

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
<p>NOTE:</p> <p>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.</p> <p>Course Objectives:</p> <p>To give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential Calculus and Basic elements of algebra.</p>	

UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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 their applications (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	<i>Module-2</i>	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	<i>Module-3</i>	Conjugate of a complex 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	<i>Module-4</i>	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	<i>Module-5</i>	Permutations and Combinations: Value of nPr and nCr . 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 binomial approximation 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, 40th Edition, 2007.
2.	G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3.	Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 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 the following points:

- 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.

UNIT II

Differential Calculus: Definition of function, Concept of limits, Four standard limits

$$\lim_{x \rightarrow a} x^n = a^n, \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1, \lim_{x \rightarrow \infty} (1 + \frac{1}{x})^x = e, \text{ Differentiation by definition of } \sin x, \cos x, \tan x, e^x, \log a x.$$

$$\frac{x-a}{x-a} = \frac{x}{x} = 1$$

cosx , tanx , e^x , loga x. Differentiation of sum, product and quotient of functions. Differentiation of 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
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NOTE:	<p>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.</p> <p>Course Objectives:</p> <p>aims to give an understanding of this world both by observation and by prediction of the way in which objects behave.</p> <p>apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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 and charged 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	<i>Module-3</i>	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 colour coding. 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	<i>Module-4</i>	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	<i>Module-5</i>	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 tapped). 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 and Company 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 following points:

- State basic optical laws, establish the location of the images formed by mirrors and thin converging 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 for total internal reflection.
- Define capacitance and its unit, explain the function of capacitors in simple circuits and solve 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 the parameters: electric current, 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
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NOTE:	<p>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.</p> <p>Course Objectives:</p> <p>Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.</p> <p>Use relevant water treatment method to solve domestic and industrial problems.</p> <p>Solve the engineering problems using knowledge of engineering materials and properties.</p> <p>Use relevant fuel and lubricants for domestic and industrial applications</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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 measurement of water hardness by EDTA method, total dissolved solids (TDS) alkalinity estimation.	5
UNIT-3	<i>Module-3</i>	Engineering Materials: Natural occurrence of metals – minerals, ores of iron, aluminium and copper, 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	<i>Module-4</i>	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	<i>Module-5</i>	Electro-Chemistry: Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems. Industrial Application 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. I and 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 following points:

- Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.
- Qualitatively analyze the engineering materials and understand their properties and applications.
- Choose fuel and lubricants suitable for economical industrial processing to obtain eco-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
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NOTE:	<p>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.</p> <p>Course Objectives:</p> <p>To develop confidence in speaking English with correct pronunciation.</p> <p>To develop communication skills of the students i.e. listening, speaking, reading and writing skills.</p> <p>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.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	Soft Skills for Professional Excellence: Introduction: Soft Skills and Hard Skills, Importance of soft skills, applying soft skills across cultures.	5
UNIT-3	<i>Module-3</i>	Reading Comprehension: Comprehension, vocabulary enhancement and grammar exercises.	6
UNIT-4	<i>Module-4</i>	Professional Writing: The art of précis writing, Letters: business and personnel, Drafting e-mail, notices, minutes of a meeting etc.	5
UNIT-5	<i>Module-5</i>	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, New Delhi (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 following points:

- Develop basic speaking and writing skills including proper usage of language and vocabulary 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, facing interviews 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 and gestures.

