

2.1 ENGLISH AND COMMUNICATION SKILLS - II

L T P Cr
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RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

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| 1. | Facets of Literature | (14 hrs) |
| | 1.1 Short stories | |
| | 1.1.1 The Portrait of a Lady - Khushwant Singh | |
| | 1.1.2 The Doll's House – Katherine Mansfield | |
| | 1.1.3 The Refugees – Pearl S. Buck | |
| | 1.2 Prose | |
| | 1.2.1 Walking Tours – R.L. Stevenson | |
| | 1.2.2 A Dialogue on Civilization – C.E.M. Joad | |
| | 1.2.3 The Sign of Red Cross – Horace Shipp | |
| | 3 Poems | |
| | 1.3.1 All The World's A Stage – W. Shakespeare | |
| | 1.3.2 Say Not, The Struggle Nought Availeth – A.H. Clough | |
| | 1.3.3 Pipa's Song – Robert Browning | |
| 2. | The Art of Précis Writing | (04 hrs) |
| 3. | Grammar and Usage | (08 hrs) |
| | 3.1 Narration | |
| | 3.2 Voice | |
| | 3.3 Idioms and Phrases | |
| 4. | Correspondence | (04 hrs) |
| | 4.1 Business Letters | |
| | 4.2 Personal letters | |

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| 5. | Drafting | (06 hrs) |
| | 5.1 Report Writing | |
| | 5.2 Inspection Notes | |
| | 5.3 Memos, Circulars and Notes | |
| | 5.4 Telegrams | |
| | 5.5 Press Release | |
| | 5.6 Agenda and Minutes of Meetings | |
| | 5.7 Applying for a Job | |
| 6. | Glossary of Technical & Scientific Terms | (04 hrs) |
| 7. | Communication | (08 hrs) |
| | 7.1 Media and Modes of Communication | |
| | 7.2 Channels of Communication | |
| | 7.3 Barriers to Communication | |
| | 7.4 Listening Skills | |
| | 7.5 Body language | |
| | 7.6 Humour in Communication | |

LIST OF PRACTICALS

1. Practice on browsing Information on Internet
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette-demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

Note:

1. The Text Book on "English and Communication Skills, Book-II by Kuldip Jaidka et. al. developed by NITTTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.
2. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.
3. Elements of body language will be incorporated in all practical exercises.
4. The practical exercises involving writing may also be included in Theory Examination.

INSTRUCTIONAL STRATEGY

Looking into the present day needs of effective communication in every field, teacher is expected to develop necessary competencies by giving practical tips and more emphasis on grammar, vocabulary and its usage in addition to practical exercises on correspondence, drafting, communication and report writing assignments projects.

RECOMMENDED BOOKS

1. English and Communication Skills, Book-II By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1	Facets of Literature	14	30
2	The Art of Précis Writing	4	10
3	Grammar and its Usage	8	15
4	Correspondence	4	10
5	Drafting	6	15
6	Glossary of Technical & Scientific Terms	4	10
7	Communication	8	20
Total		48	100

2.2 APPLIED MATHEMATICS - II

L T P Cr
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RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

DETAILED CONTENTS

1. Differential Calculus (35 hrs)

1.1 Definition of function; Concept of limits.

$$\text{Four standard limits } \lim_{x \rightarrow a} \frac{x^n - a^n}{x - a},$$

$$\lim_{x \rightarrow \infty} \frac{\sin x}{x}, \quad \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \quad \lim_{x \rightarrow 0} (1+x)^{1/x}$$

1.2 Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , $\log_a x$ only

1.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

1.4 Differentiation of trigonometric inverse functions . Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

1.5 Applications:

(a) Maxima and minima

(b) Equation of tangent and normal to a curve (for explicit functions only)

2. Integral Calculus (35 hrs)

2.1 Integration as inverse operation of differentiation

2.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)

2.3 Evaluation of definite integrals (simple problems)-

$$\text{Evaluation of } \int_0^{\pi/2} \sin^n x \cdot dx, \quad \int_0^{\pi/2} \cos^n x \cdot dx, \quad \int_0^{\pi/2} \sin^m x \cos^n x \cdot dx$$

using formulae without proof (m and n being positive integers only)

2.4 Applications:

(a) Area bounded by simple curves and axes.

