Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering Yadrav- Ichalkaranji

(An Autonomous Institute)

(Approved by AICTE, New Delhi, Recognized by Government of Maharashtra & Affiliated to Dr. BATU , Lonere)

Accredited by NAAC 'A' Grade

An ISO 9001:2015 Certified Institute

Teaching and Evaluation scheme for F Y B. Tech.

(Mechatronics Engineering)

Department of Basic Sciences and Humanities

Semester: I & II

Abbreviations

L: Lecture

T: Tutorial

P: Practical

CA1- Continuous Assessment 1

CA2- Continuous Assessment 2

MSE: Mid Semester Exam

ESE: End Semester Exam

BSC -Basic Science Courses

ESC: Engineering Science Courses

AEC: Ability Enhancement Courses

IKS: Indian Knowledge System

VSEC: Vocational and skill Enhancement Course

PCC: Programme Core Course

CC: Co-curricular Courses

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

(An Autonomous Institute)

Department: Department of Basic Sciences and Humanities
Rev: Course Structure/00/2023-24
Class: F.Y. B.Tech (Mechatronics Engineering) **Semester:** I

Course Code	Type of Course	Name of the course	Teaching Scheme			Evaluation scheme				Credit
			L	T	P	CA1	CA2	MSE	ESE	
23MT1101	BSC	Applied Mathematics-I	3	1	0	10	10	30	50	4
23MT1102	BSC	Applied Chemistry	2	0	0	10	10	30	50	2
23MT1103	IKS	Indian Knowledge System	2	0	0	10	10	30	50	2
23MT1104	ESC	Basic Electronics Engineering	1	0	0	5	5	15	25	1
23MT1105	ESC	Basic Civil Engineering	1	0	0	5	5	15	25	1
23MT1106	ESC	Engineering drawing	1	0	0	5	5	15	25	1
23MT1107	PCC	Fundamentals of Mechatronics Engineering	2	0	0	10	10	30	50	2
23MT1108	BSC	Applied Chemistry Laboratory	0	0	2	25	25	-	-	1
23MT1109	ESC	Basic Electronics Engineering Laboratory	0	0	2	25	25	-	-	1
23MT1110	ESC	Basic Civil Engineering Laboratory	0	0	2	25	25	-	-	1
23MT1111	ESC	Engineering drawing Laboratory	0	0	2	25	25	-		1
23MT1112	VSEC	Workshop Practices	0	0	2	25	25	-	-	1
23MT1113	VSEC	Mechatronics Workshop	0	0	2	25	25	-	-	1
23MT1114	CC	Yoga/Sports Practicals/Mini project	0	0	4	25	25	-	-	2
Total			**12**	**1**	**16**	**230**	**230**	**165**	**275**	**21**

Shri. ShamraoPatil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

(An Autonomous Institute)

Department: Department of Basic Sciences and Humanities

Rev: Course Structure/00/2023-24

Class: F.Y. B.Tech (Mechatronics Engineering) **Semester:** II

Course Code	Type of Course	Name of the course	Teaching Scheme			Evaluation scheme				Credit
			L	T	P	CA1	CA2	MSE	ESE	
23MT1201	BSC	Applied Mathematics- II	3	1	0	10	10	30	50	4
23MT1202	BSC	Applied Physics	2	0	0	10	10	30	50	2
23MT1203	AEC	Communication Skills	1	0	0	5	5	15	25	1
23MT1204	ESC	Fundamentals of Mechanical Engineering	1	0	0	5	5	15	25	1
23MT1205	ESC	Basic Electrical Engineering	1	0	0	5	5	15	25	1
23MT1206	ESC	Engineering Mechanics	2	0	0	10	10	30	50	2
23MT1207	VSEC	Problem Solving using C programming	2	0	0	10	10	30	50	2
23MT1208	BSC	Applied Physics Laboratory	0	0	2	25	25	-	-	1
23MT1209	AEC	Communication Skills Laboratory	0	0	2	25	25	-	-	1
23MT1210	ESC	Fundamentals of Mechanical Engineering Laboratory	0	0	2	25	25	-	-	1
23MT1211	ESC	Basic Electrical Engineering Laboratory	0	0	2	25	25	-	-	1
23MT1212	ESC	Engineering Mechanics Laboratory	0	0	2	25	25	-	-	1
23MT1213	VSEC	Problem Solving using C programming Laboratory	0	0	2	15	15	-	20	1
23MT1214	CC	Yoga/Sports Practicals/Mini project	0	0	4	25	25	-	-	2
Total			**12**	**1**	**16**	**220**	**220**	**165**	**295**	**21**

Course Category	BSC	ESC	PCC	VSEC	HSSM	CC
Credits of Semester-I	7	6	2	2	2	2
Credits of Semester-II	7	7	0	3	2	2
Cumulative Sum	**14**	**13**	**2**	**5**	**4**	**4**

Applied Mathematics-I

23MT1101	BSC	Applied Mathematics-I	3-1-0	4 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 Hrs/week Tutorial: 1 Hrs/week	CA1 -10 Marks CA2- 10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: HSC Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the concept basic laws of derivatives in partial differentiation to solve first and higher order derivative.
CO2	Apply the concept of partial derivative, to find Jacobin, series expansion and maxima and minima of functions of two variables.
CO3	Use of characteristics of complex numbers in problems pertaining to Electric Circuit, Mechanical System etc.
CO4	Apply the concept of linear transformation to solve the linear equations.
CO5	Apply the Eigen values and Eigen Vectors to use Cayley-Hamilton theorem to find inverse of the matrix.
CO6	Apply the concept of linear algebra to solve numerically linear simultaneous equations.

Course Contents:

Unit 1: Partial differentiation Partial derivatives of first and higher orders, Homogeneous functions-Euler's theorem, Total derivative, Change of variables, Differentiation of implicit function.	**[8]**
Unit 2: Application of partial derivative Jacobians – properties, Taylor's and Maclaurin's theorem for functions of one and two variables, Errors and approximations, Maxima and minima of functions of two variables.	**[6]**
Unit 3: Complex numbers De-Moivre's theorem (without proof), Roots of complex numbers by using De-Moivre's theorem, Expansion of $sinn\theta$ and $cosn\theta$ in powers of $\boldsymbol{\sin\theta}$ and $\boldsymbol{\cos\theta}$, Circular functions of complex variable-definition, Hyperbolic functions, Relations between circular and hyperbolic functions, Real and imaginary parts of circular and hyperbolic functions, Logarithm of complex quantities.	**[8]**
Unit 4: Matrices and Solution of simultaneous linear equations Elementary row and column transformations on a matrix, Rank of a matrix-normal form and Echelon form, Consistency and solutions of systems of linear equations using elementary transformations.	**[8]**

Unit 5: Eigen values and Eigen vectors Linear dependence and independence of vectors, Eigen values and Eigen vectors, Properties of Eigen values and Eigen vectors, Cayley Hamilton's theorem (without proof) and its applications.	**[6]**
Unit 6: Numerical solution of simultaneous linear equations Gauss elimination method, Gauss- Jordan method, Jacobi's iteration method, Gauss-Seidal iteration method, Determination of Eigen values by iteration.	**[6]**

Text Books:

1. P. N. Wartikar and J. N. Wartikar: A Text Book of Applied Mathematics. (Vol I and II), Pune Vidyarthi Griha Prakashan, Pune
2. N. P. Bali: A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.
3. Peter O" Neil: A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

Reference Books:

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons.
3. B. V. Ramana: Higher Engineering Mathematics, McGraw-Hill Publications,New Delhi
4. C. R. Wylie and L. C. Barrett: advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.

