# SCHEME OF EXAMINATION
# AND
# COURSE OF STUDY


## THREE-YEAR DIPLOMA
## IN
## MECHANICAL ENGINEERING
## (w.e.f. 2023-2024)

***Department of Mechanical Engineering***

## FACULTY OF ENGINEERING & TECHNOLOGY
## GURUKULA KANGRI (DEEMED TO BE) UNIVERSITY, HARIDWAR

**Annexure-I**

# Syllabus

## Diploma ME.I Year

(Semester – I)

| S.NO. | COURSE CODE | COURSE OPTED | SUBJECT | Period per week | | | EVALUATION SCHEME | | | | Credit | Subject TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SESSIONAL EXAM. | | | EXAM. ESE | | |
| | | | | L | T | P | CT | TA | TOTAL | | | |
| **THEORY SUBJECTS** | | | | | | | | | | | | |
| 1 | DEM-C101 | BSC | Mathematics –I | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 2 | DAP-C101 | BSC | Physics –I | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 3 | DAC-C101 | BSC | Chemistry | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 4 | DEG-A101 | HSMC | Communication Skill in English | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| PRACTICAL / TRAINING / PROJECT | | | | | | | | | | | | |
| 5 | DAP-C151 | BSC | Physics -I Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 6 | DAC-C151 | BSC | Chemistry Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 7 | DSP-S151 | BSP | Physical Training and Yoga | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 8 | DEG-A151 | HSMC | Communication Skill in English Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| | | | TOTAL | 8 | 4 | 8 | 160 | 80 | 240 | 560 | 16 | 800 |

**Syllabus**

**Diploma ME. I Year**

**(**Semester – II)

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

**Syllabus**

# Diploma ME. II Year

(Semester – III)

| S.NO. | COURSE CODE | COURSE OPTED | SUBJECT | Period per week | | | EVALUATION SCHEME | | | | Credit | Subject TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SESSIONAL EXAM. | | | EXAM. ESE | | |
| | | | | L | T | P | CT | TA | TOTAL | | | |
| **THEORY SUBJECTS** | | | | | | | | | | | | |
| 1 | DME-C301 | ESC | Applied Mechanics | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 2 | DME-C302 | ESC | Material Science | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 3 | DME-C303 | ESC | Workshop Technology | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 4 | DME-C304 | ESC | Thermodynamics | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 5 | DME-C305 | ESC | Metrology, Instrumentation & Control | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| PRACTICAL / TRAINING / PROJECT | | | | | | | | | | | | |
| 6 | DME-C352 | ESC | Material Science Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 7 | DME-C354 | ESC | Thermodynamics Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 8 | DME-C355 | ESC | Metrology, Instrumentation & Control | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 9 | DME-C353 | ESC | Workshop Technology Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| | | | TOTAL | 10 | 5 | 8 | 180 | 90 | 270 | 630 | 19 | 900 |

## Syllabus Diploma

## ME. II Year

(Semester – IV)

| S.NO. | COURSE CODE | COURSE OPTED | SUBJECT | Period per week | | | EVALUATION SCHEME | | | | Credit | Subject TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SESSIONAL EXAM. | | | EXAM. ESE | | |
| | | | | L | T | P | CT | TA | TOTAL | | | |
| **THEORY SUBJECTS** | | | | | | | | | | | | |
| 1 | DME-C401 | ESC | Strength of Materials | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 2 | DME-C402 | ESC | Hydraulics and Hydraulic Machines | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 3 | DME-C403 | ESC | Production Technology | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 4 | DME-C404 | ESC | Automobile Engineering | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 5 | DME-C405 | ESC | Applied Thermodynamics | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| PRACTICAL / TRAINING / PROJECT | | | | | | | | | | | | |
| 6 | DME-C455 | ESC | Applied Thermal Engineering Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 7 | DME-C452 | ESC | Hydraulics and Hydraulic Machines Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 8 | DME-C454 | ESC | Automobile Engineering Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 9 | DME-C456 | ESC | Industrial Training | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| | | | TOTAL | 8 | 4 | 8 | 180 | 90 | 270 | 630 | 19 | 900 |

## Syllabus

## Diploma ME. III Year

**(**Semester – V)

| S.NO. | COURSE CODE | COURSE OPTED | SUBJECT | Period per week | | | EVALUATION SCHEME | | | | Credit | Subject TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SESSIONAL EXAM. | | | EXAM. ESE | | |
| | | | | L | T | P | CT | TA | TOTAL | | | |
| **THEORY SUBJECTS** | | | | | | | | | | | | |
| 1 | DME-C501 | ESC | Dynamics of Machine | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 2 | DME-C502 | ESC | Machine Design | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 3 | DME-C503 | ESC | Production Management | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 4 | DME-C504 | ESC | CNC Machines and Automation | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 5 | DME-C505 | ESC | Maintenance Engineering | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| PRACTICAL / TRAINING / PROJECT | | | | | | | | | | | | |
| 6 | DME-C551 | ESC | Dynamics of Machine Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 7 | DME-C551 | ESC | Machine Design lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 8 | DME-C554 | ESC | CNC Machine and Automation Lab | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 9 | DME-C556 | ESC | Minor Project – | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| | | | TOTAL | 10 | 5 | 8 | 180 | 90 | 270 | 630 | 19 | 900 |

## Syllabus

## Diploma ME. III Year

**(**Semester – VI)

| S.NO. | COURSE CODE | COURSE OPTED | SUBJECT | Period per week | | | EVALUATION SCHEME | | | | Credit | Subject TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SESSIONAL EXAM. | | | EXAM. ESE | | |
| | | | | L | T | P | CT | TA | TOTAL | | | |
| **THEORY SUBJECTS** | | | | | | | | | | | | |
| 1 | DME-C601 | ESC | Entrepreneurship Development and Management | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 2 | DME-C602 | ESC | Computer Application in Machine Design | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 3 | DME-C603 | ESC | Non-Conventional Energy Resources | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| 4 | DME-C604 | ESC | Power Plant Engineering | 2 | 1 | 0 | 20 | 10 | 30 | 70 | 3 | 100 |
| PRACTICAL / TRAINING / PROJECT | | | | | | | | | | | | |
| 5 | DME-C652 | ESC | Computer Application in Machine Design | 0 | 0 | 2 | 20 | 10 | 30 | 70 | 1 | 100 |
| 6 | DME-C670 | ESC | Major Project | 0 | 0 | 16 | 0 | 100 | 100 | 300 | 6 | 400 |
| | | | TOTAL | 8 | 4 | 18 | 100 | 150 | 250 | 650 | 19 | 900 |

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

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

**Suggested books:**

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

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

- 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 $\lim_{x \to a} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin nx}{x}$, $\lim_{x \to a} \frac{a^x - 1}{x}$, $\lim_{x \to \infty}(1 + x)^{\frac{1}{x}}$, Differentiation by definition of $x^n$, **sinx**, **cosx**, **tanx**, $e^x$, $\log_a x$. 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**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

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

**Suggested books:**

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

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

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

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

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

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

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

**Suggested books:**

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

**Course Outcomes:** After completing this course the students shall understand the 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**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

**Suggested books:**

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

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


**Course Outcomes:** After completing this course the students shall understand the 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**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