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
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NOTE:	<ol style="list-style-type: none"> 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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.	2
<i>Experiment-2</i>	To verify laws of reflection from a plane mirror/ interface.	2
<i>Experiment-3</i>	To verify laws of refraction (Snell's law) using a glass slab.	2
<i>Experiment-4</i>	To determine focal length and magnifying power of a convex lens.	2
<i>Experiment-5</i>	To verify Ohm's law by plotting graph between current and potential difference.	2
<i>Experiment-6</i>	To verify laws of resistances in series and parallel combination.	2
<i>Experiment-7</i>	To find the frequency of AC main using electrical vibrator.	2
<i>Experiment-8</i>	To verify Kirchhoff's law using electric circuits.	2
<i>Experiment-9</i>	To study the dependence of capacitance of a parallel plate capacitor on various factors and determine permittivity of air at a place.	2
<i>Experiment-10</i>	To find resistance of a galvanometer by half deflection method.	2
<i>Experiment-11</i>	To convert a galvanometer into an ammeter.	2
<i>Experiment-12</i>	To convert a galvanometer into a voltmeter.	2
<i>Experiment-13</i>	To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.	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
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NOTE:	<ol style="list-style-type: none"> 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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Preparation of standard solution of oxalic acid or potassium permanganate.	2
<i>Experiment-2</i>	To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.	2
<i>Experiment-3</i>	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
<i>Experiment-4</i>	Iodometric estimation of copper in the copper pyrite ore.	2
<i>Experiment-5</i>	Volumetric estimation of total acid number (TAN) of given oil.	2
<i>Experiment-6</i>	Volumetric estimation of <ul style="list-style-type: none"> • Total hardness of given water sample using standard EDTA solution. • Alkalinity of given water sample using 0.01M sulphuric acid 	2
<i>Experiment-7</i>	Determine the conductivity of given water sample.	2
<i>Experiment-8</i>	Determination of the Iron content in given cement sample using colorimeter.	2
<i>Experiment-9</i>	Determination of calorific value of solid or liquid fuel using bomb calorimeter.	2
<i>Experiment-10</i>	Determination of viscosity of lubricating oil using Redwood viscometer.	2
<i>Experiment-11</i>	Determination of flash and fire point of lubricating oil using Able's flash point apparatus.	2
<i>Experiment-12</i>	To verify the first law of electrolysis of copper sulfate using copper electrode.	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
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NOTE:	<ol style="list-style-type: none"> 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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	<p>Introduction to Physical Education:</p> <ul style="list-style-type: none"> • Meaning & definition of Physical Education • Aims & Objectives of Physical Education • Changing trends in Physical Education 	2
<i>Experiment-2</i>	<p>Olympic Movement:</p> <ul style="list-style-type: none"> • 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
<i>Experiment-3</i>	<p>Physical Fitness, Wellness & Lifestyle</p> <ul style="list-style-type: none"> • 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
<i>Experiment-4</i>	<p>Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga</p> <ul style="list-style-type: none"> • Define Anatomy, Physiology & Its Importance • Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.) 	2
<i>Experiment-5</i>	<p>Postures</p> <ul style="list-style-type: none"> • 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, Kyphosis, Bow Legs and Scoliosis. • Corrective Measures for Postural Deformities 	2

<i>Experiment-6</i>	<p>Yoga</p> <ul style="list-style-type: none"> • 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
<i>Experiment-7</i>	<p>Yoga & Lifestyle</p> <ul style="list-style-type: none"> • Asanas as preventive measures. • Hypertension: Tadasana, Vajrasana, Pavan MuktaSana, Ardha Chakrasana, Bhujangasana, Sharasana. • Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana. • Back Pain: Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana. • Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, • Pavan MuktaSana, Ardha Matsyendrasana. • Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana. 	2
<i>Experiment-8</i>	<p>Training and Planning in Sports</p> <ul style="list-style-type: none"> • 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
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NOTE:	<ol style="list-style-type: none">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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Listening Skills: Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.	2
<i>Experiment-2</i>	Introduction to Phonetics: Sounds: consonant, vowel.	2
<i>Experiment-3</i>	Speaking Skills: Standard and formal speech: Group discussion, oral presentations, 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: 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.	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.

UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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 $\int 2 \sin^n x dx$, $\int 2 \cos^n x dx$, and $\int 2 \sin^m x \cos^n x dx$ for solving problems Where m and n are positive integers. Applications of integration for (i) Simple problem on evaluation of area bounded by a curve and axes, (ii) Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).	4
UNIT-3	<i>Module-3</i>	Co-Ordinate Geometry: Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. 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, directrices or vertices are given.	8
UNIT-4	<i>Module-4</i>	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	<i>Module-5</i>	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

S. No.	Name of Authors /Books /Publisher
1.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2.	G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3.	Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 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 the following points:

- 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.

MM: 100 Time: 3 Hr. L T P 2 1 0	Sessional: 30 ESE: 70 Credit : 3
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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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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	<i>Module-3</i>	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	<i>Module-4</i>	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	<i>Module-5</i>	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:	<p>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.</p> <p>Course Objectives:</p> <p align="center">To make new students comfortable with computing environment Learning basic computer skills, Learning basic application software tools, Understanding Computer Hard- ware, Cyber security awareness</p>

UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital 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	<i>Module-2</i>	Linux: OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.	4
UNIT-3	<i>Module-3</i>	HTML: HTML4, CSS, making basic personal webpage	8
UNIT-4	<i>Module-4</i>	Office Tools: Open Office Writer, Open Office Spreadsheet (Calc), Open Office Impress.	8
UNIT-5	<i>Module-5</i>	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 Publishing House
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 following points: Able to comfortably work on computer, install and configure OS, assemble a PC. Able to connect it to external devices, write documents, create worksheets, prepare presentations, 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:	<p>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.</p> <p>Course Objectives:</p> <ul style="list-style-type: none"> • 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	<i>Module-1</i>	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, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.	4
UNIT-2	<i>Module-2</i>	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	<i>Module-3</i>	Electric and Magnetic Circuits: EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis 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	<i>Module-4</i>	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	<i>Module-5</i>	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, New Delhi, 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 following points:

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

MM: 100 Time: 3 Hr. L T P 2 1 0	Sessional: 30 ESE: 70 Credit : 3
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NOTE:	<p>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.</p> <p>Course Objectives:</p> <ul style="list-style-type: none"> • 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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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	<i>Module-3</i>	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	<i>Module-4</i>	Renewable sources of Energy: Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass, Wind Energy.	8
UNIT-5	<i>Module-5</i>	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 International Public 2007, ISBN: 81-224-1835-X.
5.	Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, IS 07- 451871-8.
6.	Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 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 the following points:

- Understand the ecosystem and terminology and solve various engineering problems applying 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
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NOTE:	<ol style="list-style-type: none">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.
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Experiment	Course Content
<i>Experiment-1</i>	Browser features, browsing, using various search engines, writing search queries
<i>Experiment-2</i>	Visit various e-governance/Digital India portals, understand their features, services offered
<i>Experiment-3</i>	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
<i>Experiment-4</i>	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
<i>Experiment-5</i>	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
<i>Experiment-6</i>	Practice HTML commands, try them with various values, make your own Webpage
<i>Experiment-7</i>	Explore features of Open Office tools, create documents using these features do it multiple times
<i>Experiment-8</i>	Explore security features of Operating Systems and Tools, try using them and see 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
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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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	To measure voltage, current and power in 1-phase circuit with resistive load.	2
<i>Experiment-2</i>	Verification of Kirchhoff's laws.	2
<i>Experiment-3</i>	Calibration of voltmeter and ammeter.	2
<i>Experiment-4</i>	To connect single phase transformer and measure input and output quantities.	2
<i>Experiment-5</i>	To connect resistors in series and parallel combination on bread board.	2
<i>Experiment-6</i>	Test the performance of Zener diode.	2
<i>Experiment-7</i>	Test the performance of LED.	2
<i>Experiment-8</i>	Use multimeter to measure the value of given resistor.	2
<i>Experiment-9</i>	Determine the value of given resistor using digital multimeter to confirm with colour code.	2
<i>Experiment-10</i>	Test the performance of PN-junction diode.	2
<i>Experiment-11</i>	To determine the permeability of magnetic material by plotting its B-H curve.	2
<i>Experiment-12</i>	Use LCR-Q tester to measure the value of given capacitor and inductor.	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
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NOTE:	<ol style="list-style-type: none"> 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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	<p align="center">Carpentry:</p> <ul style="list-style-type: none"> • 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
<i>Experiment-2</i>	<p align="center">Fitting:</p> <ul style="list-style-type: none"> • 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
<i>Experiment-3</i>	<p align="center">Welding:</p> <ul style="list-style-type: none"> • 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
<i>Experiment-4</i>	<p align="center">Sheet Metal Working:</p> <ul style="list-style-type: none"> • 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
<i>Experiment-5</i>	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none">• 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
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NOTE:	<p>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.</p> <p>Course Objectives:</p> <p>To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.</p> <p>To develop drafting and sketching skills, to know the applications of drawing equipments, and get familiarize with Indian Standards related to engineering drawings.</p> <p>To develop skills to visualize actual object or a part of it, on the basis of drawings.</p> <p>To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles.</p> <p>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.</p>
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	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
<i>Experiment-2</i>	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
<i>Experiment-3</i>	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
<i>Experiment-4</i>	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	<p>Computer aided drafting interface: Computer Aided Drafting: concept, Hardware and various CAD software available. System requirements and Understanding the interface.</p> <p>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.</p> <p>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.</p> <p>Computer aided drafting: Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline.</p> <p>Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.</p> <p>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.</p> <p>Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.</p>	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 Colleges IS: Sp- BIS. Government of India, Third Reprint.
2.	Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujarat.
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 the following points:

- 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
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NOTE:	<ol style="list-style-type: none"> 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.
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Conversion of Galvanometer into an Ammeter of given range.	2
<i>Experiment-2</i>	Conversion of Galvanometer into Voltmeter of given range.	2
<i>Experiment-3</i>	To verify ohm's laws by drawing a graph between voltage and current.	2
<i>Experiment-4</i>	To verify laws of resistances in series and in parallel connection.	2
<i>Experiment-5</i>	To draw characteristics of a pn junction diode and find resistance of diode.	2
<i>Experiment-6</i>	Verification of Kirchhoff's Laws.	2
<i>Experiment-7</i>	Determination of resistivity by Meter bridge	2
<i>Experiment-8</i>	To assemble the components of a given electrical circuit.	2
<i>Experiment-9</i>	To identify a Diode, LED, transistor, Resistor, Capacitor from mixed collection of such items and draw their notation.	2
Total number of hours		26

Course Code: DME-C301

Course Name: Applied Mechanics

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

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
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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	<i>Module-3</i>	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	<i>Module-4</i>	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	<i>Module-5</i>	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:	<ol style="list-style-type: none"> 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 the course students will be able to understand the importance and application of various laws of mechanics <p>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.</p>
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<p>Introduction</p> <p>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.</p> <p>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.</p> <p>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</p>	6

UNIT-2	<i>Module-2</i>	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	<i>Module-3</i>	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
UNIT-4	<i>Module-4</i>	bronze, gun metal and aluminium bronze. Composition and uses of cast aluminium-alloys & wrought aluminium-alloys. 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. Abrasion 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:	<ol style="list-style-type: none"> 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 <p>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</p>
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective</p> <p>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</p>
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UNIT	Module	Course Content	No. of Hours
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UNIT-1	<i>Module-1</i>	<p>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.</p> <p>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.</p>	6
UNIT-2	<i>Module-2</i>	<p>Pattern Making and Moulding</p> <p>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.</p> <p>Moulding Sand - Properties of moulding sand, their impact and control of properties</p>	6
		<p>viz. moisture, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility, Various types of moulding sand.</p> <p>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,</p>	
UNIT-3	<i>Module-3</i>	<p>Casting</p> <p>Principles, working and applications of Dies casting: hot chamber and cold chamber, Centrifugal casting. Gating and Riser 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..</p> <p>Lathe Description and function of various parts</p>	6

UNIT-4	<i>Module-4</i>	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	<i>Module-5</i>	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:	<ol style="list-style-type: none"> 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.
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	<p>5. The ability to select manufacturing processes appropriate for particular applications;</p> <p>6. Further develops interpersonal understanding, teamwork and communication skills working on group assignments.</p>
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

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.
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UNIT	Module	Course Content	No. of Hours
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UNIT-1	<i>Module-1</i>	<p>Fundamental Concepts</p> <p>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</p> <p>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.</p> <p>Specific heat at constant pressure, specific heat at constant volume of gas, simple problems on gas equation</p>	6
UNIT-2	<i>Module-2</i>	<p>Thermodynamic Processes and Heat Transfer</p> <p>Types of thermodynamic processes – isochoric, isobaric, isothermal, isentropic, polytropic and throttling processes, equations representing the processes.</p> <p>Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes</p> <p>Introduction to Heat Transfer: Modes of</p>	6
UNIT-3	<i>Module-3</i>	<p>heat transfer, Fourier's law, steady state conduction, composite structures, Natural and forced convection, thermal radiation</p> <p>Laws of Thermodynamics</p> <p>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.</p> <p>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.</p>	6

UNIT-4	<i>Module-4</i>	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 cycle, Rankine cycle Course throttling calorimeter, 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	<i>Module-5</i>		
Total No. of Hours			30

Learning Outcomes:	<ol style="list-style-type: none"> 1. Students will be able to explain the basic principles and applications of the thermodynamics to the various real life systems. 2. Students will be able to describe fundamental laws of thermodynamics. 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 thermodynamic 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. <p>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.</p>
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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.	ESE: 35
L T P	Credit : 1
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<i>Objective</i> <i>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.</i>
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Specimen preparation for micro structural examination- cutting, grinding, polishing, etching.	2
<i>Experiment-2</i>	Material identification of say 50 common items kept in a box.	2
<i>Experiment-3</i>	Study of corrosion and its effects.	2
<i>Experiment-4</i>	Other tests such as shear, bend tests on UTM.	2
<i>Experiment-5</i>	Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines	2
<i>Experiment-6</i>	Spring index testing on spring testing machine	2
<i>Experiment-7</i>	Torsion testing of a rod on torsion testing machine.	2
<i>Experiment-8</i>	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
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Time: 2 Hr. L T P 0 0 2	ESE: 35 Credit : 1
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	To prepare a half T joint of given dimensions. Molding Shop	2
<i>Experiment-2</i>	To prepare a mould of half bearing.	2
<i>Experiment-3</i>	To prepare a butt joint of MS strips using Arc welding.	2
<i>Experiment-4</i>	To prepare a T joint of MS strips using Oxy Acetylene gas welding.	2
<i>Experiment-5</i>	To prepare a rectangular piece with slant edge of given size from M.S.	2
<i>Experiment-6</i>	To prepare a job on Lathe machine of given shape and size.	2
<i>Experiment-7</i>	To prepare a job on Shaper machine of given shape and size	2
<i>Experiment-8</i>	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	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

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

Course Code :DME -C355

Course Name: Machine Drawing-I

MM: 50	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	
Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<i>Objective</i> <i>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.</i>
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	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
<i>Experiment-2</i>	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

<i>Experiment-3</i>	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
<i>Experiment-4</i>	Lathe Tool Holder (Assembly Drawing) (01 sheets)	2
<i>Experiment-5</i>	Reading of mechanical components drawings (01 sheets)	2
<i>Experiment-6</i>	Sketching practice of bearing, bracket and pulley(02 sheets)	2
<i>Experiment-7</i>	Drilling Jig (Detail and Assembly) (02 sheets)	2
<i>Experiment-8</i>	Machine Vice (Detail and Assembly) (02 sheets)	2
Total number of hours		16

Learning Outcomes:	<ol style="list-style-type: none"> 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. <p>INSTRUCTIONAL STRATEGY</p> <ol style="list-style-type: none"> 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
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction Definition of metrology. Standard of measurement. Types of Errors - Controllable and random errors. Precision, accuracy, sensitivity, hysteresis, 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	<i>Module-2</i>	<p>Linear Measurement</p> <p>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.</p>	6
UNIT-3	<i>Module-3</i>	<p>Angular Measurement</p> <p>Construction and use of instruments for angular measurements: bevel protector, sine bar, angle gauges, clinometer, angle</p>	6
		<p>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.</p>	
UNIT-4	<i>Module-4</i>	<p>Instrumentation</p> <p>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)</p> <p>Inspection: Necessity of inspection, their advantages. Types of inspection: remedial, preventive and operative inspection, incoming inspection, in-process and final inspection</p>	6

UNIT-5	<i>Module-5</i>	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:	<ol style="list-style-type: none"> 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
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	<p>Protractor,</p> <p>4. Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats</p> <p>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</p>
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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:

Hydraulic Machine

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

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
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Introduction and Pressure Measurement 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: piezometer tube, manometers - simple U-tube, differential single column, inverted U-tube, micro manometer. Bourdon pressure gauge. Simple problems.	8

UNIT-2	<i>Module-2</i>	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	<i>Module-3</i>	Flow through Orifices and Pipes C_c , C_v , C_d , flow through drowned, partially drowned orifices, time for emptying a tank through a circular	10

		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	<i>Module-4</i>	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.	8
UNIT-5	<i>Module-5</i>	Centrifugal pumps: Classification of centrifugal pumps, vector diagrams, velocity triangle, power and efficiency calculations	6
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 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. <p>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</p>
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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:

**Fundamental of I.C Engines and
Automobile**

MM: 100	Sessional: 30
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Time: 3 Hr. L T P 3 0 0	ESE: 70 Credit : 3
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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
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	Hypothetical & Actual Indicator Diagram of Two- Stroke and FourStroke (Petrol and Diesel) Engines.//	8
UNIT-2	<i>Module-2</i>	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	<i>Module-3</i>	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	<i>Module-4</i>	Pollutants in Exhaust Gases of Petrol and Diesel Engines, their effects on environment and possible ways of reducing the Pollutants in the Exhaust Gases.	8
UNIT-5	<i>Module-5</i>	Compressors: Classification, reciprocating compressors, single & multistage, intercooling	8
Total No. of Hours			40

Learning Outcomes:	<p>5. To understand the basic measurement units and able to calibrate various measuring devices.</p> <p>6. To express error and correction factors of various measuring devices.</p> <p>7. To use measuring tools such as Sine Bar, Sine Center, Bevel</p>
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	<p>Protractor,</p> <p>8. Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats</p> <p>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</p>
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

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
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UNIT	Module	Course Content	No. of Hours
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UNIT-1	<i>Module-1</i>	<p>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.</p> <p>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.</p>	8
UNIT-2	<i>Module-2</i>	<p>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</p>	8

		subjected to concentrated and UDL. Point of contra flexure. Numerical problems.	
UNIT-3	<i>Module-3</i>	Bending Stress Concept of bending stresses, Theory of simple bending, assumptions made in bending theory, Use of equation $\sigma/y = M/I = E/R$, 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	<i>Module-4</i>	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	<i>Module-5</i>	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:	<ol style="list-style-type: none"> 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 and 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 9. 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
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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
<i>Experiment-1</i>	Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up.	2
<i>Experiment-2</i>	Test and calibration of a thermocouple.	2
<i>Experiment-3</i>	Measurement with height gauge and depth gauge.	2
<i>Experiment-4</i>	Measurement of flatness with dial indicator.	2
<i>Experiment-5</i>	Measurement with combination set and bevel protector.	2
<i>Experiment-6</i>	Study and use of slip gauges.	2
<i>Experiment-7</i>	Measurement of angle with sine bar.	2
<i>Experiment-8</i>	Measurement of surface roughness of a surface.	2
Total number of hours	16	

Course Code: DME-C452

Course Name: Hydraulic 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
<i>Experiment-1</i>	1. Measurement of pressure head by employing i) Piezometer tube ii) Single and double column manometer iii) Pressure gauge	2
<i>Experiment-2</i>	To find out the value of coefficient of discharge for a venturimeter	2
<i>Experiment-3</i>	Measurement of flow by using venturimeter	2
<i>Experiment-4</i>	Verification of Bernoulli's theorem	2
<i>Experiment-5</i>	To determine the coefficient of friction of pipe using Darcy's equation	2
<i>Experiment-6</i>	Study the working of a pelton wheel and Francis turbine	2
<i>Experiment-7</i>	Dismantling and assembly of a single stage centrifugal pump to study its constructional details, operation including fault diagnosis.	2
<i>Experiment-8</i>	Study of characteristics curve for centrifugal pump and plot its curves	2
Total number of hours		16

Course Code: DME-C453 Course Name:

Fundamental of I.C.Engines and

AutomobileLab

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

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Understand working principle and construction of four-stroke Petrol and Diesel Engine.	2
<i>Experiment-2</i>	Understand working principle and construction of two-stroke Petrol and Diesel Engine.	2
<i>Experiment-3</i>	Conduct trial on I.C. Engine Test Rig to find out the Heat Balance in an I.C. Engine.	2
<i>Experiment-4</i>	Study of valve timing diagram of four-stroke Petrol and Diesel Engine.	2
<i>Experiment-5</i>	Determination of I.P., B.P., Mechanical Efficiency and Thermal Efficiency of an I.C. Engine through suitable method.	2
<i>Experiment-6</i>	Conduct Morse Test on Multi-cylinder Diesel / Petrol Engine.	2
<i>Experiment-7</i>	Study of Cooling System generally installed in four-stroke (single / multi-cylinder) I.C. Engine.	2
<i>Experiment-8</i>	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
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	<i>Given a PC, name its various components and list their functions</i> <i>Identification of various parts of a computer and peripherals</i>	2
<i>Experiment-2</i>	Practice in installing a computer system by giving connection DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP	2
<i>Experiment-3</i>	Exercises on entering text and data (Typing Practice using any tutor)	
<i>Experiment-4</i>	Features of Windows as an operating system <ul style="list-style-type: none">- 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	<p>MS-Word</p> <ul style="list-style-type: none"> - 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
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	<p>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</p> <ul style="list-style-type: none"> - 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 	
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<i>Experiment-6</i>	<p>MS-Excel</p> <ul style="list-style-type: none"> - 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
<i>Experiment-7</i>	<p>1. MS PowerPoint</p> <p>a) Introduction to PowerPoint How to start PowerPoint</p> <p>Working environment: concept of toolbars, slide layout, templates etc. Opening a new/existing presentation</p> <p>Different views for viewing slides in a presentation: normal, slide- sorter etc.</p> <p>b) Addition, deletion and saving of slides</p> <p>c) How to view the slide show?</p> <p>Viewing the presentation using slide navigator</p> <p>Slide transition Animation effects etc.</p>	2
<i>Experiment-8</i>	<p>2. Internet and its Applications</p> <p>a) Log-in to internet</p> <p>b) Navigation for information seeking on internet</p>	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	
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Total number of hours	16
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
3 0 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	08

UNIT-2	<i>Module-2</i>	<p>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</p> <p>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</p>	08
UNIT-3	<i>Module-3</i>	<p>Power Transmission Devices (Belt, Rope and Chain Drive): Introduction, Belt, Rope and Chain drives</p> <p>,Material for Belt, and Rope, Open and crossed belt drives, action of belton pulleys, velocity ratio, Slip and Creep in belts ,Length of belt in case of open and</p>	08

		cross belt, Ratio of tensions in case of flat and Vbelt, 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	<i>Module-4</i>	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	08
UNIT-5	<i>Module-5</i>	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	08
Total No. of Hours			40

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

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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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.	08
UNIT-2	<i>Module-2</i>	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.	08

UNIT-3	<i>Module-3</i>	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.	08
UNIT-4	<i>Module-4</i>	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.	10

		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	<i>Module-5</i>	Robot Technology Introduction to robot technology, basic robot motion, robot applications.	06
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 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 <p>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</p>
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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	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	Objective <i>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.</i>
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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.	08

UNIT-2	<i>Module-2</i>	<p>Fitting and Plumbing Shop-II</p> <p>Description and demonstration of various types of drills, taps and dies Selection of dies for tapping. Types of taps, tapping, dieing and drilling operations.</p> <p>Job I Making internal and external threads on a job by tapping and dieing operations</p>	08
		<p>(manually) Precautions while drilling soft metals, specially aluminum and lead.</p> <p>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.</p> <p>Job III Preparation of a job by filing on non-ferrous metal.</p> <p>Job IV Production of a utility job involving all the above operations.</p> <p>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</p> <p>Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.</p>	
UNIT-3	<i>Module-3</i>	<p>Welding Shop-II</p> <p>Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment.</p> <p>Job I Practice in handling gas welding equipment and welding practice. Common welding joints generally made by gas welding.</p> <p>Job II Preparation Butt joint by gas welding.</p> <p>Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding.</p> <p>Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves).</p> <p>Job V Exercise job on spot/seam welding machine. Demonstration of various methods adopted for painting steel items.</p> <p>Job VI Painting steel items by brush/roller/spray</p>	08

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 tray 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	08	
	Module-5	Importance of three phase wiring and its effectiveness Job III Explain three phase wiring and its effectiveness Job VII Marking and drilling practice on mild steel piece Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine. Job VII Marking and drilling practice on aluminium piece Job IX Demonstration of various functions of CNC Machine		
UNIT-5	Module-5	Job II Connecting single phase energy meter and testing it of Reading and working out the power consumption and the cost of energy Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine. Job VII Marking and drilling practice on aluminium piece 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 Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy 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.	08	
		Total No. of Hours		40

Learning Outcome s:	<ul style="list-style-type: none"> 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 orthogonal metal cutting. 5) To explain principle and applications of advanced machining to develop part program for turning, design jig and fixture for given component
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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
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Time: 3 Hr. L T P 2 1 0	ESE: 70 Credit : 3
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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
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	8
UNIT-2	<i>Module-2</i>	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	8

UNIT-3	<i>Module-3</i>	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	8
UNIT-4	<i>Module-4</i>	Inventory Control: Inventory, function, cost, deterministic models. Introduction to MRP, supply chain Management.	8
UNIT-5	<i>Module-5</i>	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 &	8
		follow-up, Effectiveness of PPC, Introduction of JIT.	
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 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..
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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	Sessional: 15	
Time: 2 Hr.	ESE: 35	
L T P	Credit : 1	
0 0 2		
Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Study of simple links/models/mechanisms.	2
<i>Experiment-2</i>	Study of various commonly used mechanisms and its inversions in machines	2
<i>Experiment-3</i>	Study of various types of models of cam and follower arrangements.	2
<i>Experiment-4</i>	Study of various models of gear trains arrangements	2
<i>Experiment-5</i>	Experiment on cam and follower apparatus	2
<i>Experiment-6</i>	Experiment on Journal bearing apparatus	2
<i>Experiment-7</i>	Experiment on Engine Brakes	2
<i>Experiment-8</i>	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
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Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	1. Study the constructional details of CNC lathe.	2
<i>Experiment-2</i>	Study the constructional details of CNC milling machine.	2
<i>Experiment-3</i>	Study the constructional details and working. - Automatic tool changer and tool setter - Multiple pallets - Swarf removal system - Safety devices	2
<i>Experiment-4</i>	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
<i>Experiment-5</i>	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
<i>Experiment-6</i>	Preparation of work instruction for machine operator.	2
<i>Experiment-7</i>	Preparation of preventive maintenance schedule for CNC machine.	2
<i>Experiment-8</i>	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	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

Experiment	Course Content	No. of Hours
<i>Experiment-1</i>	Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter..	2
<i>Experiment-2</i>	Gear manufacturing by some indexing device on a milling machine & gear hobber. Inspection of gear	2
<i>Experiment-3</i>	Job on grinding using <ul style="list-style-type: none">a. Surface grindingb. Cylindrical grindingc. Centreless grinding	2
<i>Experiment-4</i>	Milling cutter grinding on tool and cutter grinder.	2
<i>Experiment-5</i>	Preparation of job through eccentric turning.	2
<i>Experiment-6</i>	Practice of taper turning.	2
<i>Experiment-7</i>	Exercise on EDM for preparation of electrodes(male and female).	2
<i>Experiment-8</i>	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	Sessional: 30
Time: 2 Hr.	ESE: 70
L T P	Credit : 1
0 0 2	

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>The object of this training is to:</p> <ol style="list-style-type: none"> 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.
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Course Content	No. of Hours
<p>For effective planning and implementation of this practical training, it is proposed to:</p> <p>i) Identify adequate number of industrial/field organizations where students will be sent for practical training.</p> <p>ii) Prepare a workbook, which can be used by students for guiding students to perform definite task during the practical training.</p> <p>iii) Identification of teachers who would supervise the students and provide guidance during practical training.</p> <p>The components of evaluation will include the following:</p> <ul style="list-style-type: none"> - 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
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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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	<ul style="list-style-type: none">○ Introduction and Review of Computer Programming: Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity.	08
UNIT-2	<i>Module-2</i>	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.	08
UNIT-3	<i>Module-3</i>	Geometric Transformations - Word/device co- ordinate representations, 2D and 3D geometric transformations, Matrix representation-translation.	08
UNIT-4	<i>Module-4</i>	Plane Curves: Curve representation, Interpolations Vs approximation, Parametric Continuity conditions, Spline Curves- Hermit spline, Bezier spline and B- spline Curves and its Properties.)	08

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.	08
Total No. of Hours			40

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
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Suggested books:

S. No.	Name of Authors /Books /Publisher
1.	Davis, M. J., “ <i>Computer Graphics</i> ”, 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.“ <i>Computer graphics techniques theory and practice</i> ”, 1990 Ed. Springer-Verlag, ISBN- 978-0387972374

Course Code:DME-C602

Course Name: Refrigeration and Air Conditioning

MM: 100	Sessional: 30
Time: 3 Hr.	ESE: 70
L T P	Credit : 3
2 1 0	
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.
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	<p>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.</p> <p>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.</p>	08
UNIT-3	<i>Module-3</i>	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	<i>Module-4</i>	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	<i>Module-5</i>	<p>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.</p> <p>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.</p>	08
Total No. of Hours			40

Learning Outcomes:	<ol style="list-style-type: none"> 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 analyze the refrigeration and air conditioning systems <p>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</p>
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Suggested books:

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.

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

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective</p> <p>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.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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.	08

UNIT-2	<i>Module-2</i>	<p>Plant Location Layout and Handling</p> <p>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.</p> <p>Material Handling: Principles of economic material handling. Hoisting equipment – Fork lift truck, cranes</p> <ul style="list-style-type: none"> – mobile motor cranes, overhead cranes, traveling bridges crane, derrick crane. <p>Conveying Equipment – Package conveyor, gravity roller conveyors, screw conveyors, flight or scraper conveyors, bucket conveyors, bucket elevators, belt conveyors, and pneumatic conveyors.</p>	08
UNIT-3	<i>Module-3</i>	<p>Work Study</p> <p>Definition, advantages and procedure of Work study.</p>	08

		<p>Difference between production and Productivity, measures to improve productivity.</p> <p>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.</p> <p>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</p>	
UNIT-4	<i>Module-4</i>	<p>Inventory Management</p> <p>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.</p>	08
UNIT-5	<i>Module-5</i>	<p>Estimation and Costing</p> <p>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</p>	08

	and fabrication. Numerical problems. Profit and loss estimation	
Total No. of Hours		40

Learning Outcomes:	<ol style="list-style-type: none"> 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 <p>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</p>
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Course Code:DME-C604

Course Name: Maintenance Management

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

Prerequisites:	
Objectives:	
Course Coordinator	

NOTE:	<p>Objective: • To ensure that equipment and infrastructure are always in good condition.</p> <p>To carry out prompt emergency repair of equipment and infrastructure so as to secure the best possible availability for production.</p> <p>To ensure the operation of equipment for production and for the distribution of energy and fluids.</p>
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UNIT	Module	Course Content	No. of Hours
UNIT-1	<i>Module-1</i>	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	<i>Module-2</i>	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	<i>Module-3</i>	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	8
UNIT-4	<i>Module-4</i>	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
UNIT-5	<i>MODULE-5</i>	Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning Material planning, spare parts planning and control, evaluation of maintenance management	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
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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: 15 ESE: 35 Credit : 1	
Experiment	Course Content	No. of Hours
Experiment-1	1. Detail and assembly drawing of the following using AUTOCAD (2D) (4 sheets) <ul style="list-style-type: none">○ Plummer Block○ Wall Bracket○ Stepped pulley, V-belt pulley○ Flanged coupling○ Machine tool Holder (Three views)○ 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	Sessional: 15
Time: 2 Hr.	ESE: 35
L T P	Credit : 1
0 0 2	

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

Course Code: DME-C653

Course Name: Major Project Work

MM: 200	Sessional: 20
Time: 2 Hr.	ESE: 80
L T P	Credit : 2
0 0 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.
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Module	Course Content	No. of Hours
	<p>PROJECT WORK</p> <p>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.</p>	

	<p>Each teacher is expected to guide the project work of 5-6 students.</p> <ul style="list-style-type: none"> - 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 <p>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.</p>	
Total number of hours		30

Learning Outcomes:	<ol style="list-style-type: none">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.
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