Applied Chemistry

23MT1102	BSC	Applied Chemistry	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 2 Hrs/week	CA1-10 Marks CA2-10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Pre-Requisites: 11th and 12th science chemistry.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain and determine various characteristics of water to develop water treatment methods to solve environmental problems.
CO2	Illustrate and demonstrate different rapid and reliable analytical instrumental methods for chemical analysis.
CO3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO4	Analyze the quality of fuel and select proper fuel for industrial purpose.
CO5	Outline the knowledge of corrosion for prevention of materials from corrosion.
CO6	Make use of metallic materials approach in the industrial point of view.

Course Contents:

Unit 1: Unit 1: Water Treatment Introduction, Impurities in natural water, Hardness of water-units, Types and numerical, BOD, COD definition, Ill effects of hard water in steam generation in boilers, Water purification-membrane technology-Reverse osmosis process, Electrodialysis, Ultra filtration.	**[5]**
Unit 2: Instrumental methods of chemical analysis Introduction, Advantages and disadvantages of instrumental methods, **A) Spectrometry:** Introduction, Laws of spectrometry (Lamberts and Beer-Lamberts law), **B) Chromatography:** Introduction, types, Gas-liquid chromatography (GLC), Basic principle, Instrumentation and applications.	**[5]**
Unit 3: Advanced Materials **A) Polymers:** Introduction, Plastics, Thermo softening and thermosetting plastic, industrially important plastics like phenol formaldehyde and urea formaldehyde biodegradable polymers Poly (hydroxybutyrate-hydroxyvalanate) and applications. **B) Nanomaterial's:** Introduction, Classification of nanomaterial's based on dimensions, Structure, Properties and applications of Graphene.	**[5]**
Unit 4: Fuels Introduction, Classification, Calorific value, Types of calorific value (higher and lower), Characteristics of good fuels, Comparison between solid, Liquid	**[5]**

and gaseous fuels, Gaseous fuel: composition properties and applications of CNG, Determination of calorific value of fuel by bomb calorimeter and by Boy's calorimeter, Numerical on bomb and Boy's calorimeter, Fuel cells: Introduction, Classification, advantages, Limitations and applications.	
Unit 5: Corrosion Introduction, causes, Atmospheric corrosion (oxidation corrosion), Electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), Factors affecting rate of corrosion, Prevention of corrosion by proper design and material selection, Protective coatings hot-dipping (galvanizing and tinning, Metal Spraying and electroplating).	**[5]**
Unit 6: Metallic materials and composite materials **A) Metallic materials:** Introduction, Alloy definition and classification, Purposes of making alloys, **Ferrous alloys:** Plain carbon steels (mild, medium and high), Stainless steels, **Nonferrous alloys:** Copper alloy (Brass), Nickel alloy (Nichrome) **B) Composite materials:** Introduction, Composition, Properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).	**[5]**

Text books:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company Ltd., New Delhi.
2. A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand and Company Ltd., New Delhi.
3. A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, BS Publications, Hyderabad.
4. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
5. A text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai and Co. (Pvt.) Ltd, Delhi.
6. Engineering Chemistry by Renu Bapna and Renu Gupta, MacMillan Publishers (India) Ltd, Delhi.

Reference Books:

1. D. A. Skoog, D. M. West, Fundamentals of Analytical Chemistry, Cengage Learning.
2. A. I. Vogel, Quantitative Chemical Analysis, Longmann Publication.
3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, New Delhi.
4. S. K. Kulkarni, Nanotechnology: Principals and Practices, Capital Publishing Company.
5. B. K. Sharma, Environment Chemistry, Goel Publication, Meerut.
6. K. J. Sundars, Organic Polymer Chemistry, Springer Publication.
7. B. K. Sharma, Instrumental Methods of Chemical Analysis, Goel Publication, Meerut.

Indian Knowledge System

23MT1103	IKS	Indian Knowledge System	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lectures: 2 Hrs/week	CA1-10 Marks CA2-10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Basic knowledge Indian culture and heritage

Course Outcomes: At the end of the course, students will be able to:

CO1	To remember Indian culture and heritage.
CO2	To understand Indian art.
CO3	To understand Indian architecture.
CO4	To understand Indian painting and tradition.
CO5	To understand the performing arts in India
CO6	To understand science and technology in India.

Course Contents:

Unit 1: Indian Culture: An introduction Concept of culture, Culture and heritage, General characteristics of culture, Importance of culture in human life, Characteristics of Indian culture, Significance of geography on Indian culture.	**[5]**
Unit 2: Indian art Indian sculpture: Gandhara school and mathura school of art.	**[5]**
Unit 3: Indian architecture Meaning, Form and context, Perception of India's architectural tradition: Historiography, Cave architecture, medieval architecture of India, Colonial architecture.	**[5]**
Unit 4: Indian painting tradition Ancient Indian painting tradition: Pre-classical period, Classical period and post-classical period, Indian handicraft.	**[5]**
Unit 5: Performing arts Concept of performing arts, Divisions of Indian classical music-Hindustani classical music, carnatic music, Modern Indian music, Musicians, Folk music, Dances of India, Indian cinema.	**[5]**
Unit 6: Science and technology **Science**: Kanad, Varahamihira, Nagarjuna, Medical science in ancient India (Ayurveda and Yoga): Susruta, Charak, Yoga and patanjali, **Mathematics and astronomy:** Baudhayan, Aryabhatta, Brahmgupta, Bhaskaracharya, Mahaviracharya.	**[5]**
Reference Books: 1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep	

Kohle et al. Samskrit Bharati (2006).
2. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).
3. Indian Culture and Heritage. BB Satpathy. Culture 2 (2015) 25.
4. A.L. Basham, Studies in Indian History and Culture. Sambodhi Publications Pvt. Ltd., Calcutta, 1964
5. Basham, A.L., The Wonder That Was India. Sidgwick and Jackson, London, 1954.

Basic Electronics Engineering

23MT1104	ESC	Basic Electronics Engineering	1-0-0	1 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 Hrs/week	CA1-5 Marks CA2-5 Marks Mid Semester Examination: 15 Marks End Semester Examination: 25 Marks

Pre-Requisites: Basic concepts of Physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	To demonstrate the function of different electronic instruments and diode
CO2	To illustrate the different parameters of transistor (BJT).
CO3	To compare the applications of operational amplifiers.
CO4	To classify logic gates and Boolean algebra laws, various electronic appliances.