## Course Code: DAC- C 151
## Course Name: Applied Chemistry Laboratory

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

## Course Code: DSP- S 151
## Course Name: Physical Training & Yoga

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

| | | |
|---|---|---|
| *Experiment-6* | Yoga<br>• Meaning & Importance of Yoga<br>• Elements of Yoga<br>• Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas<br>• Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana& Sha- shankasana)<br>• Relaxation Techniques for improving concentration - Yog-nidra | **2** |
| *Experiment-7* | Yoga & Lifestyle<br>• Asanas as preventive measures.<br>• Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana,Bhujangasana, Sharasana.<br>• Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana,Trikonasana, Ardh Matsyendrasana.<br>• Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.<br>• Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana,<br>• Pavan Muktasana, Ardh Matsyendrasana.<br>• Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana. | **2** |
| *Experiment-8* | Training and Planning in Sports<br>• Meaning of Training<br>• Warming up and limbering down<br>• Skill, Technique & Style<br>• Meaning and Objectives of Planning.<br>• 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**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

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

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

**Suggested books:**

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

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

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

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

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Measurement and Errors**<br>Definition of Physics ,Fundamental forces in nature Physical quantities<br>Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units) Dimensions of physical quantities.<br>Error in measurement; types of errors, random and systematic errors, propagation of errors, significant figures. | **6** |
| UNIT-2 | *Module-2* | **Force and Motion**<br>Force: Newton's laws of motion, Types of inertia and its examples.<br>Linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.<br>Lever and its uses<br>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.<br>Circular motion: Angular displacement, angular velocity and angular acceleration Relation between linear and angular velocity,linear and angular acceleration Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists Application of various forces in lifts | **5** |
| UNIT-3 | *Module-3* | **Rotational Motion**<br>Concept of translatory and rotating motion with examples Definitions of torque, angular momentum and their relationship Conservation of angular momentum (qualitative) and its examples<br>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).<br>Application of rotational motion in transport vehicles, trains and aeroplane turbine/engine. | **6** |

| | | | |
|---|---|---|---|
| UNIT-4 | *Module-4* | **Work, Power and Energy**<br>Work: definition and its SI units<br>Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application<br>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<br>Work -Energy Theorem<br>Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application | **5** |
| UNIT-5 | *Module-5* | **Properties of Matter**<br>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<br>Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure. Pascal's law (concept only). Bernoulli's Theorem (concept and examples only).<br>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<br>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**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

**Suggested books:**

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

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

## Course Code: DEE-C 201

## Course Name: Fundamentals of Electrical and Electronics Engineering

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

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

**Suggested books:**

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

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

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

## Course Code: DEN-A 201

## Course Name: ENVIRONMENT SCIENCE

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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

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

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099- |
| 2. | Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940. |
| 3. | O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House,New Delhi |
| 4. | Rao, C. S., Environmental Pollution Control and Engineering, New Age InternationalPublication, 2007, ISBN: 81-224-1835-X. |
| 5. | Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi,1988, ISBN: 0-07- 451871-8. |
| 6. | Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, NewYork ; 1978, ISBN: 9780070354760. |
| 7. | Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, AcademicPress Oxford, UK; 2013. ISBN: 9780123978257. |

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

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

**Course Code: DCE-C 251**

## Course Name: IT Systems Laboratory

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Browser features, browsing, using various search engines, writingsearch queries | **2** |
| *Experiment-2* | Visit various e-governance/Digital India portals, understand their features, services of- fered | **2** |
| *Experiment-3* | Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc. | **2** |
| *Experiment-4* | Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times | **2** |
| *Experiment-5* | Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software. | **2** |
| *Experiment-6* | Practice HTML commands, try them with various values, make your own Webpage | **2** |
| *Experiment-7* | Explore features of Open Office tools, create documents using thesefeatures, do it multi- ple times | **2** |
| *Experiment-8* | Explore security features of Operating Systems and Tools, try usingthem and see what happens. | **2** |
| **Total number of hours** | | **16** |

## Course Code: DEE- C 251

## Course Name: Electrical & Electronics Engineering Laboratory

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

## Course Code: DME-C 251

## Course Name: Workshop Practices

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

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

## Course Name: Engineering Graphics Laboratory

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

| | | |
|---|---|---|
| | should select branch specific elements for free hand sketching), Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper) | |
| *Experiment-5* | **Computer aided drafting interface:** Computer Aided Drafting: concept, Hardware and various CAD software available. System requirements and Understanding the interface.<br>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.<br>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.<br>Computer aided drafting: Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline.<br>Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.<br>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.<br>Selecting Various plottingparameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plotarea, print preview. | **2** |
| **Total number of hours** | | **10** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Bureau of Indian Standards. Engineering Drawing Practice for Schools and CollegesIS: Sp-46. BIS. Government of India, Third Reprint. |
| 2. | Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat. |
| 3. | Dhawan, R. K. Engineering Drawing. S. Chand and Company, New Delhi. |
| 4. | Shah, P. J. Engineering Drawing. S. Chand and Company, New Delhi. |
| 5. | Autodesk. AutoCAD User Guide. Autodesk Press, USA |

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

- 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**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

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

**Course Code: DME-C301**
**Course Name: APPLIED MECHANICS**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:** Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of applied Mechanics. Definition, basic quantities and derived quantities of basic units and derived units Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another density, force, pressure, work, power, velocity, acceleration, Concept of rigid body, scalar and vector quantities. | **6** |
| UNIT-2 | *Module-2* | **Laws of forces** : 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 of a force, Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position, Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces -graphically, analytically, resolution of forces, resolving a force into two rectangular components, Free body diagram, Equilibrant force and its determination, Lami's theorem (concept only) | **6** |
| UNIT-3 | *Module-3* | **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 parallel force), calculating their resultant, Concept of couple, its properties and effects, General conditions of equilibrium of bodies under coplanar forces and beams, fixed support, roller, support, over hanging, Uniformly distributed load, point load, varying load, Position of resultant force by moment, [Simple problems on the above topics | **6** |
| UNIT-4 | *Module-4* | **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** |
| | *Module-5* | **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 [Simple problems on the above topics] | **6** |

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|---|---|---|---|
| UNIT-5 | *Module-6* | **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). Second moment of area for L, T and I sections, section modulus. | **5** |
| | *Module-7* | **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. | **5** |
| **Total No. of Hours** | | | **40** |

## Course Name: MATERIAL SCIENCE & METALLURGY

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Importance of Materials:** Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys. Crystalline and non-crystalline structures; unit cells, Bravais space lattices, cubic closed pack structures, coordination number, miller indices, crystallographic planes and directions. Structural imperfections- point, line, planar and volume defects, structure property relationship. Names of common metals, their alloys and non-metals used in Industry, Properties of metals and alloys, Physical properties - Appearance, luster, colour, density and melting point, Thermal and electrical conductivity, Corrosion, causes, effects and prevention. Study of creep and fatigue. | **7** |
| UNIT-2 | *Module-2* | **Ferrous Metals and Alloys**: Flow diagram for the production of ferrous metals from their ores, constituents of iron, iron carbon diagram. Classification, composition and uses of cast iron and plain carbon steels. IS, BS and SAE Grades, Effect of alloying elements such as Aluminum, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorous on steels. Composition, properties, and uses of special steels such as High speed steel, Stainless steels, Silicon steels, Heat resistant steels, Spring steel. Heat Treatment: Iron-carbon diagram, Objectives of heat treatment. Brief description and uses with examples of principal heat treatment processes, Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding and applications, case hardening | **8** |
| UNIT-3 | *Module-3* | **Iron Carbon Equilibrium Diagram:** Phase transformation, Nucleation and growth | **5** |
| | *Module-4* | **T-T-T Diagram:** Importance of critical cooling rate. Marten site transformation, Nucleation and growth | **5** |
| UNIT-4 | *Module-5* | **Non-ferrous Metals and Alloys:** Copper: Properties and uses, Composition, properties and uses of copper alloys. Brasses: Cartridge brass, Nickel silver, Bronzes, Phosphor bronze, Al-bronze, Mn-bronze, and Gun etal.Properties and uses of Aluminium. Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnalium and Hindalium, Properties and uses of alloys of lead, tin and magnesium. Bearing Metals: Requisite qualities. Composition, properties and uses of white metal bearing, copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bi-metallic and trimetallic bushes. | **8** |