(b) Volume of a solid formed by revolution of an area about axes (simple problems).

3. Statistics (10 hrs)
- 3.1 Measures of Central Tendency: Mean, Median, Mode
- 3.2 Measures of Dispersion: Mean deviation, Standard deviation

INSTRUCTIONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and Statistics can be taught in the light of applications in the field of engineering and technology. By laying more stress on applied part, teacher can also help in providing continuing education base to the students.

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Percentage Weightage	Marks Allocation
1.	Differential Calculus	35	43.75	45
2.	Integral Calculus	35	43.75	45
3.	Statistics	10	12.5	10
Total		80	100	100

2.3 APPLIED PHYSICS – II

L T P Cr
4 - 2 5

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims at giving an understanding of this world both by observation and prediction in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

1. Waves and vibrations (12 hrs)
 - 1.1 Generation of waves by vibrating particles
 - 2.2 Wave motion with examples
 - 3.3 Types of wave motion, transverse and longitudinal wave motion with examples
 - 4.4 Velocity, frequency and wave length of a wave (relationship $v = \eta\lambda$)
 - 4.5 Sound and Light waves
2. Applications of sound waves (08 hrs)
 - 2.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
 - 2.2 Ultrasonics – production (magnetostriction and piezoelectric detection) and their engineering applications
3. Principle of optics (12 hrs)
 - 3.1 Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection
 - 3.2 Defects in image formation by lenses and their correction
 - 3.3 Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case)
 - 3.4 Overhead projector and slide projector
4. Electrostatics (12 hrs)
 - 4.1 Coulombs law, unit charge and its SI units

- 4.2 Gauss's Law
 - 4.3 Electric field intensity and electric potential, equi-potential surfaces and their properties
 - 4.4 Calculation of electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
 - 4.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
 - 4.6 Dielectric and its effect on capacitors, dielectric constant and dielectric break down
5. Electricity (08 hrs)
- 5.1 Ohm's law
 - 5.2 Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance
 - 5.3 Kirchoff's law and its applications, wheatstone bridge principle
 - 5.4 Heating effect of current and concept of electric power
6. Modern Physics (12 hrs)
- 6.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers, applications of lasers
 - 6.2 Fibre optics: Introduction, optical fiber materials, types, light propagation and applications
 - 6.3 Superconductivity: Phenomenon of super conductivity.
 - 6.4 Energy sources – Conventional and non-conventional (wind, water, solar, bio, nuclear energy) (only elementary idea).

LIST OF PRACTICALS

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To find the internal resistance of a cell by potentiometer
4. To convert a galvanometer into an ammeter of given range
5. To convert a galvanometer into voltmeter of given range

6. To find the velocity of sound in air by resonance apparatus
7. To find the frequency of a tuning fork by a sonometer
8. To set a model of an astronomical telescope and find its magnifying power
9. To set up a model of a compound microscope

INSTRUCTIONAL STRATEGY

Teacher can take help of various instructional materials like models, charts and graphs for imparting instructions. The field application should be made clear before teaching the basics of mechanics, heat, waves, sound, light etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Percentage Weightage	Marks Allocation
1.	Waves and vibrations	12	18.75	20
2.	Applications of sound waves	8	12.5	10
3.	Principle of optics	12	18.75	15
4.	Electrostatics	12	18.75	20
5.	Electricity	8	12.5	10
6.	Modern Physics	12	18.75	20
Total		64	100	100

2.4 ELECTRONIC COMPONENTS AND MATERIALS (ECM)

L T P Cr
3 - - 3

RATIONALE

Study of Electronic components and Materials is important from point of view of manufacturing, testing and maintenance of electronic devices and systems. Students should understand the procedure of identification, characteristics, specifications, merits, limitations, and applications of electronic components and materials. This subject will enable the students to understand various types of materials, their characteristics and components used in electronic systems.