Course Contents:

Unit 1: Basics of electronics and diode applications Evolution of electronics, Introduction of active and passive components-symbols and units, P-N junction Diode- construction and working, VI characteristics of diode, Diode applications: Half wave and full wave rectifier (Centre tapped and bridge) circuits and operation, Zener diode- VI characteristics, Zener diode as voltage regulator.	[4]
Unit 2: Bipolar junction transistor (BJT) Transistor construction and working principle, DC load line, biasing circuits-fixed bias, collector to base bias, voltage divider bias; Transistor configurations CB, CC and CE, Applications of transistor as an amplifier and as a switch.	[4]
Unit 3: Introduction to operational amplifier OPAMP- Definition, Block diagram of OPAMP, Pin diagram of µA741, Ideal characteristics, OPAMP applications- Inverting amplifier, Non- inverting amplifier, Voltage follower and comparator, Filters-definition, Types of filters, Working of passive and active filters (working).	[4]
Unit 4:Digital electronics Introduction to number system- Decimal, Binary, Octal, Hexadecimal; Boolean algebra and reduction techniques, Basic logic gates, universal logic gates, Half Adder, Full Adder, Half and full subtractor.	[4]
Text Books: 1. D. Chattopadhyay, P. C. Rakshit- Electronics Fundamentals and Applications, New Age International. 2. Linear Integrated Circuits by Ramakant A. Gayakwad,PHI Learning Pvt. Ltd.	

3. Digital Circuits, Anandkumar.

Reference Books:

1. Sedra and Smith, Microelectronics Engineering.
2. John D Ryder. Electronic Fundamentals and applications, PHI.
3. J.B.Gupta, Basic Electronics.
4. Malvino: Electronic Principle.
5. Schilling and Belove: Electronics Circuits.
6. Millman and Halkins Integrated Electronics, Tata McGraw Hill.
7. Bolestead and Nashelsky Electronic Devices and Circuits Theory, PHI, 200.

Basic Civil Engineering

23MT1105	ESC	Basic Civil Engineering	1-0-0	1 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 Hrs/week	CA1-5 Marks CA2-5 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Principles of trigonometry and basic chemistry.
Course Outcomes: At the end of the course, students will be able to:

CO1	Classify branches of civil engineering and construction material.
CO2	Identify the components of buildings and structures of building.
CO3	Explain building planning and construction activities.
CO4	Explain concepts of basic surveying and advanced instruments.

Course Content:

Unit 1: Introduction to civil engineering Role of civil engineering in various engineering fields like Mechanical, Electrical, Chemical, Instrumentation, Electronics and Telecommunication etc. Role of civil engineers in various construction activities, Basic construction material- Bricks, Timber, Stone, Aggregate, Sand, Cement, Steel, Bitumen, Glass, Concrete, Mortar.	**[3]**
Unit 2: Building components Definition of Building, Types of building as per NBC, Basics components of Building -Substructure and Super structure and its function, Types of foundation.	**[3]**
Unit 3: Building planning and constructions Introduction, Principles of planning, Building bye laws, Introduction of construction activities plastering, pointing and painting.	**[3]**
Unit:4 Surveying Introduction- Importance, Objectives, Principles of surveying, Linear measurements, Prismatic compass, Types of bearings, Calculation of bearing and angle, Introduction to advance surveying instruments- DGPS, GIS, GPS, Total Station.	**[3]**

Text Books:

1. "Basic Civil Engineering" by G.K. Hiraskar
2. "Basic concepts of civil engineering" by Sunder Narayan

Reference Books:

1. Basics of Civil Engineering by S S Bhavikatti.
2. Basic Civil Engineering by Ramamrutham S.
3. Basic Civil Engineering by M.S. Palanichamy.
4. Basic Civil and Mechanical Engineering by K Mylsamy and S Shanmuga.
5. Basic Civil Engineering by Rakesh Ranjan Beohar.

Engineering Drawing

23MT1106	ESC	Engineering Drawing	1-0-0	1 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 Hrs/week	CA1-5 Marks CA2-5 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Geometry and mensuration

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret projection points, lines and planes with reference to principal planes.
CO2	Interpret development of lateral surfaces of the various kinds of solids.
CO3	Interpret the orthographic views of an object.
CO4	Interpret the isometric views of an object.

Course Contents:

Unit 1: Projection of points and lines and plane (1st Angle Projection only) Introduction to drawing instruments and their uses, Layout of drawing sheets, Lettering, Different types of lines used in drawing practice, Dimensioning system as per BIS conventions (Theoretical treatment only) a) Orthographic projection system, First and Third angle projection methods, Projection of points on regular reference planes (HRP,FRP, PRP) b) Projection of lines–Horizontal, Frontal and oblique lines; Rotation method to find front view and top view. c) Projection of planes (regular polygons and circle) inclined to one reference plane.	**[3]**
Unit 2: Development of surfaces Development of plane and curved lateral surfaces: Prisms, Pyramids, Cylinders and cones (cutting planes specified).	**[3]**
Unit 3: Orthographic projections Lines used, Selection of views, spacing of views, dimensioning and conversion of pictorial view into orthographic views.	**[3]**
Unit 4: Isometric projections Introduction to isometric, Isometric scale, Isometric projections and Isometric views/drawings, Circles in isometric view, Isometric views of simple solids and objects.	**[3]**
Text Books: 1. R.K. Dhawan, "A textbook of Engineering Drawing", S. Chand and Co.	

Reference Books:

1. N.D. Bhatt, “Engineering Drawing”, Charotor Publication House, Bombay.
2. N.D. Bhatt, “Machine Drawing”, Charotor Publication House, Bombay.
3. K. Venugopal, “Engineering Drawing and Graphics”, New Age Publication.
4. N.B. Shaha and B.C. Rana, “Engineering Drawing”, Pearson Education.

Fundamentals of Mechatronics

23MT1107	PCC	Fundamentals of Mechatronics	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 2 Hrs/week	CA1-10 Marks CA2-10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Electric current and voltage DC and AC.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain principles of mechatronics system.
CO2	Explain sensors and transducers for engineering applications.
CO3	Explain and identify actuation systems.
CO4	Explain smart materials for mechatronic systems.
CO5	Explain micro mechatronic systems and programmable logical control.
CO6	Explain micro controller and applications of mechatronics engineering.

