	**2**
Experiment-5	Experiment on cam and follower apparatus	**2**
Experiment-6	Experiment on Journal bearing apparatus	**2**
Experiment-7	Experiment on Engine Brakes	**2**
Experiment-8	Experiment on Gyroscope apparatus	**2**
Total number of hours		**16**

Course Code:DME-C552

Course Name: CNC Machines and Automation Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	1. Study the constructional details of CNC lathe.	**2**
Experiment-2	Study the constructional details of CNC milling machine.	2
Experiment-3	Study the constructional details and working. - Automatic tool changer and tool setter - Multiple pallets - Swarf removal system - Safety devices	2
Experiment-4	Develop a part programme for following lathe operations and make the job on CNC lathe and CNC turning center. Plain turning and facing operations Taper turning operations (internal and external) - - Thread cutting operations (internal and external) - - Operation along contour using circular interpolation	2
Experiment-5	Develop a part programme for the following milling operations and make the job on CNC milling and CNC machining centre (vertical and horizontal type). - Plain milling - Slot milling - Contouring - Pocket milling	**2**
Experiment-6	Preparation of work instruction for machine operator.	**2**
Experiment-7	Preparation of preventive maintenance schedule for CNC machine.	**2**
Experiment-8	Demonstration of FMS on prototype model and industrial visit for awareness of actual working in production	**2**
Total number of hours		**16**

Course Code:DME-C553

Course Name: Workshop Technology – II Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter..	**2**
Experiment-2	Gear manufacturing by some indexing device on a milling machine & gear hobber. Inspection of gear	2
Experiment-3	Job on grinding using a. Surface grinding b. Cylindrical grinding c. Centreless grinding	2
Experiment-4	Milling cutter grinding on tool and cutter grinder.	2
Experiment-5	Preparation of job through eccentric turning.	2
Experiment-6	Practice of taper turning.	2
Experiment-7	Exercise on EDM for preparation of electrodes(male and female).	2
Experiment-8	Marking and drilling practice using column and knee type drilling machine and radial drilling machine	2
Total number of hours		**16**

Course Code:DME-C554

Course Name: Minor Project Work

MM: 100 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 30** **ESE: 70** **Credit : 1**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	The object of this training is to: 1. Expose the students to industrial/field procedures and practices so as to have an appreciation of the size and scale of operations. 2. Develop comprehension regarding concepts, principles and practices taught in the classroom in their application in solving field/industrial tasks/problems.

Course Content	**No. of Hours**
For effective planning and implementation of this practical training, it is proposed to: i) Identify adequate number of industrial/field organizations where students will be sent for practical training. ii) Prepare a workbook, which can be used by students for guiding students to perform definite task during the practical training. iii) Identification of teachers who would supervise the students and provide guidance during practical training. The components of evaluation will include the following: - Punctuality and regularity - Initiative in learning - Relationship at works - Industrial training report	**30**

Course Code:DME-C601

Course Name: Computer Aided Drafting and Drawing

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	**Objective:** The primary objective of the course is to introduce the student to working with discretised geometry in design of mechanical components and representations of shapes. They will also practice on AUTOCAD and CREO.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	○ **Introduction and Review of Computer Programming:** Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity.	06
UNIT-2	*Module-2*	**Computer Graphics I -** Computer systems, Graphics input devices- cursor control devices, Digitizers, Scanners, speech oriented devices and touch panels, Graphics display devices CRT, colour CRT monitors, **Computer Graphics-II:** Graphics software, Graphics functions, output primitives- Bresenhams line drawing and Mid-point circle algorithms.	06
UNIT-3	*Module-3*	**Geometric Transformations -** Word/device co- ordinate representations, 2D and 3D geometric transformations, Matrix representation-translation.	06
UNIT-4	*Module-4*	**Plane Curves:** Curve representation, Interpolations Vs approximation,Parametric Continuity conditions, Spline Curves- Hermit spline, Bezier spline and B- spline Curves and its Properties.)	06
UNIT-5	*Module-5*	**3-D Graphics:** Polygon surfaces Polygon meshrepresentations, Quadric and Super quadricsurfaces and Blobby objects, Fractals. Solid modelling- wire mesh and sweep representation, constructive solid geometry, Boolean operations, Boundary representations. Colour models.	06
Total No. of Hours			**30**

Learning Outcomes:	By completing this module, the student should be able to understand the basic concepts in CAD. They will be able to write computer programs and use them in MechanicalEngineering Design

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Davis, M. J., "***Computer Graphics****"*, UK Ed., Nova Science Pub Inc, ISBN- 978-1617618116
2.	Rogers, D. F., Earnshaw, R. A., Graphics, B. C. S. C., Group, D., & Society, C. G."***Computer graphics techniques theory and practice****", 1990 Ed.* Springer-Verlag, ISBN- 978-0387972374