DETAILED CONTENTS

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|-----------|--|-----------------|
| 1. | Materials | (24 hrs) |
| 1.1 | Classification of materials
Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure. | (04 hrs) |
| 1.2 | Conducting Materials
Resistors and factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials. | (06 hrs) |
| 1.3 | Insulating Materials
Important relevant characteristics (electrical, mechanical and thermal) and applications of the following material:
Mica, Glass, Copper, Silver, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish. | (06 hrs) |
| 1.4 | Magnetic Materials
Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications. | (05 hrs) |
| 1.5 | Idea about latest materials in the light of technological advancements like hybrid carbon etc | (03 hrs) |
| 2. | Components | (24 hrs) |
| 2.1 | Capacitors | (06 hrs) |
| a) | Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications | |
| b) | Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor. | |
| c) | Energy stored in a capacitor. | |
| d) | Concept of di-electric and its effects on capacitance, di-electric constant, break down voltage. | |
| e) | Series and parallel combination of capacitor. Simple numerical problems of capacitor. | |

- f) Charging and discharging of capacitor with different resistances in circuit, concept of current growth and decay, time constant in R-C circuits, simple problems.
- 2.2 Resistors: Carbon film, metal film, carbon composition, wound and variable types (presets and potentiometers) (03 hrs)
- 2.3 Transformer, inductors and RF coils: (03 hrs)
Methods of manufacture, testing, Need of shielding, application and trouble shooting
- 2.4 Surface Mounted Devices (SMDs): (03 hrs)
Constructional detail and specifications.
- 2.5 Connectors, Relays, switches and cables: (03 hrs)
Different types of connectors, relays, switches and cables, their symbols, specifications, construction, types, applications and their testing.
- 2.7 Semi Conductors and Integrated Circuits (06 hrs)
- Basic characteristics of Semiconductor materials, testing of diodes, transistors, FETs and SCRs.
 - Various processes in IC manufacturing. Hybrid IC technology.
 - Superconductivity and piezoelectric ceramic transducer elements

INSTRUCTIONAL STRATEGY

The teacher may demonstrate the materials and components in the class during lecture delivery. To enhance the knowledge of students regarding different materials and components, they should be given exercises on identification of materials used in various electronic gadgets etc.

RECOMMENDED BOOKS

1. Electronic components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi
2. Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta; Tata McGraw Hill, New Delhi
3. Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
4. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
5. Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Percentage Weightage	Marks Allocation
1.	Materials	24	50	50
2.	Components	24	50	50
Total		48	100	100

2.5 BASIC ELECTRONICS (Common in ECE, I&C, Computer Engineering and I T)

L T P Cr
4 - 2 5

RATIONALE

This subject gives the knowledge of fundamental concepts of basic electronics and aims at providing the students with basic understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, types of diodes, LEDs, LCD; understanding the working of transistors in various configurations; understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various term used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visit

DETAILED CONTENTS

1. Semiconductor Physics: (12 hrs)

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds

Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity.

P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor.

Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.
2. Semiconductor Diode: (12 hrs)

PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition.

V-I characteristics, static and dynamic resistance and their calculation from diode characteristics.

Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and π filter.

Types of diodes, characteristics and applications of Zenor diodes. Zenor and avalanche breakdown.
3. Introduction to Bipolar Transistor (12 hrs)

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current;

CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations;

Transistors as an amplifier in CE Configurations; d.c load line and calculation of current gain, voltage gain using d.c load line.

4. Transistor Biasing Circuits (06 hrs)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

5. Single stage Transistor Amplifier (10 hrs)

Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H- parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter.

6. Field effect Transistors (12 hrs)

Construction, operation and characteristics of FET and its application.

- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
- C MOS - advantages and applications
- Comparison of JFET, MOSFET and BJT.
- FET amplifier circuit and its working principle (No analysis).

LIST OF PRACTICALS

1. Familiarization with operation of following instruments.
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant quantities with their help.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zenor diode
2. Observe the wave shape of following rectifier circuit
 - a. Half wave rectifier
 - b. Full wave rectifier
 - c. Bridge rectifier
3. Plot the wave shape of full wave rectifier with
 - a. Shunt capacitor filter
 - b. Series inductor filter
 - c. π filter

4. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
5. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
6. Plot V-I characteristics of FET amplifier.
7. Measure the Q-Point and note the variation of Q-Point.
 - a. By increasing the base resistance in fixed bias circuit.
 - b. By changing out of bias resistance in potential divider circuit.
8. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill. New Delhi
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi

INSTRUCTIONAL STRATEGY

This subject gives the knowledge of fundamental concepts of basic electronics. The teacher should give emphasis on understanding of concepts and various term used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and electrical measuring instruments etc. Practical exercises will reinforce various concepts. Application of Semiconductor Diodes, Transistors, Field Effect Transistors etc must be told to students.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Percentage Weightage	Marks Allocation
1.	Semiconductor Physics:	12	18.75	15
2.	Semiconductor Diode:	12	18.75	20
3.	Introduction to Bipolar Transistor	12	18.75	20
4.	Transistor Biasing Circuits	6	9.37	10
5.	Single stage Transistor Amplifier	10	15.63	15
6.	Field effect Transistors	12	18.75	20
Total		64	100	100

2.6 GENERAL ENGINEERING

(Common with other diploma Programmes)

L T P Cr
4 - 2 5

RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of General Engineering has been included to impart basic knowledge of civil, electrical and mechanical engineering to the students.

Note:

1. The students of Civil Engineering, will be studying Part A (Mechanical Engineering) and Part B (Electrical Engineering) only.
2. **The students of Electrical engineering, Electronics and Communication Engineering, Instrumentation and Control Engineering, Computer Engineering and Information Technology will be studying Part A (Mechanical Engineering) and Part C (Civil Engineering) only.**
3. The students of Mechanical Engineering will be studying Part B (Electrical Engineering) and Part C (Civil Engineering) only.
4. The students of remaining branches of engineering and technology will be studying all the three Parts A (Mechanical Engineering), Part B (Electrical Engineering) and Part C (Civil Engineering), unless specified otherwise
5. A time of 2 hours per week has been allotted to Mechanical Engineering, 2 hours per week to Electrical Engineering and 2 hour per week to Civil Engineering in the lecture hours, for teaching theory and a lump-sum time of 2 hours per week has been allotted for the Practical exercises.

DETAILED CONTENTS PART-A

MECHANICAL ENGINEERING

Theory

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| 1. | Transmission of Power | (8 hrs) |
| 1.1 | Belt Drives:
Types of belts, belt materials, cross and flat belt drives, advantages of V-belt drive over flat belt drive. | |
| 1.2 | Gears Drives:
Types of gears (briefly), types of gear trains | |

- 2. Internal combustion Engines** (10 hrs)
- 2.1 Classification of IC engines
 - 2.2 Working principles of two stroke and four stroke engines
 - 2.3 Working principles of petrol engine and diesel engines
 - 2.4 Gas turbines (working principle only)
- 3. Refrigeration and Air Conditioning System** (8 hrs)
- 3.1 Different types of refrigeration principles and refrigerants
 - 3.2 Working of domestic refrigerator
 - 3.3 Working of Window type AC system
- 4. Hydraulics:** (6 hrs)
- 4.1 Classification of pumps (reciprocating and centrifugal)
 - 4.2 Working principles of both reciprocating and centrifugal pumps
 - 4.3 Turbine: Working principles of impulse turbine and reaction turbine

PRACTICAL EXERCISES IN MECHANICAL ENGINEERING

1. Demonstration and study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)
2. Demonstration and study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)
3. Demonstration and study of gas turbines through models
4. Demonstration and study of different hydraulic pumps
5. Demonstration and study of various drives for transmission of powers i.e. models of belts and gears.
6. Demonstration and study of air conditioning system in a building
7. Demonstration and study of domestic refrigerating system

PART B

ELECTRICAL ENGINEERING

Theory

1. Basic Quantities of Electricity: (4 hrs)
 - 1.1 Definition of voltage, current, power and energy with their units
 - 1.2 Name of the instruments used for measurement of quantities such as voltmeter, ammeter, wattmeter, energy meter.
 - 1.3 Connection of the instruments in electric circuit