Course Contents:

Unit 1: Basic mechatronics system Introduction, Need and Scope, Traditional v/s Mechatronics approach, Block diagram representation of general mechatronics system showing various components with suitable example, Control system – open and closed loop system, Basic elements of closed loop system.	**[5]**
Unit 2: Sensors and transducers **Sensors**: Introduction, Need of sensors, Contact and non-contact type of sensors, strain gauge elements. **Transducers**: Introduction, Primary and secondary transducers, Working of primary and secondary transducers.	**[5]**
Unit 3: Actuators Introduction and classification of actuators Need and scope, Hydraulic actuation system, Linear hydraulic actuation system-Single and double acting, Pneumatic actuation system – Gear motors and vane motors.	**[5]**
Unit 4: Smart materials Definition and classification of smart materials, Shape memory alloys, Piezoelectric materials, Magnetostrictive materials, Meta-materials.	**[5]**
Unit 5: Programmable logical controller: Introduction, Definition, Basic PLC functions, PLC block diagram.	**[5]**
Unit 6: Microcontroller and applications of mechatronics systems Comparison of microprocessor and microcontroller, Applications-Temperature control-stepper motor control, Application of mechatronics	**[5]**

systems in washing machine.	

Text books:

1. R. K. Rajput, “A textbook of mechatronics, S. Chand & Company Private Limited.
2. Sami Franssila, “Introduction to micro fabrication” Wiley 2nd Edition.
3. Yi Qin, “Micromanufacturing Engineering and Technology, Micro and nano Technology Series” Elsevier.

Reference Books:

1. Mechatronics – W. Bolton, Pearson education.
2. Mechatronics – Mahalik, Tata Mcgraw Hill.
3. Introduction to PLC Programming, NIIT, P.
4. Programmable Logical Controller, Reis Webb, Prentice Hall.
5. Automated Manufacturing Systems, S. Brain Morris, Mcgraw Hill.
6. Mechatronics – Appu Kuttam, Oxford Publications.
1. Microprocessor 8085 - Gaokar

Applied Chemistry Laboratory

23MT1108	BSC	Applied Chemistry Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: 11th and 12th science Chemistry.

Course Outcomes: At the end of the course, students will be able to:

CO1	Ability to determine the different parameters of given water sample.
CO2	Ability to prepare advanced polymer materials.
CO3	Experiment with different industrial compounds of coal material.
CO4	Demonstrate the different instrumental methods to analyze the given samples.

List of Experiments:

Sr. No	Name of Experiment
1.	Determination of chloride content of water by Mohr's method.
2.	Determination of total hardness of water by EDTA method.
3.	Determination of dissolve oxygen of water by Winkler's method.
4.	Determination of alkalinity of water.
5.	Preparation of urea-formaldehyde resin.
6.	Determination of rate of corrosion of Aluminium in acidic and basic medium.
7.	Determination of moisture, volatile and ash content from coal by proximate analysis.
8.	pH metric Titration (Acid Base titration).
9.	Demonstration of photo-colorimeter / spectrophotometer.
10.	Conductometric Titration (Acid Base titration).

Basic Electronics Engineering Laboratory

23MT1109	ESC	Basic Electronics Engineering Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basic concepts of Physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	To demonstrate the function of different electronic instruments and diode
CO2	To illustrate the different parameters of transistor (BJT).
CO3	To compare the applications of operational amplifiers.
CO4	To classify logic gates and Boolean algebra laws, various electronic appliances.

List of Experiments:

Sr. No	Name of Experiment
1.	Identification of circuit components, Breadboard and its connections.
2.	Study of CRO and measurement of voltage amplitude and frequency.
3.	To study the VI characteristics of P-N junction diode.
4.	To study the VI characteristics of Zener diode.
5.	To study Half wave Rectifier with and without filter.
6.	To study Full wave Rectifier with and without filter.
7.	To perform single stage amplifier using transistor.
8.	To study the Inverting and Non-inverting Amplifier.
9.	To study the digital logic Gates.
10.	To perform De-Morgan’s theorem.

Basic Civil Engineering Laboratory

23MT1110	ESC	Basic Civil Engineering Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hr/week	CA1: 25 Marks CA2: 25 Marks

Course outcome: At the end of the course, students will be able to:

CO1	Identify building component and various sign conventions.
CO2	Explain linear measurements by using different instruments.
CO3	Measure area by using different instruments.

List of Experiments

Sr. No	Name of Experiment
1.	Site visit showing various building components.
2.	Drawing sheet showing various building elements.
3.	Drawing sheet showing various sign conventions.
4.	Plotting the outlines of building by chaining, ranging.
5.	Offsetting by using open and French Cross staff.
6.	Introduction to various leveling instrument.
7.	Plotting of closed traverse by compass.
8.	Measurement of area by planimeter.

Engineering Drawing Laboratory

23MT1111	ESC	Engineering Drawing Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve projection of points, lines and plane planes with reference to principal.
CO2	Adopt basic knowledge of imagination and construction of various kinds of solids and development of its lateral surfaces.
CO3	Develop orthographic views of an object also make use of different basic commands of AUTOCAD to produce drawing in CAD.
CO4	Construct isometric views of an object.

Term work:

Students are supposed to draw/construct and submit all the sheets based on syllabus contents in the semester. (Sheet size-A2)

List of Experiments

Sr. No	Name of Experiment
1.	Lettering, Types of lines and methods of dimensioning and geometrical constructions.
2.	Projection of lines and planes.
3.	Development of lateral surfaces.
4.	Orthographic projections.
5.	Isometric projections.
6.	Orthographic projections on CAD software.

Workshop Practices

23MT1112	VSEC	Workshop Practices	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical:2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basics of Mechanical.

Course Outcomes: At the end of the course, students will be able to:

CO1	To make use of different tools for carpentry and welding operations with safety measures.
CO2	To develop skills in sheet metal and machine shop operations with safety measures.

Evaluation:

The evaluation consists of continuous assessment of each job and performance of work based on Workshop Practice syllabus. The term work also based on workshop diary and attendance of student.

Instructions to the student:

Each student is required to maintain a "workshop diary" consisting of drawing/sketches of the jobs and a brief description of tools, equipment and procedure used for doing the job.

Course Contents:

Unit 1: Carpentry

Technical Terms related to wood working, Types of wood, Joining materials, Types of joints -Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, carpentry tools like-Marking tools, cutting tools, planes, striking tools, holding tools, Carpentry operations-marking, sawing, chiseling, grooving etc. safety precautions.

Unit 2: Welding

Arc welding- Welding joints, Edge preparation, Welding tools and equipment, Electrode classification and coding, Safety precautions.

Unit 3: Sheet metal work

Specifications of metal sheets, working tools, Simple development and sheet metal operations like-cutting, bending, folding, punching, riveting and joining by brazing and soldering, Sheet metal machines- Bending Machine, Sheet metal joints, safety precautions.

Unit 4: Machine shop:

Lathe machine, types of lathes, major parts, cutting tool, turning, facing and drilling operations, safety precautions.

List of Experiments:

1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving

to make different types of joint.

2. Exercise in Arc welding to make a joint.
3. Making a small parts using GI sheet involving development ,marking, cutting, bending, brazing and soldering operations-i) Tray ii) Dustbin iii) funnel, etc. and similar articles.
4. A job on turning of a Mild Steel cylindrical job using center lathe.

Reference Books:

1. A Course in Workshop Technology, Vol–I by B.S. Raghuvanshi, Dhanapat Rai and Sons.
2. Elements of Workshop Technology, Vol–I by Hajara Chaudhari, Media Promoters.
3. Workshop Technology, Vol–I by Gupta and Kaushik, New Heights.
4. Workshop Technology, Vol–I by Chapman, The English Language Book Society.
5. Workshop Technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.
6. K.C. John, Mechanical Workshop Practice ,Prentice Hall Publication, New Delhi, 2010.

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Mechatronics Workshop

23MT1113	VSEC	Mechatronics Workshop	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basic concepts Mechanical.

Course Outcomes: At the end of the course, students will be able to:

CO1	To make use of different tools for fitting, and spot welding operations with safety measures.
CO2	To develop skills smithy and plumbing operations with safety measures.

Course Contents:

Unit 1: Smithy

Introduction to smithy operations like- bending, Forming, upsetting, Drawing, Smithy tools - hammer, Hot and cold chisel flatters, Tongs, anvil etc. Safety precautions.

Unit 2: Plumbing

Different types of pipes, Joints, taps, Fixtures and accessories used in plumbing, Safety precautions.

Unit 3: Fitting

Fitting operation like chipping, Filing, Right angle, Marking, Drilling, Tapping etc., Fitting handtools like vices, Cold chisel, etc. Drilling machine and its operation, Safety precautions.

Unit 4: welding

Resistance welding - Spot welding, Safety precautions.

List of Experiments:

1. A job on smithy involving upsetting, Drawing, bending such as- Hook, peg, chisel,square headed bolt or similar articles.
2. A job on use of plumbing tools and preparation of plumbing line involving fixing ofwater tap and use of elbow, tee, union and coupling.
3. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding,drilling and tapping on M. S. plates.
4. Exercise in Resistance (Spot) welding to make a lap joint.
5. One Industrial visit to understand the basics of workshop practices

Reference Books:

1. A Course in Workshop Technology, B.S. Raghuvanshi, Dhanapat Rai and Sons.
2. Elements of Workshop Technology, Vol–I by Hajara Chaudhari, Media Promoters.
3. Workshop Technology, Vol –I by Gupta and Kaushik, New Heights.
4. Workshop Technology, Vol –I by Chapman, The English Language Book Society.
5. Workshop Technology, Vol.-I by H.S. Bawa, TMH Publications, New

Delhi.
6. K.C. John, Mechanical Workshop Practice, Prentice Hall Pub., Delhi, 2010

Applied Mathematics-II

23MT1201	BSC	Applied Mathematics-II	3-1-0	4 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 Hrs/week Tutorial: 1 Hrs/week	CA1-10 Marks CA2-10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: HSC Mathematics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the reduction formula to evaluate definite integral and develop the ability to trace the curve for a given equation of curve and its nature.
CO2	Apply the concept of change of variable and change of order of integration to evaluate multiple integral and their usage in computing area and volumes.
CO3	Apply the concept of O.D.E.to solve first order linear and exact differential
CO4	Apply the first order linear and exact differential equations to solve the problems related to electric circuit, mechanical system etc.
CO5	Solve the first order and first degree differential equations numerically.
CO6	Solve higher order linear differential equations with constant coefficients.

Course Contents:

Unit 1: Curve tracing and Reduction formulae Reduction formulae: $\int_0^{\frac{\pi}{2}} sin^n x dx, \int_0^{\frac{\pi}{2}} cos^n x dx$ and $\int_0^{\frac{\pi}{2}} sin^m x\, cos^n x dx$(m and n are positive integers) and problems. Tracing of the curves given in Cartesian and polar forms; Rectification of plane curves in Cartesian and Polar form.	**[8]**
Unit 2: Multiple integrals and its application Double integration in Cartesian and polar co-ordinates, Evaluation of double integrals by changing the order of integration and changing to polar form, Triple integral, Area enclosed by plane curves, Mass of a plane lamina.	**[8]**
Unit 3: Ordinary differential equation of first order and first degree Introductory remarks- Order, Degree and formation of differential equations, Linear differential equations, Reducible to Linear differential equations, Exact differential equations, Reducible to exact differential equations.	**[6]**
Unit 4: Applications of ordinary differential equation of first order and first degree Application to electric circuit, Orthogonal trajectories, Newton's law of cooling and rate of decay and growth.	**[6]**
Unit 5: Numerical solution of ordinary differential equations of first	**[6]**

order and first degree Numerical solution by Picard's method, Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta fourth order formula	
Unit 6: Linear differential equations with constant coefficients Introductory remarks- Complementary function, particular integral; Rules for finding complementary function and Particular integral; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear differential equation.	**[8]**

Text Books:

1. P. N. Wartikar and J. N. Wartikar: A Text Book of Applied Mathematics (Vol I and II), Pune Vidyarthi Griha Prakashan, Pune.
2. N. P. Bali: A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.
3. Peter O" Neil: A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

Reference Books:

1. B. S. Grewal: Higher Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons.
3. B. V. Ramana: Higher Engineering Mathematics, McGraw-Hill Publications,New Delhi
4. C. R. Wylie and L. C. Barrett: advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.

Applied Physics

23MT1202	BSC	Applied Physics	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 2 Hrs/week	CA1 -10 Marks CA2- 10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Basic concepts of optics, solid state physics and modern physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the basic of interference, diffraction, polarization for their engineering applications.
CO2	Make use of laser technology and optical fibers in various disciplines.
CO3	Explain the basic concepts of rotational motion and pendulum.
CO4	Apply the knowledge of crystallography to study various engineering materials.
CO5	Solve the problems by applying the basics of semiconductors and dielectrics.
CO6	Summarize the basic knowledge of nanotechnology and Nano-materials.

Course Contents:

Unit 1: Interference, diffraction and polarization Introduction, Interference of light in thin films, Diffraction grating construction theory, Derivation of measurement of wavelength using diffraction grating, Polarization of light, Methods of production of polarized light, Huygens theory of double refraction.	**[5]**
Unit 2: LASER and fibre optics Introduction, Principle of laser, Types of laser, Population inversion and pumping, Applications of laser, Introduction of optical fibre, Structure of optical fibre, Propagation mechanism of light through optical fibre, applications of optical fibre.	**[5]**
Unit 3: Rotational motion and pendulum Introduction, Analogy of rotational motion with translational motion, Moment of inertia of a spherical shell and solid cylinder, Motion of spherical shell and solid cylinder rolling down an inclined plane, Compound pendulum, Kater's pendulum and Bessel's formula.	**[5]**
Unit 4: Crystallography Introduction, Space lattice and seven crystal system, Unit cell, Bravais lattice, Properties of cubic unit cell, Relation between lattice constant and density, Lattice planes and Miller indices, Interplanner spacing for cubic system, X-ray diffraction, Bragg's law, X-ray spectrum.	**[5]**
Unit 5: Semiconductor and dielectrics Introduction**,** Intrinsic and extrinsic semiconductor, Conductivity of	**[5]**

semiconductor, Hall Effect, Application of semiconductor, Introduction of dielectrics, Dielectric parameters, Types of polarization, Dielectric materials, Frequency and temperature dependence of dielectric materials.	
Unit 6: Nanophysics Introduction, Top down and bottom up approach for synthesis of nonmaterial's, Length scales relevant to nanoscience, Carbon nanotubes (CNTs)- structure and types, Properties and applications of CNTs, Applications of Nanophysics, Scanning electron microscopy, Transmission electron microscopy.	**[5]**

Textbooks:

1. M. N. Avadhanulu and P.G. Kshirsagar, A Textbook of Engineering Physics, S Chand Publication 2007.
2. B. K. Pandey and S. Chaturvedi, Engineering Physics: – Cengage Publications.
3. N.S. Khare and S. Kumar. A text Book of properties of matter, Atmaram and sons New Delhi.

Reference Books:

1. Geometrical and Physical optics by D. S. Mathur.
2. Laser and Non-liner optics by B.B. Laud.
3. S. O. Pillai, Solid State Physics.
4. Physics- S.G. Starling and Woodal Longmams and Green Co. Ltd.
5. R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications.
6. C.M. Srivastava and C. Srinivasan, Science of Engineering Materials, Wiley publication.
7. Nanotechnology, Dr. Sulbha K Kulkarni, Capital Publishing Co, 2011, Second Ed.

Communication Skills

23MT1203	AEC	Communication Skills	1-0-0	1 Credit

Teaching Scheme:	Evaluation Scheme:
Lectures: 1 Hrs/week	CA1 -5 Marks CA2- 5 Marks Mid Semester Examination: 15 Marks End Semester Examination: 25 Marks

Pre-Requisites: Basic knowledge of English language with grammar.

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate concept of communication and its process.
CO2	Relate the knowledge of reading and listening skills.
CO3	Apply the knowledge of oral communication and presentation skills.
CO4	Make use of grammar correctly.

Course Contents:

Unit 1: Fundamentals of communication Nature and importance of communication, process of communication, types and functions of communication, Types of barriers to communication and solutions to overcome it.	**[3]**
Unit 2: Effective comprehension skills **Listening:** Importance of listening, Types of listening, Barriers to listening and techniques for effective listening. **Reading:** Introduction to reading, Types of reading, Barriers to reading	**[3]**
Unit 3: Oral communication skills Features of effective oral communication, Appropriate use of non-verbal communication, Group discussion, Public speaking, Job Interview, Telephonic etiquettes.	**[3]**
Unit 4: Basic English grammar Articles, Sentence formation and sentence structures, Aspects of tenses, Subject-verb agreement, Use of auxiliaries and modal auxiliaries, Common errors.	**[3]**

Text Books:

1. Sanjay Kumar, PushpLata, Communication Skills, Oxford University Press, 2016
2. Meenakshi Raman, Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2017
3. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill, New Delhi

Reference Books

1. Bovee Courtland, L and Thrill, John V. Business Communication, Tata McGraw Hill, New York, Taxman Publication (1989).
2. G.S. Kushwaha, English Phonetics and Pronunciation for Indian Learners, Notion Press

Fundamentals of Mechanical Engineering

23MT1204	ESC	Fundamentals of Mechanical Engineering	1-0-0	1 Credit

Teaching Scheme:	Evaluation Scheme:
Lecture: 1 Hrs/week	CA1 -5 Marks CA2- 5 Marks Mid Semester Examination: 15 Marks End Semester Examination: 25 Marks

Pre-Requisites: General Physics and Chemistry

Course Outcomes: At the end of the course, students will be able to:

CO1	Describe Various thermodynamic systems and laws of thermodynamics.
CO2	Explain different types of links, mechanisms and machines in mechanical engineering.
CO3	List different types of manufacturing processes and different engineering materials.
CO4	Describe different power plants and Energy conversion devices.

Course Contents:

Unit 1: Introduction to thermal engineering Thermodynamic State, Process, cycle, Thermodynamic system, Heat, work, Internal Energy, Zeroth law, First law of thermodynamics and its application to various mechanical elements, Limitations of first law of thermodynamics, Introduction to IC Engine: Construction and working of C.I. and S.I. engine, two stroke and four stroke cycles, Introduction to Refrigeration and Air conditioning: Vapour compression and Vapour absorption system, window Air conditioning (Descriptive treatment only).	**[3]**
Unit 2: Introduction to machine, gear train and its application Difference between machine and structure, Definition of link, Pair, Kinematic chain, Different motions involved in Mechanisms, types of gears and gear trains, study of different machines such as Drilling, Lathe, Milling.	**[3]**
Unit 3: Introduction to manufacturing processes Casting Process, Steps involved in sand casting process, Metal removing processes: Turning, Drilling, Milling, Boring, Grinding, Super finishing operations (Applications of each metal removing process), Metal Joining processes: Introduction to Welding, Soldering, and Brazing Process (Applications of each metal joining process), Materials used in engineering and their applications: Metals- Ferrous and Non-Ferrous, Nonmetallic materials, material selection criteria.	**[3]**
Unit 4: Introduction to power plants and energy conversion devices Power Plants: Solar, Steam, Hydroelectric, Nuclear, Bio-Diesel Power plants (Descriptive treatment only) Energy conversion devices: Pumps, Compressors, Turbine.	**[3]**

Text Books:

1. Thermal Engineering by R.K. Rajput, Laxmi publication, Delhi..
2. Engineering Thermodynamics by Achultan, Prentice Hall of India.
3. Elements of Heat Engine Vol.I,II,III by patel and karamchandani, Acharya Book Depot.
4. Elements of Workshop Technology, Vol.I and II by Hajara Choudhari, Media Promoters.
5. Theory of Machines by S.S. Ratan.
6. Internal combustion Engine by V. Ganesan, Tata McGraw-Hill Publication.
7. Power plant Engineering by arora and Domkunwar, Dhanpatrai and sons publication.

Reference Books:

1. Manufacturing Technology Volume I and II by P.N. Rao, Tata McGraw-Hill Publication.
2. Basic Mechanical Engineering by Basant Agraval and C.M.Agrawal, Wiley India Pvt Ltd.
3. S. Hall, A.R. Holowenko, H.G. Langhlin, ”Theory and Problems of Machine Design.”, Schaum’s outline series, Tata McGraw-Hill book company, New York, 1982.

Basic Electrical Engineering

23MT1205	ESC	Basic Electrical Engineering	1-0-0	1 Credit

Teaching Scheme:	Evaluation Scheme:
Lecture:1 Hrs/week	CA1 -5 marks CA2-5 Marks Mid Semester Examination: 15 Marks End Semester Examination: 25 Marks

Pre-Requisites: Basic concepts of Physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	To explain electrical quantities and laws.
CO2	To explain magnetic quantities, laws and induction principle.
CO3	To explain fundamentals of ac circuit.
CO4	To explain operation principles of electrical machines.