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|---|---|---|---|
| UNIT-5 | *Module-6* | **Other Important Materials:** Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics and their uses and grades.<br>Composite materials.Heat insulating materials: Properties and uses of asbestos, glass wool, thermo Cole, cork, mica. Electrical insulating materials. Properties and uses of china clay, leather, bakelite, ebonite, glass wool, rubber, felt.Sound insulating materials: Cork, fibre boards.Fabrication materials: Wood, plywood, rubber – natural and synthetic, Glass – plate glass, toughened glass, safety glass. Refractory materials: | **7** |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C352**
**Course Name: MATERIAL SCIENCE & METALLURGY LAB**

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Classification of about 25 specimen of materials/parts into<br>• Metals and Non Metals<br>• Metals and Alloys<br>• Ferrous and nonferrous metals<br>• Ferrous and nonferrous alloys | **2** |
| *Experiment-2* | Given a set of specimen of metals and alloys (copper, brass, aluminum, cast iron, HSS, Gun metal), identify and indicate the various properties possessed by them | **2** |
| *Experiment-3* | Study of heat treatment furnace | **2** |
| *Experiment-4* | Study of metallurgical microscope and a specimen polishing machine. | **2** |
| *Experiment-5* | To anneal a given specimen and find out difference in hardness as a result of annealing | **2** |
| *Experiment-6* | To normalize a given specimen and to find difference in hardness as a result of normalizing | **2** |
| **Total number of hours** | | **12** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Material Science by R.K.Rajput; Laxmi Publications, Darya Ganj, New Delhi. |
| 2. | Advances in material Science by R.K.Dogra and Dr.A.K.Sharma;S.K.kataria & sons; New Delhi. |
| 3. | Material Science by GBS Narang; Khanna Publishers New Delhi |
| 4. | Material Science and Metallurgy by D.S. Nutt. SK Kataria and Sons, Delhi. |
| 5. | Material Science and Engineering by Dr. P.L Shah |

**Course Code: DME-C303**
**Course Name: WORKSHOP TECHNOLOGY**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | Principle of welding, Classification of welding processes, Advantages and limitations, Industrial applications of welding, Welding positions and techniques, symbols. Gas Welding , Principle of gas welding, Types of gas welding flames and their applications, Gas welding equipment's, Gas welding torch, Oxy acetylene cutting torch, Blow pipe, Pressure regulators, Filler rods and fluxes. | **7** |
| UNIT-2 | *Module-2* | Arc Welding, Principle of operation, Arc welding machines and equipment, A.C. and D.C. arc welding, Effect of polarity, current regulation and voltage regulation, Electrodes, Flux for arc welding. Other Welding processes, Resistance welding: Principle, advantages, limitations, working and applications of spot welding, seam welding, projection welding and percussion welding. Shielded metal arc welding, submerged arc welding, welding defects, methods of controlling welding defects and inspection of welded joints. | **8** |
| UNIT-4 | *Module-4* | Pattern Making, Types of pattern, Pattern material, Pattern allowances, Pattern codes as per, B.I.S. Introduction to cores, core boxes and core materials, Core making procedure, Core prints, positioning of cores. Moulding Sand, Properties of moulding sand, permeability, refractoriness, adhesiveness, cohesiveness, strength, flow ability, collapsibility etc. Various types of moulding sand and testing of moulding sand. Mould Making, Types of moulds, Moulding boxes, hand tools used for mould making, Moulding processes: Bench moulding, floor moulding, pit moulding and machine moulding. | **8** |
| UNIT-5 | *Module-5* | Casting Processes Principle, working and applications of Die casting: hot chamber and cold chamber, Investment and lost wax process, Centrifugal casting, Continuous casting process. Gating and Risering system , Elements of gating system, Pouring basin, sprue, runner, gates Types of risers, location of riser, Casting Defects, Different types of casting defects and their reasons, | **8** |
| | *Module-6* | Melting Furnaces Construction and working of: Pit furnace, Cupola furnace, Crucible furnace –tilting type. | **5** |

| **Total No. of Hours** | **40** |
|---|---|

**Course Code: DME-C353**
**Course Name: WORKSHOP TECHNOLOGY LAB**

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| **Experiment** | **Course Content** | **No. of Hours** |
|---|---|---|
| *Experiment-1* | Preliminary joining practice by gas welding. | **2** |
| *Experiment-2* | Exercises of gas welding on the following Aluminum, Brass, Copper, C.I. | **2** |
| *Experiment-3* | Gas cutting of the following types<br>a. Preliminary gas cutting practice<br>b. Stock cutting by oxy acetylene | **2** |
| *Experiment-4* | Making following types of joints by arc welding:<br>a. (a)Preliminary joining practice by arc welding<br>b. Butt and lap joint (in vertical position, travel up and down)<br>c. Welding of outside corner joint | **2** |
| *Experiment-5* | Exercise on spot welding | **2** |
| *Experiment-6* | Exercise on brazing | **2** |
| *Experiment-7* | Exercise on TIG/MIG welding | **2** |
| *Experiment-8* | Testing & Inspection of welding defects visually | **2** |
| *Experiment-9* | Pattern making: Preparation of solid pattern (single piece), Preparation of split pattern | **2** |
| **Total number of hours** | | **18** |

**Suggested books:**

| **S. No.** | **Name of Authors /Books /Publisher** |
|---|---|
| 1. | Workshop Technology by B S Raghuvanshi; Dhanpat Rai and Sons, Delhi. |
| 2. | Manufacturing Technology by M Adithan and AB Gupta, New Age International (P) Ltd. |
| 3. | Elements of Workshop Technology by SK Chaudhry and Hajra; Asia Publishing House. |

| | |
|---|---|
| 4. | Workshop Technology Vol. I, II, III by Chapman; Standard P ublishers Distributors, New Delhi. |

**Course Code: DME-C304**
**Course Name: THERMODYNAMICS**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Fundamental Concepts:** Period Introduction, thermodynamic system, surrounding, boundary, state, 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, concept of work and heat, equality of temperature, Zeroth law of thermodynamics, definition of properties like pressure, volume, temperature, enthalpy, internal energy, Simple numerical problems. | **6** |
| UNIT-2 | *Module-2* | **Laws of Perfect Gases:** Definition of gases, concept of perfect gas, explanation of perfect gas laws – Boyle's law, Charle's law, Avogadro's law, Universal gas constant, Characteristic gas equations (Simple numerical problems) Specific heat at constant pressure, specific heat at constant volume of gas | **5** |
| UNIT-3 | *Module-3* | **Thermodynamic Processes on Gases:** Types of thermodynamic processes – isochoric, isobaric, isothermal, hyperbolic, isentropic, polytrophic and throttling processes, equations representing the processes Derivation of work done in various processes change in internal energy. | **6** |
| | *Module-4* | **Laws of Thermodynamics:** Law 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 polytrophic processes, steady flow energy equation, Application of steady flow energy equation to turbines, pump, boilers, compressors, nozzles, evaporators. Limitations. Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck's statement, Classius statement, equivalence of statements, Perpetual motion Machine of first and second kind, Carnot engine. | **8** |

| | | | |
|---|---|---|---|
| UNIT-4 | *Module-5* | Formation of steam and related terms, thermodynamics properties of steam, steam tables, internal latent heat, internal energy of stream, T- s diagrams, Mollier diagram (H – S Chart), Expansion of steam, Hyperbolic, reversible adiabatic and throttling processes Quality of steam (dryness fraction), measurement of dryness fraction, throttling calorimeter | **5** |
| UNIT-5 | *Module-6* | **Steam Boiler:** Classification of steam Boilers, Working principle of Simple vertical boilers & Babcock and Wilcox boiler, boiler mountings and accessories | **5** |
| | *Module-7* | **Steam turbines:** Function and use of steam turbine, Steam nozzles- types and applications, Steam turbines, impulse, reaction, Throttle governing of steam turbines | **5** |
| **Total No. of Hours** | | | **40** |

**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. | Engineering Thermodynamics by CP Arora, Tata McGraw Hill, Delhi. |
| 4. | A Treatise on Heat Engineering by VP Vasandani and DS Kumar |

## Course Code: DME-C354
## Course Name: THERMODYNAMICS LAB

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Demonstration of steam turbines through models. | **2** |
| *Experiment-2* | To verify first law of thermodynamics by Joule's experiment. | **2** |
| *Experiment-3* | Study of modern high pressure steam boilers (at least one) | **2** |
| *Experiment-4* | Demonstration of boiler Accessories and mountings | **2** |
| *Experiment-5* | Demonstration/ study of a steam impulse turbine | **2** |
| *Experiment-6* | Demonstration/ study of a stream reaction turbine | **2** |
| **Total number of hours** | | **12** |

**Course Code: DME-C305**
**Course Name: METROLOGY, INSTRUMENTATION & CONTROL**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:** Definition of metrology Standard of measurement - Primary, secondary, Tertiary and working standards. Types of errors- Controllable and random errors Precision, accuracy, sensitivity, hysterisis, response time, repeatability, calibration, uncertainty of measurement | **6** |
| UNIT-2 | *Module-2* | **Linear Measurement:** Construction features and use of instruments for non precision linear measurement: steel rule, callipers, surface plate, angle plate, V-block. Construction features and use of instruments for precision measurements : vernier calipers, vernier height and depth gauges, micrometers. Slip gauges, Indian standards of slip gauges, sets of slip gauges, use of slip gauges. Cylinder bore gauges, feeler and wire gauges.Comparators – Characteristics, uses, working principles of different types of comparators: mechanical, electrical, electronics and pneumatic comparator. | **7** |
| UNIT-3 | *Module-3* | **Angular Measurement:** Construction and use of instruments for angular measurements: bevel Protector, sine bar, angle gauges, clinometers. Optical instruments for angular easurement, auto collimator. | **6** |
| | *Module-4* | **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 for measuring surface Roughness | **5** |
| UNIT-4 | *Module-6* | **Limits, Fits and Tolerances:** Definition and terminology of limits, fits and tolerances. Interchangeability Hole basis and shaft basis systems. Type of fits. Standard and Limit gauges. | **8** |
| UNIT-5 | *Module-8* | **Instrumentation:** Brief description about the measurement of displacement, vibration, frequency, pressure, temperature and humidity by electro mechanical transducers, LVDT, Resistance thermometer, | **8** |
| **Total No. of Hours** | | | **40** |

## Course Code: DME-C355
## Course Name: METROLOGY, INSTRUMENTATION & CONTROL LAB

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Metrology, instrumentation & control | **2** |
| *Experiment-2* | Measurement with height gauge and depth gauge. | **2** |
| *Experiment-3* | Measurement of flatness with dial indicator. | **2** |
| *Experiment-4* | Measurement with combination set and bevel protector. | **2** |
| *Experiment-5* | Study and use of slip gauges. | **2** |
| *Experiment-6* | Measurement of angle with sine bar | **2** |
| *Experiment-7* | Determination of temperature by (i) pyrometer (ii) thermocouple. | **2** |
| *Experiment-8* | Measurement of surface roughness of a surface | **2** |
| **Total number of hours** | | **8** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Engineering Metrology by RK Jain; Khanna Publishers, New Delhi. |
| 2. | AText Book of Production Engineering by PC Sharma; S Chand and Company |
| 3. | Metrology Laboratory Manual by M Adithan and R Bahl; NITTTR, Chandigarh. |
| 4. | Engineering Metrology by RK Rajput; SK Kataria and Sons, Ludhiana. |
| 5. | Mechanical Measurements and Control by Kumar D.S ; Metropolitan, N. Delhi |

**Course Code: DME-C401**
**Course Name: STRENGHT OF MATERIAL**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction to Material Property:** Mechanical properties of materials such as elasticity, plasticity, ductility, brittleness, toughness, hardness, fatigue, malleability, stiffness. Elastic bodies, plastic bodies and rigid bodies, deformation. | **4** |
| UNIT-2 | *Module-2* | **Stresses and Strains:** Force, its definition and types, units, different types of loads. Definition of stress and strain, axial loading, different types of stresses and strains, tensile and compressive stress and strain, elastic limit, Hooke's law, stress-strain curve for ductile and brittle material, salient features of stress- strain curve. Young's modulus of elasticity. Factor of safety.<br>Stress and strain due to temperature variations in homogeneous and composite bars. Shear load, shear stress and strain, modulus of rigidity, lateral strain, Poisson's ratio. Volumetric strain, bulk modulus. Relation between modulus of elasticity, modulus of rigidity and bulk modulus (Without Derivation). | **8** |
| | *Module-3* | **Shear Force and Bending Moment:** Types of beams. Concept of shear force and bending moment. Shear force and bending moment diagram for cantilever and simply supported beams subjected to point load and uniformly distributed loads only. Maximum bending moment and point of contra flexure | **6** |
| UNIT-3 | *Module-4* | **Theory of Simple Bending:** Concept of pure bending, neutral axis, moment of resistance, section Modulus, bending equation, bending of simple, beams of uniform strength. Application of flexural formula for solid rectangular and circular section, Channel section, hollow rectangular and circular section. | **6** |
| | *Module-5* | **Strain Energy:** Concept of strain energy, proof resilience and modulus of resilience. Stresses developed due to gradual, sudden and impact load. Strain energy stored due to gradual, sudden and impact load. Strain energy due to bending and torsion. | **5** |
| UNIT-4 | *Module-6* | **Slope and Deflection:** Introduction, determination of slope and deflection by Macaulay's method, moment area of method.<br>Simple cases of slope and deflection in simply supported beam with uniformly distributed load on whole of the length and a point load at the centre. Cantilever beam with uniformly distributed load on whole length and a point load at the end. | **6** |

| | | | |
|---|---|---|---|
| UNIT-5 | *Module-7* | **Thin Cylinder and spheres**Introduction Thin Cylinder Vessel Subjected to internal Pressure, Stresses in a Thin Cylinder Vessel Subjected to internal Pressure, Expression for circumferential stresses, Expression for longitudinal stresses. | **5** |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C402**
**Course Name: HYDRAULICS AND HYDRAULIC MACHINES**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:**Fluid, types of fluid; properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity, specific gravity, viscosity, compressibility | **6** |
| UNIT-2 | *Module-2* | **Pressure and its Measurement:** Concept of Pressure (Atmospheric Pressure, gauge pressure, absolute pressure), Pressure measuring devices: peizometer tube, manometers - simple U-tube, differential single column, inverted U- tube Manometer | **6** |
| | *Module-3* | **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, | **6** |
| UNIT-3 | *Module-4* | **Notches and Weirs:** Different type of notches, Measurment of discharge over rectangular notch. Francis and Brazin's fomula for rectangular weirs, submerged weirs, broad crested weirs. | **4** |
| UNIT-4 | *Module-5* | **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. | **6** |
| | *Module-6* | **Hydraulic Devices:** Description, operation and application of hydraulic machines –hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, | **6** |
| UNIT-5 | *Module-7* | **Water Turbines and Pumps:** Concept of a turbine, types of turbines – impulse and reaction. Construction and working of pelton wheel, Francis turbine and Kaplan turbine. Concept of hydraulic pump. Construction, working and operation of reciprocating pump and centrifugal pump. | **6** |
| **Total No. of Hours** | | | **40** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Fluid Mechanics & Hydraulics Machines by Dr. R.K. Bansal |
| 2. | Fluid Mechanics & Hydraulics Machines by Modi and seth |

## Course Code: DME-C452
## Course Name: HYDRAULICS AND HYDRAULIC MACHINES LAB

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Measurement of pressure head by employing<br>Piezometer tube<br>Single and double column manometer<br>Pressure gauge | **2** |
| *Experiment-2* | To find out the value of coefficient of discharge for a venture meter | **2** |
| *Experiment-3* | Measurement of flow by using venture meter | **2** |
| *Experiment-4* | Verification of Bernoulli's theorem | **2** |
| *Experiment-5* | To determine the coefficient of friction of pipe using Darcy's equation. | **2** |
| *Experiment-6* | Study the working of a Pelton wheel and Francis turbine | **2** |
| *Experiment-7* | Dismantling and assembly of a single stage centrifugal pump to study its constructional details, operation including fault diagnosis | **2** |
| *Experiment-8* | To demonstrate the working of a Kaplan Turbine. | **2** |
| *Experiment-9* | To demonstrate the working of a single acting and double acting Reciprocating pump | **2** |
| *Experiment-10* | To determine Cd, Cv and Cc for a orifice. | **2** |
| **Total number of hours** | | **20** |

## Course Code: DME-C403
## Course Name: PRODUTION TECHNOLOGY

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | Elementry theory of metal cutting, chip formation, continuous chip, continuous chip with BUE, discontinuous chips. Mechanism of chip formation, Geometry of chip formation, forces of chip, Merchant circle diagram. Tool life, Economics of tool life. Cutting Tools and Materials, Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect, Properties of cutting tool material, Study of various cutting tool materials viz. High speed steel, tungsten carbide, cobalt steel, cemented carbides, stellite, ceramics and diamond | **8** |
| UNIT-2 | *Module-2* | Lathe, Principle, Description and function of various parts of a lathe, Classification and specification of various types of lathe, Drives and transmission, Work holding devices, Lathe tools: Parameters/Nomenclature and applications, 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. Speed ratio, preferred numbers of speed selection. Lathe accessories: - Centers, dogs, chucks, collets, face plate, angle plate, mandrel, steady rest, taper turning attachment, tool post grinder. | **8** |
| UNIT-3 | *Module-3* | Drilling, Principle of drilling. Classification of drilling machines and their description. Various operations performed on drilling machine –drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping. Speeds and feed during drilling, machining time. Types of drills and their features, Types of reamers. | **8** |
| | *Module-4* | Boring Principle of boring, Classification of boring machines and their brief description. Specification of boring machines. | **5** |
| UNIT-4 | *Module-5* | Shaping, Planing and Slotting, Working principle of shaper, planer and slotter. Quick return mechanism applied to shaper, slotter and planer machine. Types of tools used and their geometry. Specification of shaper, planer and slotting machine. Speeds and feeds in above processes | **5** |

| | | | |
|---|---|---|---|
| UNIT-5 | *Module-6* | Cutting fluids and Lubricants, Function of cutting fluid, Types of cutting fluids, Difference between cutting fluid and lubricant, Selection of cutting fluids for different materials and operations, Common methods of lubrication of machine tools. | **6** |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C405**
**Course Name: APPLIED THERMAL ENGINEERING**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **IC Engines:** Introduction and classification of IC engine. Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, Diesel cycle and dual cycle, Location and functions of various parts of IC engines and materials used for them, Concept of IC engine terms: bore, stroke, dead centre, crank throw, compression ratio, clearance volume, piston displacement and piston speed, working of carburettor, mixture requirements, carburettor types. | **8** |
| UNIT-2 | *Module-2* | **Cooling and Lubrication:** Function of cooling system in IC engine,Air cooling and water cooling system, use of thermostat, radiator and forced circulation in water cooling (description with line diagram) | **8** |
| UNIT-3 | *Module-3* | **Testing of IC Engines:** Engine power –Indicated and brake power, Efficiency - mechanical, thermal, relative and volumetric<br>Methods of finding indicated and brake power, Morse test. Morse test for petrol engine Heat balance sheet, Concept of pollutants in SI and CI engines, pollution control, norms for two or four wheelers, EURO standards, methods of reducing pollution in IC engines, alternative fuels like CNG, LPG (Simple numerical problems) | **10** |
| UNIT-4 | *Module-4* | **Steam condensers:** Function of a steam condenser, elements of condensing plant Classification-Jet condenser, surface condenser<br>Cooling pond and cooling towers | **6** |
| UNIT-5 | *Module-5* | **Air compressors:** Function of air compressor, type of air compressor - single stage, multi stage reciprocating compressors, inter-cooling of compressors, rotary compressor, Construction and working. | **8** |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C455**

## Course Name: APPLIED THERMAL ENGINEERING LAB

| | |
|---|---|
| **MM: 50**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 15**<br>**ESE: 35**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Study of working principle of two/ four stroke petrol engines | **2** |
| *Experiment-2* | Study of simple/ compound carburettor. | **2** |
| *Experiment-3* | To determine brake horse power by dynamometer. | **2** |
| *Experiment-4* | To determine indicated horse power of a multi cylinder petrol/diesel | **2** |
| *Experiment-5* | Study of condensers. | **2** |
| *Experiment-6* | Study of cooling system of I.C. engines. | **2** |
| *Experiment-7* | Study of Rotary and Reciprocating compressor. | **2** |
| **Total number of hours** | | **14** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Elements of heat engines by Pandey and Shah; Charotar Publishing house |
| 2. | Thermal Engineering by PL.Ballaney; Khanna Publishers, New Delhi. |
| 3. | Engineering Thermodynamics by CPArora; Tata Mc Graw Hill Publishers |
| 4. | Thermal engineering by RK Purohit; Standard publishers Dustributors, NewDelhi. |
| 5 | Refrigeration and air conditioning by CPArora , Tata McGraw Hill , New Delhi. |
| 6 | Refrigeration and air conditioning by R.S Khurmi and J.K Gupta; S Chand andCompany Limited, New Delhi |

**Course Code: DME-C404**

## Course Name: AUTOMOBILE ENGINEERING

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **INTRODUCTION:** Definitions and specifying an automobile, Automobile development and scope, Components of an automobile,Classification of automobiles, Layout of chassis,Types of drives-front wheel, rear wheel, four wheel left hand, right hand Body or super structure. | **4** |
| UNIT-2 | *Module-* | **TRANSMISSION SYSTEM:** Clutch Function Constructional details of single plate and multi plate friction clutch, Centrifugal and semi centrifugal clutch, Hydraulic operation of single plate clutch, Clutch troubles, Gear Box, 4-speed gear box, Gear ratios, Working of sliding mesh, constant mesh and synchromesh 4-speed gear box, Torque converter and overdrive Transfer box, Propeller Shaft and Rear Axle Function, Universal joint, Final drive and differential assembly, Front driving axles Real axle drives and different types of rear axles Wheels and Tyres, Types of wheels- disc wheel, wire wheel and alloy cast wheel, Types of tyres used in Indian vehicles, Toe in, Toe out, camber, caster, kingpin inclination, Tubeless tyres | **8** |
| UNIT-3 | *Module-3* | **STEERING SYSTEM:** Function and principle Ackerman and Davis steering gears, Types of steering gears – worm and ball nut, worm and wheel, worm and roller, rack and pinion type Power steering, Wheel balancing, Wheel alignment | **5** |
| | *Module-4* | **BRAKING SYSTEM:** Constructional details and working of mechanical, hydraulic and vacuum brake, Details of master cylinder, wheel cylinder, Concept of brake drum, brake lining and brake adjustment, Air brake, Emergency and Parking brake, Anti-lock braking system | **4** |
| UNIT-4 | *Module-5* | **SUSPENSION SYSTEM:** Function, Types<br>Working of coil spring, leaf spring, rubber springs, Shock absorber- telescopic type Air suspension, Strut suspension. | **4** |
| | *Module-6* | **BATTERY:** Principles of battery operation<br>Constructional details of lead acid cell battery<br>Specific gravity of electrolyte – effect of temperature on specific gravity, Capacity and efficiency of battery, Battery charging, chemical reactions during charge and discharge, Maintenance of Batteries. | **5** |
| UNIT-5 | *Module-7* | **DYNAMO and ALTERNATOR:** DYNAMO Function and details, Regulator – voltage current and compensated type, Cutout – construction, working and their adjustment ALTERNATOR, Construction and working Charging of battery from alternator. | **5** |
| | *Module-8* | **LIGHTING SYSTEM AND ACCESSORIES**<br>Lighting system, wiring circuit, Headlight, aiming of headlights, Lighting switches, Direction indicators, Windscreen wiper, Horn Speedometer, Heater. | **5** |

| **Total No. of Hours** | **40** |
|---|---|

**Suggested books:**

| **S. No.** | **Name of Authors /Books /Publisher** |
|---|---|
| 1 | Automobile Engineering by P.S. GILL |
| 2 | Automobile Engineering Vol. 1 & 2 by Dr. Kripal Singh; Standard PublishersDistributors |
| 3 | Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi. |
| 4 | Automobile Engineering by K.M. Gupta, Umesh Prakashan, Delhi. |

**Course Code: DME-C454**
**Course Name: AUTOMOBILE ENGINEERING LAB**

| | |
|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | Wheel Balancing | **2** |
| *Experiment-2* | Wheel Alignment | **2** |
| *Experiment-3* | Suspension System Servicing | **2** |
| *Experiment-4* | Retreading and Recapping of Tyres | **2** |
| *Experiment-5* | Automotive Brake Service | **2** |
| *Experiment-6* | A/C System Service | **2** |
| *Experiment-7* | Clutch Troubles and Clutch Service. | **2** |
| *Experiment-8* | Servicing of Fuel Injection Pump. | **2** |
| *Experiment-9* | Study of MPFI System | **2** |
| *Experiment-10* | Study of steering system | **2** |
| **Total number of hours** | | **20** |

**Course Code: DME-C501**
**Course Name: Dynamics of Machine**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | 1. **Basic Concepts:** Definition of statics, dynamics, kinetics, and. kinematics, Rigid body and resistant body., Links, its classification, Kinematics chain and their types, Kinematics pairs and it's classification, Mechanism. Machine, Structure & Inversion, Degree of freedom, Types of joints, Constrained motion, and it's classification , Classification of mechanisms, Four bar chain and it's inversion, Single slider crank chain and its inversions. | **8** |
| UNIT-2 | *Module-2*<br><br>*Module-3*<br><br>*Module-4* | 2. 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<br>3. 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<br><br>4**. 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, | 8 |
| UNIT-3 | *Module-5* | 5**. Power Transmission Devices (Belt, Rope and Chain Drive):**<br>Introduction, Belt, Rope and Chain drives ,Material for Belt, and Rope, Open and crossed belt drives, action of belt on pulleys, velocity ratio, Slip and Creep in belts ,Length of belt in case of open and cross belt, Ratio of tensions in case of flat and V belt, Power transmitted and maximum power transmitted by belt, Centrifugal force and its effect on belt tension, Initial tension and its effect on the transmission of maximum, Simple problems on power transmitted by belts and ropes. | 8 |

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|---|---|---|---|
| UNIT-4 | *Module-6* | **6. Gear Drive:**<br>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. | 4 |
| | *Module-7* | 7.Brakes and Dynamometers:<br>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. | 6 |
| UNIT-5 | *Module-8* | 8. 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 | 6 |
| **Total No. of Hours** | | | **40** |

## Course Name: Machine Design

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:**Design – Definition, Type of design, necessity of design, Comparison of designed and undesigned work,Design procedure, Practical examples related with design procedure, Characteristics of a good designer, Characteristics of environment required for a designer, Design terminology: stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit. General design considerations Engineering materials and their mechanical properties: Properties of engineering materials: elasticity, plasticity, malleability, ductility, toughness, hardness and resilience. Fatigue, creep, tenacity, strength | **8** |
| UNIT-2 | *Module-2* | Design Failure for static loading:Brittle and ductile behaviour of the materials, Various design failures under static loading, causes of failure, Maximum principal stress theory, Maximum shear stress theory, Distortion Energy theory, Design for tensile, compressive and torsional loading, Design for combined torsion and bending, | 8 |
| UNIT-3 | *Module-4* | **Design for Cyclic loading:**<br>Types of cyclic loading, failure of parts due to cyclic loading, design strength for cyclic loading, design equation for simple cyclic loading | 4 |
| | *Module-5* | **Design of Shaft:**<br>Type of shaft, shaft materials, Type of loading on shaft, standard sizes of shaft available Design of shaft subjected to torsion on the basis of :Strength criterion, Rigidity criterion, Design of shaft subjected to bending, Design of shaft subjected to combined torsion and bending | 6 |
| UNIT-4 | *Module-6* | **Design of Key:**<br>Types of key, materials of key, functions of key, Failure of key (by Shearing and Crushing), Design of key (Determination of key dimension), Effect of keyway on shaft strength. (Figures and problems). | 6 |

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|---|---|---|---|
| UNIT-5 | *Module-7* | **Design of Joints:**Types of joints - Temporary and Permanent, utility of joints,**Temporary Joint:** Knuckle Joints – Different parts of the joint, material used for the joint, type of knuckle Joint, design of the knuckle joint. (Figures and problems). **Permanent Joint:** Welding symbols, standards and materials having high weldability.**Welded Joint -** Type of welded joint, strength of parallel and transverse fillet welds.Strength of combined parallel and transverse weld, Axially loaded welded joints**.Riveted Joints. :** Rivet materials, Rivet heads, leak proofing of riveted joint – caulking and fullering. Different modes of rivet joint failure.**Design of riveted joint –** Lap and butt, single and multi riveted joint. | 8 |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C503**
**Course Name: Production Management**

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:** Production management defined, history of development, functions of PM, scope & applications of PM, advantages- disadvantages. | **8** |
| | *Module-2* | **Production and Productivity:**Production, production functions, productivity, factors affecting productivity, measurement of productivity, causes of decrease in productivity, difference between production and productivity. | |
| UNIT-2 | *Module-3* | **Plant Location, Layout and Material Handling:**Plant location, factors affecting plant location, concept of plant layout, types of layout, their characteristics, factors affecting plant layout, work station design, factors considered while designing a work station, introduction, need and objective of material handling, factors considered while selecting a material handling device, safety concept of material handling equipment. | 8 |
| UNIT-3 | *Module-4* | **Work Study:**Definition and scope of work study; areas of application of work study in industry, Role of work study in improving productivity, Objectives, needs and methods of method study, information collection, recording techniques, process symbols, c h a r t s a n d diagrams, critical examination, development, installation and maintenance of improved methods, work measurement objectives, needs and methods of work measurement, time study, various allowances, calculation of time, work sampling, standard data and its use. Application of engineered time standards and work sampling, Ergonomics, concept and advantages | 8 |
| UNIT-4 | *Module-5* | **Production Planning and Control:** Introduction, objectives and components (functions) of P.P.C, Advantages of production planning and Production Control, stages of P.P.C, process planning,<br>routing, scheduling, dispatching and follow up, routing purpose, route sheets**,** scheduling – purpose, machine loading chart, Gantt chart, dispatching – purpose, and procedure, follow up – purpose and procedure. Production Control in job order, batchtype and continuous type of productions. Difference between these controls. | 8 |

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|---|---|---|---|
| UNIT-5 | *Module-6* | **Inspection and Quality Control:**Definitions, types of inspection and procedure, Quality, Quality control, Statistical quality control, Process capability, Control charts for variables - X and R chart, control chart, for fraction defectives (P chart), control chart for number of defects (C chart), Concept of ISO 9000, ISO 14000 and TQM, Quality Circles. | 8 |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C504**
**Course Name: CNC Machine and Automation**

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | Automation: Introduction to CAM, Automated Manufacturing system, Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends. | **8** |
| UNIT-2 | *Module-2*<br><br>*Module-3* | Introduction of NC Machines: Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Axis orientation system of NC Machines. Advantages, suitability and limitations of NC machine tools, Application of NC system, DNC &BTR (behind tape reader), BINARY NUMBER SYSTEM (ADDITION & SUBTRACTION)<br>NC Part Programming & Common Problems in CNC Machines:<br>Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rotational components, Common problems in mechanical, electrical, pneumatic, electronic and PC components of CNC machines. | 8 |
| UNIT-3 | *Module-4* | System Devices:Introduction to DC motors, stepping motors, SLIDE WAYS, PALLETS, TOOL MAGAZINES, SWARF REMOVAL SYSTEM.Control of NC Systems-Open and closed loops, Control of point to point systems, Incremental open loop control, Incremental close loop, Absolute close loop, Control loop in contouring systems, Adaptive control and it's types. | 8 |
| UNIT-4 | *Module-5* | Computer Integrated Manufacturing system:Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Computer aided Inspection. | 8 |

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|---|---|---|---|
| UNIT-5 | *Module-6* | Robotics and Manufacturing Intelligent: Types and generations of Robots, Structure and operation of Robot, Robotapplications, Economics, Robot programming methods.<br>Introduction to Artificial Intelligence for Intelligent manufacturing. | 8 |
| **Total No. of Hours** | | | **40** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Technology of Computer aided Design and Manufacturing by Kumar and Jha,Dhanpat Rai and Sons |
| 2. | CNC Machines –Programming and Applications by M Adithan and BS Pabla,New Age International (P) Ltd., Delhi. |
| 3. | Numerical Control of Machines Tools by Yorem Korem and IB Uri, KhannaPublishers, New Delhi. |

## Course Code: C554
## Course Name: CNC Machine and Automation Lab

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|---|---|
| **MM: 100**<br>**Time: 2 Hr.**<br>**L T P**<br>**0 0 2** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 1** |

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

| Experiment | Course Content | No. of Hours |
|---|---|---|
| *Experiment-1* | To study the basic feature and operation of NC, CNC machine & Study the constructional details of CNC lathe , working of following ,tool changer and tool setter ,Multiple pallets , Safety devices. | **4** |
| *Experiment-2* | To demonstrate how to program (using the computer-assisted method) and machine a simple part on the CNC lathe and Develop part programms for following lathe operations:<br>Plain turning and facing operations<br>Taper turning operations (internal and external)<br>Thread cutting operations (internal and external) | 6 |
| *Experiment-3* | To operate a CNC milling machine and become familiar with set-up, procedures and data flow. | 4 |
| *Experiment-4* | To use AutoCAD to define a series of closed 2-D polygons that form initials, orother artistic creations, within a 150 x 100 mm border. To run the output data filethrough the Auto LISP program called “digitize.lsp”. | 6 |
| **Total number of hours** | | **20** |

**Course Code: DME-C505**
**Course Name: Maintenance Engineering**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:** Necessity and advantages of testing, repair and maintenance, Economic aspects, manpower planning and materials management, Fits and tolerances – common fits and tolerances used for various machine Parts. | **8** |
| UNIT-2 | *Module-2* | **Erection and Commissioning of Machines (Installation):** Location, layout and positioning of machines, Foundation – types of foundation, foundation plan, erection and leveling, grouting, vibration damping, vibration isolation – methods of isolation, anti vibration mounts.<br>**Testing of Machines :** Testing equipment – dial gauge, mandrel, spirit level, straight edge, autocollimator, Testing methods – geometrical/alignment test, performance test, testing under load, run test, vibrations, noise. | 8 |
| UNIT-3 | *Module-3* | **Lubrication Systems:** Lubrication methods and periodical lubrication chart for various machines (daily, weekly, monthly ), Handling and storage of lubricants, Lubricants conditioning and disposal, Lubricant needed for specific components such as gears, bearings, and chains, Purpose and procedure of changing oil periodically (like gear box oil) | 8 |
| UNIT-4 | *Module-4* | **Repairing:** Common parts which are prone to failure, reasons of failure, Repair schedule, Parts that commonly need repair such as belts, couplings, nuts, and bolts | 8 |
| UNIT-5 | *Module-5* | **Maintenance:** Definition, advantages, limitations and types of maintenance viz. preventive, breakdown, predictive, Organization of maintenance, Introduction to computerized maintenance record, ISO standards for maintenance documentation, Introduction to machine history card – purpose and advantages, Preparation of yearly plan for preventive maintenance, Need of frequently needed spare parts inventory. | 8 |
| **Total No. of Hours** | | | **40** |

**Suggested books:**

| S. No. | Name of Authors /Books /Publisher |
|---|---|
| 1. | Industrial Maintenance by HP Garg; S. Chand and Company, Delhi. |
| 2. | Plant Maintenance Engineering by RK Jain; Khanna Publishers, Delhi. |
| 3. | Installation, Servicing and Maintenance by SN Bhattacharya; S Chand andCompany,Delhi. |
| 4. | Maintenance Engineering and Management by RC Mishra and K Pathak;Prentice Hall of India Pvt. Ltd., New Delhi. |

**Course Code: DME-C601**
**Course Name: ENTREPRENEURSHIP DEVLOPMENT AND MANAGEMANT**

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

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|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:**Concept /Meaning and its need, Qualities and functions of entrepreneur and barriers in entrepreneurship, Sole proprietorship and partnership forms of business organisations, Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP). | **8** |
| | *Module-2* | **Market Survey and Opportunity Identification:** Scanning of business environment, Salient features of National and State industrial policies and resultant business opportunities, Types and conduct of market survey, Assessment of demand and supply in potential areas of growth, Identifying business opportunity, Considerations in product selection | 4 |
| UNIT-2 | *Module-3* | **Project report Preparation:** Preliminary project report, Detailed project report including technical, economic and market feasibility, Common errors in project report preparations, Exercises on preparation of project report | 4 |
| UNIT-3 | *Module-4* | **Introduction to Management:** Definitions and importance of management Functions of management: Importance and Process of planning, organising, staffing, directing and controlling.<br>Principles of management (Henri Fayol, F.W. Taylor)<br>Concept and structure of an organization<br>Types of industrial organisations<br>Line organisation<br>Line and staff organisation<br>Functional Organisation | 8 |
| | *Module-5* | **Leadership and Motivation:**<br>**Leadership**<br>Definition and Need<br>Qualities and functions of a leader<br>Manager Vs leader<br>Types of leadership<br>**Motivation**<br>Definitions and characteristics | 4 |