Course Code:DME-C602

Course Name: Refrigeration and Air Conditioning

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective The diploma holder of Mechanical Engineering are responsible for supervising and maintenance of RAC system. For this purpose, the knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students. Moreover, RAC industry is expanding and employment opportunities in this field are good.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Fundamental of Refrigeration/Refrigerants Introduction to refrigeration and air conditioning, units of refrigeration, methods of refrigeration, natural system and artificial system of refrigeration, refrigeration effect. Rating of refrigeration, co efficient of performance. Difference between COP and efficiency. Introduction to air refrigeration cycle. Bell – Colleman cycle, calculation of mass flow rate, work done and COP. Miscellaneous: Study of Ice plant, cold storage, centrally air-conditioned plant, air conditioning of car. Insulating materials. Safety switches – thermostat, overload protector, low pressure high pressure cut out switch, oil pressure cut out switch.	08
UNIT-2	*Module-2*	Vapour Compression System Principle, function, parts and necessity of vapour compression system.P – H charts. Dry, wet, and super heated compression. Effect of sub cooling and super heating, effect of moisture in vapour compression system. Comparison between air refrigeration and vapour compression system. Vapour Absorption System: Introduction, principle and working of electrolux refrigeration system, solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.	08

UNIT-3	*Module-3*	Refrigerants Physical, chemical, thermodynamic and commercial properties of NH_3, water, CO_2, R-12, R-22 and R-134 A. Properties of ideal refrigerants used in refrigeration system.	08
UNIT-4	*Module-4*	Vapour Absorption System Introduction, principle and working of Electrolux refrigeration system, solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.	08
UNIT-5	*Module-5*	Refrigeration Equipment Compressor – Function, various types of compressor. Condenser – Function, Various types of condenser. Evaporators – Function, Various types of evaporators. Expansion Devices – Function, Different types such as capillary tube, thermostatic expansion valve, automatic expansion valve, low side float valve and high side float valve. Psychrometry: Definition of dry air, moisture, saturated air, unsaturated air, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT. Psychrometric charts, heating with humidification, cooling with dehumidification, by pass factor. Air conditioning systems. Windows type air conditioner, split type air conditioner.	08
Total No. of Hours			**40**

Learning Outcomes:	1. Students should be able to understand various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables. 2. Students should be able to illustrate the fundamental principles and applications of refrigeration and air conditioning system 3. Students should be able to obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems 4. Students should be able to present the properties, applications and environmental issues of different refrigerants 5. Students should be able to estimate the condition of steam and performance of vapour power cycle and vapour compression cycle. 6. Students should be able to calculate cooling load for air conditioning systems used for various applications 7. Students should be able to use Psychometric charts and estimate various essential properties related to Psychrometry and processes. 8. Students should be able to operate and a0lyze the refrigeration and air conditioning systems **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher

1.	Refrigeration and Air conditioning by A.S Sarao; Satya Prakashan, New Delhi.
2.	Refrigeration and Air conditioning by Mahohar Lal.
3.	Refrigeration and Air Conditioning by R.S Khurmi & J.K Gupta; S. Chand, New Delhi.

Course Code:DME-C603

Course Name: Production Management

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective Diploma holder in this course is responsible for controlling production and quality of the product on the shop floor as well as for production planning and control. He is also required to supervise erection, installation and maintenance of equipment including material handling and undertake work-study for better utilization of resources. For this purpose, knowledge and skills about these topics need to be imparted to them. This subject aims at development of competencies to prepare material, equipment schedule and production control schedules and maintain required quality levels. In addition, it will also help in developing skills in erection, installation and testing of equipment.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	Production, Planning and Control Types of production. – Job, batch and mass production.Concept of planning, scheduling, routing, dispatching and follow up, forecasting. Break even analysis and Gantt chart. Project scheduling, application of CPM and PERT, simple numerical problems.	06
UNIT-2	*Module-2*	Plant Location Layout and Handling Definition. Factors affecting the site selection of plant. Factors affecting plant layout. Types of layout – Process, product, combination and fixed position, layout patterns.Techniques of making layout – Flow diagram,templates,distance volumematrix, travel chart. Line balancing, workstation. Material Handling: Principles of economic material handling. Hoisting equipment – Fork lift truck, cranes – mobile motor cranes, overhead cranes, traveling bridges crane, derrick crane.Conveying Equipment – Package conveyor, gravity roller conveyors, screw conveyors, flight or scraper conveyors, bucket conveyors, bucket elevators, belt conveyors, and pneumatic conveyors.	06
UNIT-3	*Module-3*	Work Study Definition, advantages and procedure of Work study.	06

		Difference between production and Productivity, measures to improve productivity. Method study – Definition, Objectives and Procedure. Symbols, Flow process chart, Flow diagram, Machine chart, Two hand process chart. Principles of motion economy, Therblig symbols, Simo chart. Work Measurement – Time study, definition, principle and method of time study. Stop watch study – Number of readings, calculation of basic time, rating techniques, normal time, allowance, standard time, simple numerical problems. E	
UNIT-4	*Module-4*	Inventory Management Material purchasing, store keeping, functions and duties of store department. Definition of inventory, Types of inventory. ABC analysis. Procurement cost, carrying charges, lead-time, reorder point, economic ordering quantity, simple numerical problems. Codification and standardization. Objectives and functions of MRP. Management information of MRP. Concept of JIT.	06
UNIT-5	*Module-5*	Estimation and Costing Introduction, Purpose/functions of estimating. Different between estimation and costing. Costing concept – ladder and elements of cost. Depreciation, methods of calculating depreciation. Overheads and their types. Estimation of material cost. Estimation of cost for machining processes and fabrication. Numerical problems. Profit and loss estimation	06
Total No. of Hours			**30**

Learning Outcomes:	1. In production management we learn the concept of production and many type of production planning system. 2. In production we study the plant location layout as well as the site selection of plant. 3. It Introduce the concept of planning management scheduling routing and many other concepts production. 4. We Learn the principal of different type of material handling processes by using hoisting equipments. 5. Also study about production and productivity and to improve the productivity by work study method. 6. Understand the principles of inventory managements. Observe the time schedule and proper way of method study objective and procedure **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Industrial Engineering and Management by T.R. Banga and SC Sharma; Khanna Publishers, Delhi.
2.	Industrial Engineering and Management by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.

Course Code:DME-C604

Course Name: Maintenance Management

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective: • To ensure that equipment and infrastructure are always in good condition. To carry out prompt emergency repair of equipment and infrastructure so as to secure the best possible availability for production. To ensure the operation of equipment for production and for the distribution of energy and fluids.

UNIT	Module	Course Content	No. of Hours
UNIT-1	*Module-1*	**Introduction:** Introduction, operating life cycle, reliability, Failure analysis, failure rate curve, elements in series, parallel, logic diagrams, improving reliability, maintainability, availability, reliability and maintainability.	08
UNIT-2	*Module-2*	**Maintenance Strategies**: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, and zero break down. Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure.	08
UNIT-3	*Module-3*	Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure	6
UNIT-4	*Module-4*	**Break down maintenance planning**, assignment model, minimum cost service rate. Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning	08

Total No. of Hours	30

Learning Outcomes:	Understand the maintenance function and its objectives and know how to prepare report about the maintenance function. Gain the necessary knowledge about the types of maintenance and know how to use them when design maintenance systems. **NOTE FOR PAPER SETTER:** The question paper shall comprise of 70 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Nauhria & Prakash, Management of systems, Wheeler publishing, ISBN-9788185814520
2.	V. Venkataraman , Maintenance engineering and management, Prentice Hall India Learning Private Limited, ISBN- 978-8120331303

Course Code:DME-C651

Course Name: CAD (Computer Aided Design) Lab

MM: 100 **Time: 3 Hr.** **L T P** **2 1 0**	**Sessional: 30** **ESE: 70** **Credit : 3**

Experiment	Course Content	No. of Hours
Experiment-1	1. Detail and assembly drawing of the following using AUTOCAD (2D) (4 sheets) o Plummer Block o Wall Bracket o Stepped pulley, V-belt pulley o Flanged coupling o Machine tool Holder (Three views) o Screw jack or knuckle joint	4
Experiment-2	Isometric Drawing by CAD using Auto CAD (one sheet) Drawings of following on computer: Cone Cylinder Isometric view of objects	4
Experiment-3	Modelling (02 sheets) 3D modelling, Transformations, scaling, rotation, translation	4
Experiment-4	Introduction to other CAD softwares; (Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software)	4
Total		16

Course Code:DME-C652

Course Name: Refrigeration and Air Conditioning Lab

MM: 50 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 15** **ESE: 35** **Credit : 1**

Experiment	Course Content	No. of Hours
Experiment-1	Experiment on refrigeration test rig and calculation of various performance parameters.	**2**
Experiment-2	Experiment on air-conditioning test rig & calculation of various performance parameters.	2
Experiment-3	Experiment on Ice-plant test rig & calculation of various performance parameters.	2
Experiment-4	To study different types of expansion devices used in refrigeration system.	2
Experiment-5	To study different types of evaporators used in refrigeration systems.	2
Experiment-6	To study basic components of air-conditioning system.	2
Experiment-7	To study air washer system and processes.	2
Experiment-8	To study the window air conditioner	2
Total number of hours		**16**

Course Code:DME-C653

Course Name: Major Project Work

MM: 200 **Time: 2 Hr.** **L T P** **0 0 2**	**Sessional: 40** **ESE: 160** **Credit : 2**

Prerequisites:	
Objectives:	
Course Coordinator	

Course outcome	Review and finalization of the Approach to the Problem relating to the assigned topic. Preparing an Action Plan for conducting the investigation, including team work. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed. Final development of product/process, testing, results, conclusions and future directions.

Module	Course Content	No. of Hours
	PROJECT WORK Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.	

	Each teacher is expected to guide the project work of 5-6 students. - Projects related to increasing productivity - Projects related to quality assurance - Projects related to estimation and economics of production - Projects connected with repair and maintenance of plant and equipment - Projects related to identification of raw material thereby reducing the wastage - Any other related problems of interest of host industry It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.	
Total number of hours		**30**

Learning Outcomes:	1.Students will get knowledge of problem identification and use their skills for team building and project development. 2.Develop a solution for any real world problem. 3.Students will get equipped with knowledge of latest/upcoming problems and solutions. 4.Students will also be able to improve skills for project planning, implementation and communication.