Course Contents:

Unit 1: Elementary concepts Electric current, electric potential, EMF, Resistance, power, energy, ohm's law, series and parallel circuits, KVL, KCL (simple numerical).	**[3]**
Unit 2: Electromagnetic induction Definition of magnetic quantities: Magnetic circuit, leakage flux, fringing effect, Comparison between magnetic and electric circuit, Faraday's law of electromagnetic induction, Lenz's law, laws of electromagnetic forces, principle of self and mutual induction.	**[3]**
Unit 3: Fundamentals of AC circuits Generation of voltage, Phase, average value, RMS, Power factor, Form factor, power-active, reactive and apparent peak factor, phasor diagram. (Simple numerical).	**[3]**
Unit4: Basics of electrical machines Concepts of machine, Introduction, DC Motor –operation principle of DC Motor, Classification and industrial applications, **Transformer**- operating principle of single phase transformer and industrial applications, **AC Machine**- operating principle of single phase induction motor and industrial applications.	**[3]**

Text Books:

1. "Basic Electrical Engineering" by Nagrath, I and Kothari.
2. "Basic Electrical Engineering" by Mittle, V and Arvind Mittle.
3. "Basic Electrical Engineering" by C L Wadhwa.

Reference Books

1. "Basic Electrical Engineering" by T K Nagsarkar and M S Sukhija.
2. "Abc of Electrical Engineering" by Theraja B L and Theraja A K.
3. "Basic Electrical and Electronics Engineering" by S K Bhattacharya.

Engineering Mechanics

23MT1206	ESC	Engineering Mechanics	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 2 Hrs/week	CA1-10 Marks CA2-10 Marks Mid Semester Examination – 30 Marks End Semester examination – 50 Marks

Pre-Requisites: Basic concepts of physics and mathematics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the fundamental laws of mechanics.
CO2	Make use of concept of statics equilibrium.
CO3	Solve the various types of frames.
CO4	Find the centroid and moment of inertia.
CO5	Apply the knowledge of kinematics and kinetics.
CO6	Explain the concept of work , energy and impact.

Course Contents:

Unit 1: Fundamentals of statics Basic terms in mechanics, Fundamental law's of mechanics. Force, Moment and couple, system of forces, Characteristics of force, Resultant, Resolution and composition of forces, Varignon's theorem.	**[5]**
Unit 2: Equilibrium Equilibrium of forces, analytical conditions of equilibrium, Free body diagram, Lami's theorem, Beam, Types of beams, types of supports, types of load, Analysis of beams reactions	**[5]**
Unit 3: Analysis of frames (Truss) Types of frames, Assumptions, Methods of analysis:- method of joints (for plane trusses), method of sections (for plane trusses).	**[5]**
Unit 4: Centroid and moment of inertia Centroid and center of gravity, Moment of inertia of standard shapes, Parallel and perpendicular axis theorem, Moment of inertia of plain and composite figures, Radius of gyration.	**[5]**
Unit 5: Dynamics Types of motion, Introduction to kinematics of linear motion (Constant and variable acceleration), Acceleration due to gravity, Kinetics of linear motion- D Alembert's principle, Impulse momentum principle.	**[5]**
Unit 6: Work, energy and impact Impact, Types of Impact, Principle of conservation of momentum, Coefficient of restitution, Numerical on direct central Impact, Work, Energy, Power, Work- Energy equation, Loss of kinetic energy.	**[5]**

Textbooks:

1. Engineering Mechanics by S. S. Bhavikattis, New Age International Pvt. Ltd.
2. Engineering Mechanics by R. S. Khurmi, S. Chand Publications).
3. Engineering Mechanics by R. K. Bansal and Sanjay Bansal.

Reference Books:

1. Vector Mechanics for Engineers Vol.I and II by F. P. Beer and E. R. Johnston, Tata Mc-Graw Hill Publication.
2. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi.
3. Engineering Mechanics by Statics and Dynamics by Ferdinand Singer, Harper and Row Publications.
4. "Applied Mechanics- Dynamics and Statics " by I.B. Prasad, Khanna Publisher, Delhi.

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Problem Solving Using C Programming

23MT1207	VSEC	Problem Solving Using C Programming	2-0-0	2 Credits

Teaching Scheme:	Evaluation Scheme:
Lecture:2 Hrs/week	CA1 -10 Marks CA2- 10 Marks Mid Semester Examination: 30 Marks End Semester Examination: 50 Marks

Pre-Requisites: Basics of Algorithm and flow chart

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline basic terminologies used in C Programming.
CO2	Demonstrate the fundamentals of control structures in C programming.
CO3	Demonstrate the concept of arrays and string handling functions.
CO4	Apply concepts of functions.
CO5	Apply concepts of structures.
CO6	Apply concepts of pointers.

Course Contents:

Unit 1: Basics of C Algorithm, Flowchart, Introduction of C, History and features of C, Basic structure of C program, Role of compiler and interpreter, Building an executable version of a C Program, Data type, Tokens- Identifiers, Keywords, Constants, Operators, Special characters and strings, Formatted input/output function, Reading/Writing characters.	**[5]**
Unit 2: Control statements in C Simple if, if-else Statement, Nesting of if-else, if-else ladder, Switch statements, while loop, do-while loop, for loop.	**[5]**
Unit 3: Arrays in C What and Why? One dimensions arrays; Multi dimensions arrays-Two dimensions arrays, Reading string from terminal, Writing string to screen, String handling functions.	**[5]**
Unit 4: Functions in C Function definition, Advantage of function, Types of function- built-in function, User defined function, Categories of function, Recursion, Variable storage class	**[5]**
Unit 5: Structures in C Basics of structure, Advantage of structure, Size of structure, Array of structures, Structure and function, Defining unions.	**[5]**
Unit 6: Pointer in C Introduction to pointer, Pointer expressions, Pointer and arrays, Pointers to functions- call by reference, Structures and pointer.	**[5]**

Text Books:

1. ."Let us C" by Yashwant Kanetkar
2. Computing Fundamentals and C Programming | 2nd Edition, by E Balagurusamy

Reference Books:

1. The C Programming Language by Brian Kernighan and Dennis Ritchie.
2. C: The Complete Reference by By Herbert Schildt.

Applied Physics Laboratory

23MT1208	BSC	Applied Physics Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basic concepts of optics, solid state physics and modern physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the I-V characteristic and band gap energy of semiconductor.
CO2	Understand the basic concept of LASER and fibre optics.
CO3	Demonstrate the knowledge of motion and pendulum, grating and crystal structure.
CO4	Develop the basic knowledge of Hall effect, Ultrasonic Interferometer and Newton's ring.