2. Basics of Electronics: (6 hrs)
Basic idea of P and N type semiconductors, diodes, zenor diodes and their applications as rectifiers. Transistors PNP and NPN and their applications as amplifiers, switches etc. Introduction to thyristors and their applications in control of drives.
3. Various Types of Power Plants: (3 hrs)
 - 3.1 Elementary block diagram of thermal, hydro and nuclear power stations
 - 3.2 Brief explanation of the principle of power generation in above power stations
4. Electrical Distribution System (6 hrs)
 - 4.1 Key diagram of 3 phase Electrical distribution system
 - 4.2 Brief functions of accessories of distribution line
 - 4.3 Distinction between 11 kV and 415 volt distribution system
 - 4.4 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
 - 4.4 Identification of the voltage between phases and between one phase and neutral
 - 4.5 Arrangement of supply system from pole to the distribution board
 - 4.6 Function of service line, energy meter, main switch, distribution board
5. Domestic Installation: (5 hrs)
 - 5.1 Distinction between light and fan circuits and single phase power circuit, sub circuits
 - 5.2 Various accessories and parts of installation, identification of wiring systems
 - 5.3 BIS codes for safety measures and earthing of installation.
6. Transformers, Electric Motors and Pumps: (8 hrs)
 - 6.1 Working Principle of a single phase transformer, types of transformers, turns ratio. Introduction to three phase transformer
 - 6.2 Working Principle and various applications of single phase and three phase motors and their starting methods
 - 6.3 Conversion of horse power in watts or kilowatts
 - 6.4 Special purpose motors such as stepper motors, universal motors, flame proof motors.
 - 6.5 Type of pumps and their applications

PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:

1. Use of Megger:
Objective: To make the students familiar with different uses of megger

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.
Objective: Students may be made familiar with the equipment needed to control a three-phase motor
 The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabilizer etc.
Objective: Students may be made familiar with the different types of equipment and circuits used in the domestic installations

4. Trouble shooting in a three-phase motor
Note: The teacher may create anyone of the following faults
 - (a) Loose connections
 - (b) Blown fuse
 - (c) Tripped overload protection
 - (d) Incorrect direction of rotation
 - (e) Single phasing
 - (f) Burnt winding to be simulated by a loose connection behind a terminal box.**Objective:** The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary

5. Treatment of electric shock
Note: The teacher may give a demonstration how an electric shock must be treated.
Objective: Students must be trained to treat the persons suffering from an electric shock

6. Demonstration and study of Domestic installation components used in single phase and three phase wiring
7. Demonstration and study of distribution line components
8. Demonstration and study of a distribution Board
Note: Students may be asked to study the distribution board in the institution and note down all accessories.

- Objective:** Students must be made familiar with the distribution board
9. Connections and taking reading of an energy meter (1 ϕ & 3 ϕ)
- Objective:** Students may be asked to connect an energy meter to a load and calibrate the reading with a stop watch and counting the number of revolutions of the energy meter disk.
10. Demonstration and the study of submersible motor pump set and its working
- Objective:** To tell use of the set in water supply and irrigation works.

PART C

CIVIL ENGINEERING

Theory

1. Construction Materials (10 hrs)
- Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.
2. Foundations (8 hrs)
- i) Bearing capacity of soil and its importance
ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines
3. Basic concept of concrete (8 hrs)
- Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete
4. RCC (6 hrs)
- Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

PRACTICAL EXERCISES IN CIVIL ENGINEERING

1. Testing of bricks
- a) Shape and size
b) Soundness test
c) Water absorption
d) Crushing strength

2. Testing of concrete
 - a) Slump test
 - b) Compressive Strength of concrete cube
3. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

INSTRUCTIONAL STRATEGY

While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted in the laboratories and organized demonstrations for explaining various concepts and principles.

RECOMMENDED BOOKS

Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana
5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

Electrical Engineering

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta BR, S Chand and Company, New Delhi
3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi
4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi
6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

Civil Engineering

1. Textbook of Concrete Technology 2nd Edition by Kulkarni, PD Ghosh RK and Phull, YR; New Age International (P) Ltd., Publishers, New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co., Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi
5. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vazirani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, Delhi
8. Soil Mechanics and foundation Engineering by SK Garg; Khanna Publishers, Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
PART-A (MECHANICAL ENGINEERING)			
1.	Transmission of Power	8	12
2.	Internal combustion Engines	10	15
3.	Refrigeration and Air conditioning System	8	13
4.	Hydraulics	6	10
PAERT-B (ELECTRICAL ENGINEERING)			
1.	Basic Quantities of Electricity	4	5
2.	Application and Advantages of Electricity	3	5
3.	Various Types of Power Plant	3	5
4.	Transmission and Distribution System	6	10
5.	Supply from the Poles to the Distribution Board	4	5
6.	Domestic Installation	6	10
7.	Electric Motors and Pumps	6	10
PART-C (CIVIL ENGINEERING)			
1.	Constructional Materials	10	15
2.	Foundations	8	12
3.	Basic concept of concrete	8	13
4.	RCC	6	10
Total will be sum of any two branches. Total time will be 64 hours & total marks will be 100			