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|---|---|---|---|
| | | Factors affecting motivation<br>Theories of motivation (Maslow, Herzberg, McGregor) | |
| UNIT-4 | *Module-6* | **Management Scope in Different Areas:**<br>**Human Resource Management**<br>Introduction and objective<br>Introduction to Man power planning, recruitment and selection<br>Introduction to performance appraisal methods<br>**Material and Store Management**<br>Introduction functions, and objectives<br>ABC Analysis and EOQ<br>**Marketing and sales**<br>Introduction, importance, and its functions<br>Physical distribution<br>Introduction to promotion mix<br>Sales promotion<br>**Financial Management**<br>Introductions, importance and its functions<br>Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT | 8 |
| UNIT-5 | *Module-7* | **Miscellaneous Topics:**<br>Customer Relation Management (CRM)<br>Definition and need<br>Types of CRM<br>**Total Quality Management (TQM)**<br>Statistical process control<br>Total employees Involvement<br>Just in time (JIT)<br>**Intellectual Property Right (IPR)**<br>Introductions, definition and its importance<br>Infringement related to patents, copy right, trade mark | 4 |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C602**

**Course Name: COMPUTER APPLICATION IN MECHANICAL DRAFTING, DESIGN AND ANALYSIS**

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **MS Word:** Introduction to MS word for preparing technical report. Use of different fonts, size,tables, and equations should be considered. | **8** |
| UNIT-2 | *Module-2* | MS Excel: Creation of graphs such as bar chart, PI chart, line diagram using technical data, Examples: Load deformation data of any material may be given to the students andask to convert these data to stress strain form and plot of stress strain curve. Determination of modulus of elasticity, yield strength, percentage elongation,ultimate strength, etc from the above curve. With given x-y data, plotting of the dataand fitting various regression equations using Excel program | 8 |
| UNIT-3 | *Module-3* | **MS Power Point:**Templates, wizard, views, colour schemes, Introduction to various Power Pointtoolbars, Presentations using Power Point:-Slide Views Slide FormattingAnimation Graphs. | 8 |
| UNIT-4 | *Module-4* | **Computer Aided Design using any sotware such as AUTO CAD/ IDEAS/ etc-** Concept of Auto CAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode, Drawing commands – point, line, arc, circle, ellipse,Editing commands – scale, erase, copy, stretch, lengthen and explode, Dimensioning and placing text in drawing area, Sectioning and hatching, Inquiry for different parameters of drawing entity. | 8 |
| UNIT-5 | *Module-5* | **Assembly and detail drawings of the following using AUTOCAD**<br>Tool post, Tail stock, Screw jack, Safety valve, Stuffing Box, Bench vice<br>a) Isometric Drawings by CAD<br>Drawings of following on computer:<br>Cone, Cylinder, Isometric view of objects<br>b) 3D Modelling:3D modelling, Transformations, scaling, rotation, translation | 8 |
| **Total No. of Hours** | | | **40** |

**Course Code: DME-C603**
**Course Name: NON CONVENTIONAL ENERGY RESOURCES**

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|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction to Non-Conventional/renewable energy Sources:** Conventional and Non-conventional sources of energy. Need, importance and scopeof non-conventional and alternate energy resources. | **4** |
| | *Module-2* | **Biogas Technology:** Bio-gas: Importance of bio- gas. Principles of biogas generation. Main parts of biogas plants: Digester, gas holder, pressure gauge, gas controlling cocks and meter. Selection of biogas plant model and size. Site selection of biogas plants. | 4 |
| UNIT-2 | *Module-3* | **Wind Energy Technology:** Introduction, scope and significance of wind mill, Type and constructional details of windmill - vertical and horizontal axis type wind mill. Site selection for installation of windmill. Care and maintenanceof windmill. | 8 |
| UNIT-3 | *Module-4* | **Solar Energy Technology:** Introduction, significance of solar energy, solar spectral and green house effect. Principles of thermal collection and storage. Comparison of flat type collector and concentration or focussing type collectors. Introduction to SPV module, its principleand applications. | 8 |
| UNIT-4 | *Module-5* | **Solar Thermal Systems:** Operation, constructional details and maintenance of solar cooker, solar water heater, solar still, solar water pump, SPV system etc**.** | 8 |
| UNIT-5 | *Module-6* | **Energy Conservation:** Principles of energy conservation. Familiarization with different energy conservation appliances and practices, Scope of energy conservation in the domestic, commercial and agriculturalsectors. | 8 |
| **Total No. of Hours** | | | **40** |

**Course Code:DME-C604**
**Course Name: POWER PLANT ENGINEERING**

| | |
|---|---|
| **MM: 100**<br>**Time: 3 Hr.**<br>**L T P**<br>**2 1 0** | **Sessional: 30**<br>**ESE: 70**<br>**Credit : 3** |

| | |
|---|---|
| **NOTE:** | The question paper shall consist of two sections (Section-A and Section-B). Section-A shall contain of ten (10) short answer type questions of six (06) mark each and student shall be required to attempt any five (05) questions. Section-B shall contain eight (08) long answer type questions of ten (10) marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus |

| UNIT | Module | Course Content | No. of Hours |
|---|---|---|---|
| UNIT-1 | *Module-1* | **Introduction:** Sources of energy fuels, flowing stream of water, solar rays, wind, terrestrial heat, ocean tides and waves Concept of power station, central and industrial power station, captive power station, classification of power station with respect to primemover steam, IC engine, gas turbine and hydro power station, scope in Uttarakhand state | **8** |
| UNIT-2 | *Module-2* | **Steam Power Plant:**Parameters of power cycle- Thermal efficiency, work ratio, specific steam Consumption Rankine cycle flow diagram, representation on thermodynamic planes, thermal efficiency, effect on change of condenser pressure, boiler pressure, degree of super heat on thermal efficiency Reheat cycle, simple regenerative cycle, STEAM GENERATOR – FUNTIONS, CLASSIFICATION & SELECTION (No numerical)<br>**Steam Condensing Equipment**: Functions of condensers, classification, surface condenser components andtheir functions Condenser auxiliaries- hot well, condensate pump, vaccum pump, air ejector, circulating pump, atmospheric relief valve Requirement of a good condensing system Cooling towers-purpose and types | 8 |
| UNIT-3 | *Module-3* | **Hydro Power:** Advantages, basic elements, dams, head works, water turbines, classification of water turbines, speed and pressure control, plant auxiliaries, plant operation, potential in Uttarakhand state, detailed working | 8 |
| UNIT-4 | *Module-4* | **Diesel Engine Power Plant:** Advantages and disadvantages of diesel engine. Essential elements of dieselpower plant. Fuel injection system performance, testing of diesel engine power plant | 8 |
| UNIT-5 | *Module-5* | **Gas Turbine Power Plant:** Brayton cycle- schematic diagram, thermal efficiency. Advantages of gas turbinesover diesel engines. Classification of gas turbines, advantages and disadvantages,methods of improving thermal efficiency, Important parts and their functions,Essential auxiliaries and controls for gas turbine power point. Fuel for gas turbines | 8 |
| **Total No. of Hours** | | | **40** |