List of Experiments:

Sr. No	Name of Experiment
1.	To determine the wavelength of monochromatic light using Newton's rings.
2.	To find the wavelength of light with the help of plane diffraction grating.
3.	To determine the wavelength of He-Ne laser light using plane diffraction grating.
4.	To calculate numerical aperture of optic fibre by laser diode.
5.	To calculate the moment of inertia of a disc using auxiliary annular ring.
6.	To determine the acceleration due to gravity by using Kater's pendulum.
7.	To analyze crystal structure and miller indices of various planes.
8.	To determine the Hall coefficient of a given current carrying conductor.
9.	To determine band gap energy of given semiconductor.
10.	To study I-V characteristics of P-N junction diode.

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Communication Skills Laboratory

23MT1209	AEC	Communication Skills Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1- 25 Marks CA2- 25 Marks

Pre-Requisites: Basic knowledge of English language with grammar.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop received pronunciation with stress and intonation.
CO2	Take part in group discussion, elocution and debate.
CO3	Utilize writing skills effectively.
CO4	Make use of presentation and interview techniques effectively.

List of Experiments:

Sr. No	Name of Experiment
1.	Ice breaking: Problems I face while communicating (LSRW).
2.	Vocabulary building: Activities and Games.
3.	Introduction to phonetic symbols (Consonants, Vowels and diphthongs).
4.	Pronunciation/transcription from the dictionary.
5.	Stress and intonation.
6.	Elocution and Extempore.
7.	Group discussion and Debate.
8.	Interview techniques.
9.	Letter writing with resume.
10.	Presentation techniques.

Fundamentals of Mechanical Engineering Laboratory

23MT1210	ESC	Fundamentals of Mechanical Engineering Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1-25 Marks CA2:25 Marks

Pre-Requisites: Basic concepts of Physics and chemistry

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate I.C Engine and explain working of two stroke four stroke engine.
CO2	Explain working of vapor compression refrigeration system and window air conditioner.
CO3	Demonstrate Gear and gear trains and explain working of lathe drilling machine.
CO4	Choose Engineering materials with their applications and explain working of power plants and energy conversion devices.

List of Experiments:

Sr. No	Name of Experiment
1.	Demonstration of I.C. Engine.
2.	Demonstration of two stroke and four stroke engine.
3.	Demonstration of vapor compression refrigeration system and window air conditioner.
4.	Demonstration of types of gears and gear trains .
5.	Demonstration of operations of center lathe (turning, step turning, facing, boring, taper turning, knurling, grooving, threading).
6.	Demonstration of operations on drilling machines (drilling, reaming, spot facing, counter boring).
7.	Case study on engineering materials and their applications.
8.	Demonstration of solar water heating system.
9.	Demonstration of pumps and compressors.
10.	Industrial visit based on syllabus.

Basic Electrical Engineering Laboratory

23MT1211	ESC	Basic Electrical Engineering Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical:2 Hrs/week	CA1-25 Marks CA2-25 Marks

Pre-Requisites: Applied Physics.

Course Outcomes: At the end of the course, students will be able to

CO1	Explain different meters and instruments for measurement of electrical quantities
CO2	Explain Basic methods of Earthing and study how to Measure earth resistance and insulation resistance by using megger.
CO3	Test for performance parameters of electrical machines.

List of Experiments:

Sr. No	Name of Experiment
1.	Study of electric symbol and wiring components.
2.	Measurement of electrical quantities.
3.	Study of earthing.
4.	Verification of equivalent resistance for series and parallel circuit.
5.	Verify KVL and KCL.
6.	Speed control of DC motor.
7.	Perform open circuit and short circuit test on transformer
8.	Direction of rotation reversal of single phase induction motor.
9.	Use of megger for insulation testing and continuity test.
10.	Study of different types of lamps.

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Engineering Mechanics Laboratory

23MT1212	ESC	Engineering Mechanics Laboratory	0-0-2	1 Credit

Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basic concepts of physics and mathematics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of the equilibrium concept.
CO2	Identify support reaction, centroid and Coefficient of friction.
CO3	Solve the problems on resultant, support reaction and truss by graphical method.

List of Experiments:

Sr. No	Name of Experiment
1.	Polygon law of forces.
2.	Lami's theorem.
3.	Bell Crank Lever.
4.	Jib Crane Apparatus.
5.	Support reaction for beam.
6.	Centroid of irregular shaped bodies.
7.	To determine coefficient of friction.
8.	Graphical method to determine resultant.
9.	Graphical method to determine support reaction for beam.
10.	Graphical method to determine the forces in truss.

Problem Solving Using C Programming Laboratory

23MT1213	VSEC	Problem Solving Using C Programming Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical:2 Hrs/week	CA1- 15 Marks CA2- 15 Marks Practical Oral Examination-20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Design algorithm and flow chart for logical solution.
CO2	Develop the programs on the basic programming concepts.
CO3	Understand the syntax and develop programs based on control structures.
CO4	Demonstrate the knowledge of array and structure and develop programs.
CO5	Develop the programs on user defined functions.
CO6	Demonstrate the knowledge of pointer and develop programs.

List of Experiments:

Sr. No	List of Experiment
1.	Simple program to display message.
2.	Program to display data using '\n' and '\t'.
3.	Program to Calculate area of circle by using constant.
4.	Program to perform arithmetic operators.
5.	Program using conditional operator.
6.	Program to check person is eligible for voting using simple if statement.
7.	Program to check no. is even or odd using if else statement.
8.	Program to check no. is divisible by 2 and 5 using logical operators.
9.	Program to check no. is positive or negative or zero using if else ladder.
10.	Program to find largest no. from three nos using nested if else.
11.	Program to create calculator using switch case.
12.	Program to check alphabet is vowel or consonant using switch case.
13.	Program to display 1 to n numbers in reverse order.
14.	Program to calculate addition of 1 to n numbers.
15.	Program to calculate sum of digit.
16.	Program to check no is palindrome or not.
17.	Program to check no. is prime or not.
18.	Program to calculate factorial of given number.
19.	Program to display Fibonacci series.
20.	Program on nested for loop.
21.	Program to traversing 1D array.
22.	Program to calculate addition of elements of array.

23.	Program to find largest number from array.
24.	Program to traversing 2D array.
25.	Program to calculate addition of two 2D arrays.
26.	Program on string handling functions.
27.	Program to calculate multiplication of two nos using without argument and without return.
28.	Program to calculate division of two nos using without argument and with return.
29.	Program to calculate area of rectangle using with argument and without return.
30.	Program to calculate area of triangle using with argument and with return.
31.	Program to calculate square and cube of no. using two different functions.
32.	Program to calculate factorial of no using recursion.
33.	Program to calculate sum of 1 to n nos using recursion
34.	Program to implement Student structure take data from user and display.
35.	Program to implement Employee structure take data from of 3 employees and display.
36.	Program to display address and value of different data types using pointer.
37.	Program to calculate division of two nos using pointer.
38.	Program to calculate sum of elements of array using pointer.
39.	Program to implement call by reference.
40.	Program on structure and pointer.