2.7 GENERAL WORKSHOP PRACTICE - II

L T P Cr
- - 6 3

RATIONALE

Manual abilities to handle engineering materials with hand tools need to be developed in the students. This course aims at developing generic manual and machining skills in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides above the development of dignity of labour, precision, safety at work places, team working and development of right attitude are other objectives.

DETAILED CONTENTS

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

PRACTICAL EXERCISES

The following shops are included in the syllabus :

1. Carpentry and Painting shop-II
2. Fitting and Plumbing shop-II
3. Welding shop-II
4. Sheet metal shop
5. Electric shop-II
6. Machine shop

1. Carpentry and Painting Shop-II

- 1.1 Introduction to joints, their relative advantages and uses.
 - Job I Preparation of Dovetail joint and glued joint.
 - Job II Preparation of Mitre Joint
 - Job III Preparation of a lengthening Joint
 - Job 1V Preparation of atleast one utility job with and without lamination.
- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tramme, method of sharpening various saws.
- 1.3 Demonstration of job on Band Saw and circular saw, chain and diesel universal wood working machine, saw resharping machine, Saw Brazing unit.
- 1.4 Demonstration of various methods of painting wooden items.
 - Job V Preparation of surface before painting.
 - Job VI Application of primer coat
 - Job VII Painting wooden items by brush/roller/spray

2. Fitting and Plumbing Shop-II

- 2.1 Description and demonstration of various types of drills, taps and dies
- 2.2 Selection of dies for tapping. Types of taps, tapping, dieing and drilling operations.
Job I Making internal and external threads on a job by tapping and dieing operations (manually)
- 2.3 Precautions while drilling soft metals, specially aluminum and lead.
Job II Drilling practice on soft metals (Aluminum, Brass and lead)
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier, micrometer, height gauge, combination set, reading gauge. Handling of measuring instruments, checking of zero error, finding of least count.
Job III Preparation of a job by filing on non-ferrous metal.
Job IV Production of a utility job involving all the above operations.
Job V Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow T - Union, socket, stopcock, taps, etc
- 2.5 Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.

3. Welding Shop-II

- 3.1 Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment.
Job I Practice in handling gas welding equipment and welding practice.
- 3.2 Common welding joints generally made by gas welding.
Job II Preparation Butt joint by gas welding.
Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding.
Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves).
Job V Exercise job on spot/seam welding machine.
- 3.3 Demonstration of various methods adopted for painting steel items.
Job VI Painting steel items by brush/roller/ spray

4. Sheet metal shop

Introduction to sheet metal process and tools

- Job I Making sheet metal joints
- Job II Making sheet metal tray or a funnel or a computer chassis
- Job III Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering
- Job IV Prepare a lap riveting joint of sheet metal pieces

5. Electric Shop-II

- 5.1 Importance of three phase wiring and its effectiveness.
Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.
- 5.2 Estimating and costing power consumption.
Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.
Job III Checking continuity of connection (with tester and bulbs), location of faults with a

multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing.

5.3 Demonstration of dismantling, servicing and reassembling of a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven etc.

Job IV Dismantling, serving and reassembling of any of the above electrical appliances.

Job V Demonstration of testing single phase/three phase electrical motor by using voltmeters ammeter clip on meter technometer etc.

Job VI Reversing the rotation of motor.

6. Machine Shop

Introduction to various machines used in machine shop.

Job I Exercise on simple turning

Job II Exercise on taper turning

Job III Marking and drilling practice on mild steel piece

Job IV Marking and drilling practice on aluminium piece

Job V Demonstration of various functions of CNC Machine

RECOMMEND BOOKS

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection