

## COURSE STRUCTURE

<b>I- BTECH I SEM (Common to CIVIL, EEE, MECH, ECE)</b>									
COURSE CODE	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-00BS06	LINEAR ALGEBRA AND ADVANCED CALCULUS	BSC	3	1	0	3	30	70	100
AS20-00BS02	ENGINEERING CHEMISTRY	BSC	3	1	0	3	30	70	100
AS20-02ES01	BASIC ELECTRICAL ENGINEERING	ESC	3	1	0	3	30	70	100
AS20-00HS01	ENGLISH	HSMC	2	0	0	2	30	70	100
AS20-03ES01	ENGINEERING MECHANICS	ESC	3	1	0	3	30	70	100
<b>PRACTICAL COURSES</b>									
AS20-02ES02	BASIC ELECTRICAL ENGINEERING LAB	ESC	0	0	2	1	30	70	100
AS20-00HS02	ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB	HSMC	0	0	3	1.5	30	70	100
AS20-00BS03	ENGINEERING CHEMISTRY LAB	BSC	0	0	2	1	30	70	100
<b>VALUE ADDED COURSE</b>									
AS20-00HS03	SOFT SKILLS-I	HSMC	2	0	0	0	25	75	100
<b>TOTAL</b>						<b>17.5</b>			

**I BTECH II SEM (CIVIL, EEE, MECH, ECE)**

COURSE CODE	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-00BS01	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	BSC	3	1	0	3	30	70	100
AS20-00BS04	ENGINEERING PHYSICS	BSC	3	1	0	3	30	70	100
AS20-05ES01	PROGRAMMING FOR PROBLEM SOLVING	ESC	3	1	0	3	30	70	100
AS20-03ES02	ENGINEERING GRAPHICS AND DESIGN	ESC	2	0	3	3.5	30	70	100
AS20-03ES03	WORKSHOP TECHNOLOGY	ESC	3	1	0	3	30	70	100
<b>PRACTICAL COURSES</b>									
AS20-00BS05	ENGINEERING PHYSICS LAB	BSC	0	0	3	1.5	30	70	100
AS20-05ES02	PROGRAMMING FOR PROBLEM SOLVING LAB	ESC	0	0	3	1.5	30	70	100
AS20-03ES04	ENGINEERING PRACTICES	ESC	0	0	4	2	30	70	100
<b>VALUE ADDED COURSE</b>									
AS20-00HS04	SOFT SKILLS-II	HSMC	2	0	0	0	25	75	100
<b>TOTAL</b>						<b>20.5</b>			

<b>II BTECH I SEM</b>									
Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-00HS07	UNIVERSAL HUMAN VALUES-II	HSMC	3	1	0	3	30	70	100
AS20-03PC01	MECHANICS OF SOLIDS	PC	3	1	0	3	30	70	100
AS20-03PC02	PRODUCTION TECHNOLOGY	PC	3	1	0	3	30	70	100
AS20-03ES05	MATERIAL SCIENCE AND METALLURGY	ES	3	1	0	3	30	70	100
AS20-03PC03	THERMODYNAMICS	PC	3	1	0	3	30	70	100
<b>PRACTICAL COURSES</b>									
AS20-03PC04	MECHANICS OF SOLIDS LAB	PC	0	0	3	1.5	30	70	100
AS20-03PC05	PRODUCTION TECHNOLOGY LAB	PC	0	0	3	1.5	30	70	100
AS20-03ES06	MATERIAL SCIENCE AND METALLURGY LAB	ES	0	0	3	1.5	30	70	100
<b>MANDATORY COURSE</b>									
AS20-00MC01	ENVIRONMENTAL SCIENCE	MC	3	0	0	0	0	100	100
<b>VALUE ADDED COURSE* (ANY ONE COURSE OF CHOICE)</b>									
AS20-03PW01	CREO FOR BEGINNERS	PW	0	0	2	1	25	75	100
AS20-03PW02	CATIA FOR BEGINNERS	PW	0	0	2	1	25	75	100
AS20-03PW03	MAT LAB FOR BEGINNERS	PW	0	0	2	1	25	75	100
AS20-05PW02	PROJECT BASED LEARNING USING C++	PW	0	0	2	1	25	75	100
AS20-02PW09	HYBRID & ELECTRIC VEHICLE DESIGN TRAINING	PW	0	0	2	1	25	75	100
<b>TOTAL</b>						<b>20.5</b>			

II BTECH II SEM									
Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-00BS11	PROBABILITY, STATISTICS & COMPLEX VARIABLES	BSC	3	1	0	3	30	70	100
AS20-03PC06	KINEMATICS OF MACHINERY	PC	3	1	0	3	30	70	100
AS20-03PC07	THERMAL ENGINEERING-I	PC	3	1	0	3	30	70	100
AS20-03PC08	FLUID MECHANICS & HYDRAULIC MACHINES	PC	3	1	0	3	30	70	100
AS20-03ES07	INSTRUMENTATION AND CONTROL SYSTEMS	ES	3	1	0	3	30	70	100
PRACTICAL COURSES									
AS20-03PC09	THERMAL ENGINEERING LAB	PC	0	0	3	1.5	30	70	100
AS20-03PC10	FLUID MECHANICS & HYDRAULIC MACHINES LAB	PC	0	0	3	1.5	30	70	100
AS20-03ES08	INSTRUMENTATION AND CONTROL SYSTEMS LAB	ES	0	0	3	1.5	30	70	100
MANDATORY COURSE									
AS20-00MC02	GENDER SENSITIZATION	MC	3	0	0	0	0	100	100
VALUE ADDED COURSE* (ANY ONE COURSE OF CHOICE)									
AS20-03PW04	SOLID WORKS	PW	0	0	2	1	25	75	100
AS20-03PW05	HYPERMESH	PW	0	0	2	1	25	75	100
AS20-03PW06	SCI LAB	PW	0	0	2	1	25	75	100
AS20-04PW04	SENSOR TECHNOLOGY	PW	0	0	2	1	25	75	100
AS20-02PW05	SOLAR PLANT DESIGN AND ENGINEERING	PW	0	0	2	1	25	75	100
<b>TOTAL</b>						<b>20.5</b>			

III BTECH I SEM									
Course Code	COURSE TITLE	COURSE AREA	HOURS/WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PC11	METROLOGY AND MACHINE TOOLS	PC	3	1	0	3	30	70	100
AS20-03PC12	THERMAL ENGINEERING-II	PC	3	1	0	3	30	70	100
AS20-03PC13	DYNAMICS OF MACHINERY	PC	3	1	0	3	30	70	100
AS20-03PE1X	PROFESSIONAL ELECTIVE-I	PE	3	1	0	3	30	70	100
AS20-03OE1X	OPEN ELECTIVE-I	OE	3	0	0	3	30	70	100
PRACTICAL COURSES									
AS20-03PC14	METROLOGY AND MACHINE TOOLS LAB	PC	0	0	3	1.5	30	70	100
AS20-03ES09	MACHINE DRAWING PRACTICE THROUGH AUTOCAD	ES	0	0	3	1.5	30	70	100
AS20-03PC15	KINEMATICS & DYNAMICS LAB	PC	0	0	3	1.5	30	70	100
MANDATORY COURSE									
AS20-00MC04	PROFESSIONAL ETHICS	MC	3	0	0	0	0	100	100
AS20-00MC06	CYBER SECURITY	MC	3	0	0	0	0	100	100
VALUE ADDED COURSE* (ANY ONE COURSE OF CHOICE)									
AS20-00HS10	APTITUDE SKILLS	HSMC	2	0	0	1	25	75	100
AS20-00HS11	STARTUP MANAGEMENT	HSMC	2	0	0	1	25	75	100
AS20-00HS12	ERP TOOLS	HSMC	2	0	0	1	25	75	100
<b>TOTAL</b>						<b>20.5</b>			

**Professional Elective-I**

Course Code	COURSE TITLE	COURSE AREA	HOURS/WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE11	UNCONVENTIONAL MACHINING PROCESSES	PE	3	1	0	3	30	70	100
AS20-03PE12	TOOL DESIGN	PE	3	1	0	3	30	70	100
AS20-03PE13	PRODUCTION PLANNING & CONTROL	PE	3	1	0	3	30	70	100
AS20-03PE14	FINITE ELEMENT METHODS	PE	3	1	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**Open Elective-I**

Course Code	COURSE TITLE	COURSE AREA	HOURS/WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03OE11	OPTIMIZATION TECHNIQUES	OE	3	0	0	3	30	70	100
AS20-03OE12	FUNDAMENTALS OF MECHANICAL ENGINEERING	OE	3	0	0	3	30	70	100
AS20-03OE13	INTRODUCTION TO MECHATRONICS	OE	3	0	0	3	30	70	100
AS20-03OE14	COMPUTER GRAPHICS	OE	3	0	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**III BTECH II SEM**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PC16	REFRIGERATION & AIR CONDITIONING	PC	3	1	0	3	30	70	100
AS20-03PC17	HEAT TRANSFER	PC	3	1	0	3	30	70	100
AS20-03PC18	DESIGN OF MACHINE MEMBERS	PC	3	1	0	3	30	70	100
AS20-03PE2X	PROFESSIONAL ELECTIVE-II	PE	3	1	0	3	30	70	100
AS20-03OE2X	OPEN ELECTIVE-II	OE	3	0	0	3	30	70	100
<b>PRACTICAL COURSES</b>									
AS20-03PC19	REFRIGERATION & AIR CONDITIONING LAB	PC	0	0	3	1.5	30	70	100
AS20-03PC20	HEAT TRANSFER LAB	PC	0	0	3	1.5	30	70	100
AS20-00HS05	ADVANCED ENGLISH COMMUNICATION SKILLS LAB	HSMC	0	0	3	1.5	30	70	100
<b>MANDATORY COURSE</b>									
AS20-00MC03	CONSTITUTION OF INDIA	MC	3	0	0	0	0	100	100
AS20-00MC05	ARTIFICIAL INTELLIGENCE	MC	3	0	0	0	0	100	100
<b>VALUE ADDED COURSE* (ANY ONE COURSE OF CHOICE)</b>									
AS20-03PW07	ANSYS	PW	0	0	2	1	25	75	100
AS20-03PW08	FUNDAMENTALS OF FEA	PW	0	0	2	1	25	75	100
AS20-03PW09	REVIT MEP	PW	0	0	2	1	25	75	100
AS20-12PW05	3D PRINTING DESIGN	PW	0	0	2	1	25	75	100
AS20-01PW13	BASICS OF SURVEYING	PW	0	0	2	1	25	75	100
<b>TOTAL</b>						<b>20.5</b>			

**Professional Elective-II**

Course Code	COURSE TITLE	COURSE AREA	HOURS/WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE21	IC ENGINES AND GAS TURBINES	PE	3	1	0	3	30	70	100
AS20-03PE22	CNC TECHNOLOGY	PE	3	1	0	3	30	70	100
AS20-03PE23	COMPOSITE MATERIALS	PE	3	1	0	3	30	70	100
AS20-03PE24	COMPUTATIONAL FLUID DYNAMICS	PE	3	1	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**Open Elective-II**

Course Code	COURSE TITLE	COURSE AREA	HOURS/WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03OE21	WORLD CLASS MANUFACTURING	OE	3	0	0	3	30	70	100
AS20-03OE22	FUNDAMENTALS OF ROBOTICS	OE	3	0	0	3	30	70	100
AS20-03OE23	FABRICATION PROCESS	OE	3	0	0	3	30	70	100
AS20-03OE24	NON DESTRUCTIVE TESTING METHODS	OE	3	0	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			



IV BTECH I SEM									
Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-00HS06	BUSINESS ECONOMICS & FINANCIAL ANALYSIS	HSMC	3	1	0	3	30	70	100
AS20-03PC21	CAD/CAM	PC	3	1	0	3	30	70	100
AS20-03PC22	OPERATIONS RESEARCH	PC	3	1	0	3	30	70	100
AS20-03PE3X	PROFESSIONAL ELECTIVE -III	PE	3	1	0	3	30	70	100
AS20-03OE3X	OPEN ELECTIVE -III (MOOCs)	OE	3	0	0	3	30	70	100
PRACTICAL COURSES									
AS20-03PC23	CAD/CAM LAB	PC	0	0	3	1.5	30	70	100
AS20-03ES10	PRODUCTION DRAWING PRACTICE	ES	0	0	3	1.5	30	70	100
AS20-03PW10	INDUSTRY ORIENTED MINI PROJECT	PW	0	0	3	2	30	70	100
VALUE ADDED COURSE*									
AS20-00HS13	INTERVIEW SKILLS	HSMC	0	0	2	1	25	75	100
<b>TOTAL</b>						<b>21</b>			

**Professional Elective-III**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE31	ADVANCED MECHANICS OF SOLIDS	PE	3	1	0	3	30	70	100
AS20-03PE32	MECHANICAL VIBRATIONS	PE	3	1	0	3	30	70	100
AS20-03PE33	ADDITIVE MANUFACTURING TECHNOLOGY	PE	3	1	0	3	30	70	100
AS20-03PE34	POWER PLANT ENGINEERING	PE	3	1	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**Open Elective-III (MOOCs)**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03OE31	CONCEPTS OF THERMODYNAMICS	OE	3	0	0	3	30	70	100
AS20-03OE32	BASICS OF MATERIALS ENGINEERING	OE	3	0	0	3	30	70	100
AS20-03OE33	INTRODUCTION TO COMPOSITES	OE	3	0	0	3	30	70	100
AS20-03OE34	ROBOTICS	OE	3	0	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**IV BTECH II SEM**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE4X	PROFESSIONAL ELECTIVE-IV	PE	3	1	0	3	30	70	100
AS20-03PE5X	PROFESSIONAL ELECTIVE -V	PE	3	1	0	3	30	70	100
AS20-03OE4X	OPEN ELECTIVE -IV	OE	3	0	0	3	30	70	100
<b>PRACTICAL COURSE</b>									
AS20-03PW11	MAJOR PROJECT	PW	0	0	24	10	30	70	100
<b>TOTAL</b>						<b>19</b>			

**Professional Elective-IV**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE41	ENGINEERING TRIBOLOGY	PE	3	1	0	3	30	70	100
AS20-03PE42	ROBOTICS	PE	3	1	0	3	30	70	100
AS20-03PE43	PLANT LAYOUT MATERIAL HANDLING	PE	3	1	0	3	30	70	100
AS20-03PE44	AUTOMATION IN MANUFACTURING	PE	3	1	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**Professional Elective-V**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03PE51	AUTOMOBILE ENGINEERING	PE	3	1	0	3	30	70	100
AS20-03PE52	MEMS	PE	3	1	0	3	30	70	100
AS20-03PE53	TURBO MACHINES	PE	3	1	0	3	30	70	100
AS20-03PE54	RENEWABLE ENERGY SOURCES	PE	3	1	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

**Open Elective-IV**

Course Code	COURSE TITLE	COURSE AREA	HOURS/ WEEK			CREDIT	Internal Marks	External marks	Total Marks
			L	T	P				
AS20-03OE41	DISASTER MANAGEMENT	OE	3	0	0	3	30	70	100
AS20-03OE42	INDUSTRIAL MANAGEMENT & SAFETY ENGINEER	OE	3	0	0	3	30	70	100
AS20-03OE43	NANO TECHNOLOGY	OE	3	0	0	3	30	70	100
AS20-03OE44	FARM MACHINERY AND EQUIPMENT	OE	3	0	0	3	30	70	100
<b>TOTAL</b>						<b>3</b>			

\*Open Elective – Students should take Open Electives from The List of Open Electives Offered by Other Departments/Branches Only.

**B.TECH  
FIRST YEAR  
FIRST SEMESTER  
SYLLABUS**

**LINEAR ALGEBRA AND ADVANCED CALCULUS**  
**I B.Tech., I SEM**

Course Title: LINEAR ALGEBRA AND ADVANCED CALCULUS	Course Code: AS20-00BS06
Teaching Scheme (L:T:P):3:1:0	Credits:3
Type of Course: Lecture +Tutorial	Total Contact Periods: 48Hrs : 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: 1.Basic definitions of Matrices 2.Knowledge of Calculus 3.Differentiation and Integration rules	

**Course Overview:** Course include

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems .
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

**Course Objective** To learn

- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations□
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative. Finding maxima and minima of function of two and three variables

**Course Outcomes:**

CO#	Course Outcomes
C111.1	Convert the set of linear equations in to matrix notation and analyse its solution
C111.2	Apply the concept of orthogonal transformation and reduce quadratic form to canonical form
C111.3	Analyze the nature of series.
C111.4	Describe the applications of the mean value theorems
C111.5	Evaluate the improper integrals using Beta and Gamma functions.
C111.6	Categorize the extreme values of functions of two variables with constraints and without constraints.

**COURSE CONTENT (SYLLABUS)**

**UNIT I: MATRICES**

Matrices: Types of Matrices(only definitions);rank of a matrix by Echelon form and Normal form; Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations: solving system of Homogeneous and Non-Homogeneous equations-consistency, Gauss elimination method; Gauss Jacobi Iteration Method. Gauss Seidel Iteration Method.

**UNIT-II: EIGEN VALUES AND EIGEN VECTORS**

Eigen values and Eigenvectors and their properties; Cayley-Hamilton Theorem (without proof): finding inverse and power of a matrix by Cayley-Hamilton Theorem; Diagonalization; Quadratic forms and Nature, Index and Signature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT-III: SEQUENCES & SERIES**

Sequence: Definition of a Sequence, Convergence of a sequence (definitions and examples only).

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms: Comparison test, p-test, D-Alembert's ratio test; Raabe's test; logarithmic test; Integral test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**UNIT-IV: SINGLE VARIABLE CALCULUS**

Mean value theorems(all the theorems without proof): Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-V: MULTIVARIABLE CALCULUS**

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence

& independence, Maxima and minima of functions of two variables and three variables with constraints; without constraints; method of Lagrange's Multipliers.

**Text Books:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43<sup>rd</sup> Edition, 2014.
2. R.K.Jain, S.R.K. Iyengar Advanced Engineering Mathematics, Narosa Publishing House Pvt.Ltd.,5<sup>th</sup>Edition,2016

**References Books:**

1. I.N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

2. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup>Reprint, 2010.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.khanacademy.org/math/linear-algebra>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ma27](https://onlinecourses.nptel.ac.in/noc20_ma27)
3. <https://www.mooc-list.com/course/calculus-two-sequences-and-series-coursera>

### **Web Reference/E-Books:**

- 1 [www.ee.ic.ac.uk](http://www.ee.ic.ac.uk)
- 2 <http://en.m.wikipedia.org>
- 3 [www.math.odu.edu](http://www.math.odu.edu)



**ENGINEERING CHEMISTRY**  
**I B.Tech., I SEM**

Course Title: Engineering Chemistry	Course Code: AS20-00BS02
Teaching Scheme (L:T:P): 3:1:0	Credits:3
Type of Course: Lecture +Tutorial	Total Contact Periods: 48Hrs : 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Students must have studied two years of intermediate chemistry	

**Course Overview:**

The primary objective of an Engineering Chemistry course is to introduce the students to the concepts and applications of chemistry in Engineering. It should cultivate in them an ability to identify chemistry in each piece of finely engineered products used in households and industry. This course aims to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. It deals with applied and industrially useful topics, such as Water Technology, Molecular Orbital Concepts, Electrode Potential, Electrodes, types of batteries and their industrial applications, Fuels, UV-VIS, IR and NMR concepts.

**Course Objective**

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To know the modern technology and interpret different problems involved in industrial utilization of water.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of Electrochemistry and Corrosion which are essential for engineers in Industry.
- Ability to impart the knowledge of fuels to apply the role of chemistry in energy production.

To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.

**Course Outcomes (s)**

CO#	Course Outcomes
C112.1	Acquire the Scientific Attitude by means of distinguishing, analyzing and solving various Engineering problems.
C112.2	To know the modern technology and interpret different problems involved in industrial utilization of water.
C112.3	Interpret the knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
C112.4	Summarize the principles and concepts of electrochemistry, corrosion to predict the behavior of a system under different variables.
C112.5	Define and classify the fuels, distinguishing the quality of fuels based on calorific values as well as understand the concepts of petroleum refining.
C112.6	Apply the concepts on basic spectroscopy and application to medical and other fields.

**COURSE CONTENT (SYLLABUS)**

**Unit - I:**

**Water and its Treatment:** Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness, Numerical problems on Hardness of Water – Estimation of hardness of water by complexometric method. Boiler troubles: Scales and Sludge's and its treatment. Potable water and its specifications - Steps involved in treatment of Potable water – Disinfection of water by ozonation and chlorination – Breakpoint of Chlorination. Boiler feed water and its treatment – Internal Treatment of water: Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange Process. Desalination of Brackish water – Reverse Osmosis.

**Unit – II:**

**Molecular Structure and Theories of Bonding:** Introduction - Atomic and Molecular Orbital's. Linear Combination of Atomic Orbital's (LCAO), Molecular orbital's of diatomic molecules, molecular orbital energy level diagrams of N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub> molecules.  $\Pi$ -molecular orbital's of butadiene. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbital's in Tetrahedral, Octahedral and Square planar geometries. Band Structure of solids and effect of doping on conductance.

**Unit - III:**

**Electrochemistry and Corrosion:** Electro chemical cells – electrode potential, standard electrode potential, Nernst equation, Types of electrodes – Calomel, Quinhydrone and Glass electrode. Determination of P<sup>H</sup> of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary: Lithium cell, secondary batteries: Lead – Acid storage battery and Lithium ion battery. Causes and effects of corrosion – theories of chemical and electrochemical corrosion –

mechanism of electrochemical corrosion, Types of corrosion: Galvanic, Differential Aeration Corrosion - water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods - Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application: Galvanizing , Tinning, Metal Cladding.

### **Unit - IV:**

**Fuels and Combustion:** Introduction-Classification of Fuels – Calorific value, Characteristics of a good fuel - Solid fuels: coal –Classification of a coal by Rank – Analysis of coal – Proximate and Ultimate analysis and their significance. Liquid fuels – Petroleum and its refining, Cracking –types – Fixed bed Catalytic Cracking - Moving bed catalytic cracking. Synthetic Petrol – Fischer-Tropsch’s process- Knocking – Octane and Cetane rating, Flash Point, Fire point, Cloud point & Pour Point; Gaseous fuels – Composition and uses of Natural Gas, LPG and CNG.

**Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel.

### **Unit-V**

**Spectroscopic Techniques and applications:** Introduction, Principles of Electronic Spectroscopy: Beer-Lamberts law, Types of electronic transitions, applications of UV-Visible spectroscopy.

IR Spectroscopy: Introduction, Principle, Modes of Molecular vibrations, selection rules, Force Constant, Wave number regions of Some common organic functional groups (C-H, NH<sub>2</sub>, OH, -COOH, C=O, C≡N, C=C, C≡C, C-O-C), Applications of IR Spectroscopy.

<sup>1</sup>H-NMR Spectroscopy, Principles of NMR spectroscopy, Chemical shift - Shielding and Deshielding effects, Chemical shifts of some organic protons, Interpretation of NMR Spectra (Alkanes, Alcohol, carbonyl compounds, Alkyl halides) Applications of NMR: Introduction to Magnetic Resonance Imaging.

### **Text Books:**

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
4. University Chemistry, by B.M. Mahan, Pearson IV Edition.
5. R.V. Gadag & A. Nityananda Shetty., “Engineering Chemistry”, I K International Publishing House Private Ltd. New Delhi (2015- Edition).

### **References Books:**

1. O.G. Palanna, “Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint (2015- Edition).
2. “Wiley Engineering Chemistry”, Wiley India Pvt. Ltd. New Delhi. Second Edition 2013.
3. B. Jaiprakash, R. Venugopal, Sivakumaraiah and Pushpa Iyengar, Chemistry for Engineering Students, Subhash Publications, Bengaluru, (2015- Edition).
4. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/105/104/105104102/>
2. <https://nptel.ac.in/courses/105/106/105106119/>
3. <https://nptel.ac.in/courses/103/103/103103163/>
4. <https://nptel.ac.in/courses/104/106/104106096/>
5. <https://nptel.ac.in/courses/115/102/115102025/>
6. <https://nptel.ac.in/courses/103/108/103108162/>
7. <https://nptel.ac.in/courses/103/105/103105110/>
8. <https://nptel.ac.in/courses/104/102/104102113/>

### **Web Reference/E-Books:**

S.No	Advanced concepts in syllabus	Website Referred
1	Water & Its Treatment	<a href="https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/">https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/</a>
2	Lithium Ion Batteries	<a href="https://www.youtube.com/watch?v=fo3DMXwD9ig">https://www.youtube.com/watch?v=fo3DMXwD9ig</a>
3	Fuel Cells	<a href="https://nptel.ac.in/content/storage2/courses/121106014/Week11/lecture34.pdf">https://nptel.ac.in/content/storage2/courses/121106014/Week11/lecture34.pdf</a>
4	IR Spectroscopy	<a href="http://www.chem.ucalgary.ca">www.chem.ucalgary.ca</a>
5	stereochemistry	<a href="http://research.cm.utexas.edu">research.cm.utexas.edu</a>
6	Synthesis of Aspirin	<a href="http://vlab.amrita.edu/?sub=2&amp;brch=191&amp;sim=849&amp;cnt=1">http://vlab.amrita.edu/?sub=2&amp;brch=191&amp;sim=849&amp;cnt=1</a>
7	Defluoridation of fluoride water	<a href="http://www.csir.res.in">www.csir.res.in</a>
8	Engineering Chemistry IIT-MUMBAI	<a href="http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/TOC-mainM5.htm">http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/TOC-mainM5.htm</a>
9	NMR Spectroscopy	<a href="https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/Chapter_13%3A_Structure_Determination_-_Nuclear_Magnetic_Resonance_Spectroscopy">https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/Chapter_13%3A_Structure_Determination_-_Nuclear_Magnetic_Resonance_Spectroscopy</a>

**BASIC ELECTRICAL ENGINEERING**  
**I B.Tech., I SEM**

Course Title: Basic Electrical Engineering	Course Code: AS20-02ES01
Teaching Scheme (L:T:P): 3:1:0	Credits: 3
Type of Course: Lecture +Tutorial	Total Contact Periods: 48Hrs + 16Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Basics of Physics and Mathematics	

**Course Overview:**

Electrical engineering principles are taught in this course. Topics include circuit theory, alternating current theory, DC Machines, induction, motors, Synchronous Machine, cabling, batteries and Switches.

**Course Objective**

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

**Course Outcomes(s)**

<b>CO#</b>	<b>Course Outcomes</b>
C113.1	Understand the basic concepts of Electrical Circuits.
C113.2	Study various concepts in AC circuits
C113.3	Discuss the concepts of transformer and Induction motor.
C113.4	Discuss the concepts of DC Machines and synchronous machines.
C113.5	Describe the operation of different types of cables, wires and batteries.
C113.6	understand the Performance of different protecting equipment's like MCB, FUSE.

**COURSE CONTENT (SYLLABUS)**

**UNIT-I: D.C. CIRCUITS**

Electrical circuit elements R, L and C, voltage and current sources, Kirchoff's laws, Network reduction techniques, Series –parallel, Y- $\Delta$  transformation, analysis of simple circuits with dc excitation. Superposition theorem, Thevenin's theorem and Norton's Theorem.

**UNIT-II: A.C. CIRCUITS**

Representation of sinusoidal waveform, phasor representation, peak and RMS values, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, series resonance in series R-L-C circuit. Three-phase balanced circuits. Voltage and current relations in star and delta connections.

**UNIT-III: TRANSFORMERS AND INDUCTION MOTORS**

Transformers: Principle of operation of transformer, Equivalent circuit, losses and efficiency, voltage regulation. Auto-transformer. Three phase transformer connections. Induction motors: Working principle and operation of three phase induction motor, Losses and efficiency-Brake test. Single-phase induction motor-working principle, operation and applications.

**UNIT-IV: DC MACHINES AND SYNCHRONOUS MACHINES**

DC machines: Constructional details and working of DC Generator, Methods of excitation, Applications of DC generators. DC Motor - principle of operation, speed control of separately excited DC motor. Applications of DC motors. Synchronous machines: Construction and working of synchronous generator and its applications.

**UNIT-V: ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption and battery backup.

**Text Books:**

1. "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill, 2019.
2. "Basic Electrical Engineering", A. Chakrabarti, S. Debnath, Tata McGraw Hill, 2012.
3. "Basic Electrical Engineering" - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
4. "Principle of Electrical Engineering", V.K Mehta, R. Mehta, S. Chand Limited, 2011.
5. "Basic Electrical Engineering", V. Mittle & Arvind Mittal, TMH, Second Edition.

### **References Books:**

1. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. NPTEL Videos on Course “Basic Electrical Technology” Co-ordinated by IISc Bangalore  
Link: <https://nptel.ac.in/courses/108/108/108108076/>
2. NPTEL Videos on Course “Basic Electrical Technology” Co-ordinated by IIT Kharagpur  
Link: <https://nptel.ac.in/courses/108/105/108105053/>

### **Web Reference/E-Books:**

- 1) Basic Electrical Engineering By U.A.Bakshi, V.U.Bakshi · 2009  
Link: [https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)
- 2) Basic Electrical Engineering By Chakrabarti · 2009  
[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/KuJ44LVAAK4C?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/KuJ44LVAAK4C?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)
- 3) Basic Electrical Engineering By R. K. Rajput · 2009  
[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)
- 4) Basic Electrical Engineering By SK Sahdev · 2015  
[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/8xTLCgAAQB AJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/8xTLCgAAQB AJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)

**ENGLISH**  
**I B.Tech.-I SEM**

Course Title: English	Course Code: AS20-00HS01
Teaching Scheme (L:T:P): 2:0:0	Credits:2
Type of Course: Lecture	Total Contact Periods: 32 hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70Marks
Prerequisites: 1. Basic knowledge of English language 2. Must obtain Grammar, and basic reading skills 3. Able to communicate in English language with basic writing skills 4. Able to use different types of vocabulary in different types of situations	

**Course Overview:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

**Course Objective:** The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.
- Train the students to use language appropriately for Interviews, Group discussions and Public speaking
- Enhance and empower the students in communication skills by concentrating on LSRW skills.



**Course Outcomes(s)**

<b>CO#</b>	<b>Course Outcomes</b>
C114.1	Apply English language effectively in spoken and written forms
C114.2	Analyse the given texts and respond appropriately
C114.3	Apply various grammatical structures in personal and academic fronts.
C114.4	Develop appropriate vocabulary for professional communication
C114.5	Improve competency in various forms of academic and professional writing.
C114.6	Perceive the importance of language skill for the enhancement of employability opportunities.

**COURSE CONTENT (SYLLABUS)**

**UNIT I:**

**‘Of Parents and Children’ from the Essays of Francis Bacon**

Vocabulary: The Concept of Word Formation –The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences  
Importance of Proper Punctuation- Techniques for writing precisely – Paragraph writing  
– Types, Structures and Features of a Paragraph – Creating Coherence-Organizing  
Principles of Paragraphs in Documents.

**UNIT II:**

**‘The Raman Effect’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

Vocabulary Building: Homonyms, Homophones and Homographs

Grammar: Misplaced Modifiers

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Format of a Formal Letter- Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

**UNIT III:**

**‘Ancient Architecture in India’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

### **UNIT IV:**

**‘What Should You Be Eating’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

Vocabulary: Standard Abbreviations and Acronyms in English

Grammar: Sequence of Tenses

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Information Transfer- Flow Chart- Pie Chart– Essay Writing-Précis Writing.

### **UNIT V:**

**‘How a Chinese Billionaire Built Her Fortune’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

Vocabulary: Technical Vocabulary and their usage

Grammar: Collocations, Commonly Confused Words-Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction - Structure of Reports- Types of Reports - Manuscript Format.

### **Text Books:**

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

2. The Essays of Frances Bacon, Edited, with introduction and notes by Mary Augusta Scott. Charles Scribner’s Sons, New York, 1908,

### **References Books:**

1. Swan, M. (2016). Practical English Usage. Oxford University Press.

2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.

3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.

4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.

5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.

6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

7. English Grammar Usage for Technical Students. DPS Publications, G Victor Emmanuel Raju, G Shailaja Reddy and M Sanjay Saahul.

### **Web Reference/E-Books**

1. Practice English Your Own-

<https://www.immigratemanitoba.com/alt/practise-english-on-your-own.pdf>

2. Longman English Grammar Practice-

[file:///C:/Users/user/Downloads/Longman\\_English\\_Grammar\\_Practice\\_intermediate\\_Self\\_Study\\_Edition%20\(learnenglishteam.com\).pdf](file:///C:/Users/user/Downloads/Longman_English_Grammar_Practice_intermediate_Self_Study_Edition%20(learnenglishteam.com).pdf)

3. English Grammar through stories by Alan Townend-

[file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20\(learnenglishteam.com\).pdf](file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20(learnenglishteam.com).pdf)

**ENGINEERING MECHANICS**  
**I B.Tech.I SEM**

Course Title: ENGINEERING MECHANICS	Course Code: AS20-03ES01
Teaching Scheme (L:T:P): 3:1:0	Credits: 3
Type of Course: Lecture	Total Contact Periods:48 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks

**Course Overview:**

Engineering mechanics is the application of mechanics to solve problems involving common engineering elements. The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios. The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving.

**Course Objective**

The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
- Explain the resolution of a spatial system of forces using equations of equilibrium.
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

**Course Outcomes(s)**

At the end of the course, students will be able to

CO#	Course Outcomes
C115.1	Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
C115.2	Determine resultant of forces acting on a body subjected to a spatial of forces.
C115.3	Solve problem of bodies subjected to friction.
C115.4	Find the location of centroid and calculate moment of inertia of a given section.
C115.5	Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
C115.6	Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

**COURSE CONTENT (SYLLABUS)**

**UNIT I:**

Introduction to Engineering Mechanics - Force Systems :Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

**UNIT II:**

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.

**UNIT III:**

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem. Mass Moment of Inertia : Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies. Virtual Work: Theory of virtual work-Application.

**UNIT IV:**

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

**UNIT V:**

Kinetics: Kinetics of a particle-D'Alemberts principle-Motion in a curved path – work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation-work done-Principle of work-energy-Impulse-momentum. Mechanical Vibrations: Definitions, Concepts-Simple Harmonic motion- free vibrations- Simple and compound pendulums.

**Text Books:**

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J. Suresh Kumar/ BSP.
2. Engineering Mechanics/ Irving Shames, G. Krishna Mohan Rao / Prentice Hall.
3. Foundations and applications of Engineering Mechanics by HD Ram and AK Chouhan, Cambridge publications.
4. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications,2011.

5. Basudeb Bhattacharyya, “Engineering Mechanics”, Oxford University Press, 2008.

**References Books:**

1. Timoshenko S.P and Young D.H., “Engineering Mechanics”, McGraw Hill International Edition, 1983.
2. A Text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain/ Academic Publishing Company.
3. Meriam. J. L., “Engineering Mechanics”, Volume-II Dynamics, John Wiley & Sons, 2008.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/106/112106180/>
2. <https://nptel.ac.in/courses/112/106/112106286/>
3. <https://nptel.ac.in/courses/112/105/112105164/>
4. <https://nptel.ac.in/courses/112/103/112103109/>

**Web Reference/E-Books:**

1. [http://nptel.ac.in/courses/Webcourse/contents/IITKANPUR/engg\\_mechanics/ui/Course\\_home\\_3.htm](http://nptel.ac.in/courses/Webcourse/contents/IITKANPUR/engg_mechanics/ui/Course_home_3.htm).
2. <https://nptel.ac.in/courses/122/104/122104015/>
3. <https://freevideolectures.com/course/2264/engineering-mechanics>
4. <https://nptel.ac.in/courses/112/103/112103108/>
5. <https://nptel.ac.in/courses/115/104/115104094/>

**BASIC ELECTRICAL ENGINEERING LAB**

**I B.Tech., I SEM**

<b>Course Title: Basic Electrical Engineering Lab</b>	<b>Course Code: AS20-02ES02</b>
Teaching Scheme (L:T:P): (0:0:2)	Credits: 1
Type of Course: Practical	Total Contact Periods: 32 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Basic Electrical Engineering	

**Course Overview:**

Electrical engineering principles are taught practically in this Lab course. Topics include circuit theory, alternating current theory, Transformers, DC Machines, induction, motors and Synchronous Machine.

**Course Objective**

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

**Course Outcomes(s)**

<b>CO#</b>	<b>Course Outcomes</b>
C116.1	Apply basic laws of electrical circuits.
C116.2	Design simple Electrical Networks
C116.3	Analyze the response of different types of electrical circuits to different Excitations.
C116.4	Understand the measurement, calculation and relation between the basic electrical Parameters
C116.5	Determine the characteristics of DC Machines
C116.6	Determine characteristics of Transformer and AC Machines

**LIST OF EXPERIMENTS/DEMONSTRATIONS:**

Any ten of the following experiments

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

**Text Books:**

1. "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill, 2019.
2. "Basic Electrical Engineering", A. Chakrabarti, S. Debnath, Tata McGraw Hill, 2012.
3. "Basic Electrical Engineering" - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
4. "Principle of Electrical Engineering", V.K Mehta, R. Mehta, S. Chand Limited, 2011.
5. "Basic Electrical Engineering", V. Mittle & Arvind Mittal, TMH, Second Edition.

**References Books:**

1. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. NPTEL Videos on Course "*Basic Electrical Technology*" Co-ordinated by IISc Bangalore  
Link: <https://nptel.ac.in/courses/108/108/108108076/>
2. NPTEL Videos on Course "*Basic Electrical Technology*" Co-ordinated by IIT Kharagpur  
Link: <https://nptel.ac.in/courses/108/105/108105053/>

### **Web Reference/E-Books:**

1) Basic Electrical Engineering By U.A.Bakshi, V.U.Bakshi · 2009

Link: [https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)

2) Basic Electrical Engineering By Chakrabarti · 2009

[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/KuJ44LVA4K4C?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/KuJ44LVA4K4C?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)

3) Basic Electrical Engineering By R. K. Rajput · 2009

[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)

4) Basic Electrical Engineering By SK Sahdev · 2015

[https://www.google.co.in/books/edition/Basic\\_Electrical\\_Engineering/8xTLCgAAQBAJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover](https://www.google.co.in/books/edition/Basic_Electrical_Engineering/8xTLCgAAQBAJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover)



**ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**  
**I B.Tech., I SEM**

Course Title: English Language Communication Skills Lab	Course Code: AS20-00HS02
Teaching Scheme (L:T:P): 0:0:3	Credits:1.5
Type of Course : Practical	Total Contact Periods: 48 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70Marks
Prerequisites: 1. The students should have a basic knowledge of English language 2. Must obtain Grammar, and basic Speaking skills 3. Should able to communicate in English language 4. Able to use different types of vocabulary in different of situations	

**Course Overview:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English Language Communication Skills Lab has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In ELCS Lab the focus should be on the skills development in the areas of vocabulary, grammar, reading and speaking. For this, the teachers should use the prescribed Lab manual for detailed study. The students should be encouraged in improving communication skills in the lab. The time should be utilized for activity based learning. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

**Course Objective:**

The course will help to

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To train students to use language appropriately for public speaking and interviews
- To improve the fluency of students in spoken English and neutralize their mother tongue influence

**Course Outcome:**

CO#	Course Outcomes
C117.1	Learn how to pronounce words using phonetic transcription
C117.2	Improves collaborative skills and maximizes speaking skills
C117.3	Develops Neutralization of accent for intelligibility
C117.4	Develops better understanding of nuances of English language through audio-visual experience
C117.5	Improves language skills according in the different situations, discussions and interviews
C117.6	Develops linguistic, communicative and critical thinking

**COURSE CONTENT (SYLLABUS)**

Listening Skills Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab

**Exercise – I :**

- CALL Lab: Introduction to Pronunciation – Speech Sounds – Vowels and Consonants.
- ICS Lab: Understand: Communication at Work Place- Spoken vs. Written language. Practice: Greetings – Introducing Oneself and Others -Taking Leave – JAM Session- Situational Dialogues.

**Exercise – II :**

- CALL Lab: Understand: Structure of Syllables – Word Stress .
- Practice: Basic Rules of Word Accent.
- **ICS Lab:** Understand: Features of Good Conversation – Non- verbal Communication. Practice: Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions – Telephone Etiquette.

**Exercise – III**

- **CALL Lab:** Understand: Intonation- Rhythm-The Influence of Mother Tongue (MTI). Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
- **ICS Lab:** Oral Presentations- Introduction to Formal Presentations
- Practice: Formal Presentations- Poster Presentations and PPT's.

**Exercise – IV**

**CALL Lab:** Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

**ICS Lab:** Public Speaking – Exposure to Structured Talks- Group Discussion

Practice: Group Discussion.

**Exercise – V**

**CALL Lab:** Understand: Listening for Specific Details.

**Practice:** Listening Comprehension Tests.

- ICS Lab: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

**Practice: Mock Interviews**

**References**

1. ELCS LAB MANUAL

2. Practice English Your Own-

<https://www.immigratemanitoba.com/alt/practise-english-on-your-own.pdf>

**Text Books**

1. Longman English Grammar Practice-

[file:///C:/Users/user/Downloads/Longman English Grammar Practice intermediate Self Study Edition%20\(learnenglishteam.com\).pdf](file:///C:/Users/user/Downloads/Longman%20English%20Grammar%20Practice%20intermediate%20Self%20Study%20Edition%20(learnenglishteam.com).pdf)

2. English Grammar through stories by Alan Townend-

[file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20\(learnenglishteam.com\).pdf](file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20(learnenglishteam.com).pdf)

**ENGINEERING CHEMISTRY LAB**  
**I B.Tech., I SEM**

Course Title: Engineering Chemistry Lab	Course Code: AS20-00BS03
Teaching Scheme (L:T:P): 0:0:3	Credits:1
Type of Course: Practical	Total Contact Periods:48 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Basics of chemistry	

**Course Overview:**

The course emphasizes active resolution of experimental problems involving volumetric, analytical and instrumental usage; their design and optimization. Analytical, oral presentation, written report, and cooperative problem-solving skills are stressed in the context of chemical sciences practices. Safety awareness is integrated throughout the course.

**COURSE OBJECTIVES:**

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**Course Outcomes (s)**

CO#	Course Outcomes
C118.1	Analyze the need, design and perform a set of experiments.
C118.2	Differentiate hard and soft water; solve the related numerical problems on water purification and its significance in industry and daily life.
C118.3	Understand the kinetics of a reaction from a change in concentration of reactants or products as a function of time.
C118.4	Employ the basic techniques used in chemistry laboratory for analysis such as Thin Layer Chromatography, volumetric titrations, Conduct metric Measurements, Ostwald's viscometer and stalagmometer.
C118.5	To demonstrate the technique of thin Layer Chromatography (TLC) and synthesize drug molecules widely used in industry.
C118.6	Learn safety rules in the practice of laboratory investigations.

**COURSE CONTENT (SYLLABUS)  
LIST OF EXPERIMENTS**

1. Determination of total hardness of water by Complexometric method using EDTA
2. Estimation of Iron using Standard  $\text{KMnO}_4$ .
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of  $\text{Fe}^{2+}$  by Dichrometry
7. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate
8. Determination of acid value of coconut oil
9. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
10. Determination of surface tension of a give liquid using Stalagmometer
11. Synthesis of Aspirin and Paracetamol
12. Thin layer chromatography calculation of  $R_f$  values. eg ortho and para nitro phenols

**Reference Books:**

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5<sup>TH</sup> edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. [http://www.cdeep.iitb.ac.in/webpage\\_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course\\_home\\_Lec38.html](http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec38.html)
2. <http://vlabs.iitb.ac.in/vlab/labscs.html>
3. <https://www.vlab.co.in/broad-area-chemical-engineering>

**SOFT SKILLS 1**  
**I B.Tech., I SEM**

Course Title: Soft Skills 1	Course Code: AS20-00HS03
Teaching Scheme (L:T:P): 2:0:0	Credits: Nil
Type of Course: Lecture	Total Contact Periods:32 Hrs
Continuous Internal Evaluation: 25Marks	Semester End Exams: 75Marks

**Course Overview:**

The students will enhance their communication skills. The course will enable them to become responsible towards their lives and will be able to face challenges, the course will also enable to develop work culture, orientation and will enable them with problem solving abilities.

**Course Objective:-**

1. To develop Communicative Methodology.
2. To lead the life with utmost responsibility.
3. To accept challenges.
4. To develop work orientation in the mindset of the students.
5. To have problem solving ability.

**Course Outcomes(s)**

<b>CO#</b>	<b>Course Outcomes</b>
C119.1	Facilitates better interaction among students.
C119.2	Enhance and improve documentation.
C119.3	Demonstrate leadership qualities.
C119.4	Demonstrate effective presentation skills.
C119.5	Express benevolence.
C119.6	Enhance their communication skills

**COURSE CONTENT (SYLLABUS)**

**UNIT I: Importance of Soft Skills**

Successful Career - Communication - Body Language - Written Communication - Presentation

Team Work - Professionalism - Interpersonal Skills - Time and Stress Management - Leadership Qualities

**UNIT II: Self Introduction**

Introductory Speech - General Speech - Academic Speech - Evaluation of Speech - Steps of Self Introduction - Basic Questions and Answers - Deliver Self Introduction - Tips of Self Introduction - Body Gestures- Good Eye Contact - Never be Nervous - Do's and Don'ts' of Self Introduction- Examples on Self Introduction

**UNIT III: Body Language**

Introduction – Communicating Body – Studying of body language – 17 concepts of learning body language.

**UNIT IV: Communication Skills**

Sounds of English – English as a World Language – Speech formation – Pronunciation – Oral Communication – Written Communication – Face to Face Communication Effective Communication – Presentation – Information Transfer.

**UNIT V: Positive Attitude and Positive Thinking**

Introduction – Possible Reactions – Dual Attitude – Indifference Attitude – Negative Attitude – Think Positively – Depend on Positive Thinking – Know – What we are – Benefits of Behaviour – Myths of negative thinking – Tips to become a positive thinker – Moving towards success

**Text Books:**

1. Body Language in the work place – Allan and Barbara Pease 2011.
2. Students Handbook: Skill Genie – Higher education department, Government of Andhra Pradesh.
3. Soft Skills – Odhisha State Open University.

**Web References:**

1. Extraordinary Communication Skills - By Sandeep Maheshwari I Hindi & English SpeakingPracticeTips  
<https://www.youtube.com/watch?v=VczVqHJW0gg>
2. Effective Communication Skills Training Video in Hindi  
<https://www.youtube.com/watch?v=kxAXOh5RmwU>
3. A guide to effective communication  
<https://www.youtube.com/watch?v=JwjAAGGi-90>
4. A Failure to Communicate <https://www.youtube.com/watch?v=8Ox5LhJSBE>
5. Non Verbal Communication <https://www.youtube.com/watch?v=SKhsavlvua0>

**B.TECH  
FIRST YEAR  
SECOND SEMESTER  
SYLLABUS**



**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**  
**I B.Tech., II SEM**

Course Title: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	Course Code: AS20-00BS01
Teaching Scheme (L:T:P):3:1:0	Credits:3
Type of Course: Lecture +Tutorial	Total Contact Periods:48Hrs+ 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: knowledge on Derivatives, knowledge on Integrations, knowledge on Functions	

**Course Overview:**

- Students will be able to identify Exact and Non-Exact D.E. and find the solutions by using different methods.
- Students will be able to identify Homogeneous and Non-Homogeneous D.E. and find the solutions by using different methods.
- Students will learn and evaluate Double and Triple Integrals.
- Students will learn Gradient, Divergent, Curl and Vector Identities.
- Students will learn and evaluate Line, Surface and Volume Integrals and Vector Integral Theorems.

**Course Objective:**

- Methods of solving the differential equations of first order.
- Methods of solving the differential equations of higher order.
- Evaluation of multiple integrals and their applications.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course Outcomes(s)**

CO#	Course Outcomes
C121.1	Acquires various skills pertaining to differential and vector calculus and apply them in different fields of Engineering
C121.2	Determine whether the given differential equation of first order is exact or not.
C121.3	Apply the concept of higher order ODE to real world problems.
C121.4	Analyze and apply the concept of multiple integrals to find areas, volumes.
C121.5	Define Directional Derivative and Scalar Potential Function
C121.6	Evaluate the line, surface and volume integrals and convert them from one to another.

**COURSE CONTENT (SYLLABUS)**

**UNIT I: FIRST ORDER ODE**

Exact equations; Non-Exact equations; Linear equations; Bernoulli's equations; Newton's Law of Cooling; Law of Natural Growth and Decay; Orthogonal Trajectories.

**UNIT II: HIGHER ORDER LDE**

Higher Order Linear Differential Equations with Constant Coefficients; Non-Homogeneous Differential Equations with RHS of the type:  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x^k$ ,  $e^{ax}v$ ,  $xv$ , Method of Variation of Parameters.

**UNIT III: MULTIPLE INTEGRALS**

Evaluation of Double Integrals (Cartesian and Polar); Change of Variables (Cartesian to Polar); Change of Order of Integration (Cartesian form); Areas and Volumes by Double Integrals. Triple Integrals (Cartesian form).

**UNIT IV: VECTOR DIFFERENTIATION**

Vector Point Function; Scalar Point function; Gradient; Divergent; Solenoidal; Curl; Irrotational; Directional Derivative; Scalar Potential Function; Vector Identities.

**UNIT V: VECTOR INTEGRATION**

Line Integral; Surface Integral; Volume Integral; Green's Theorem in a plane; Gauss's Divergence Theorem; Stoke's Theorem (without proofs) and Applications.

**Text Books:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Edition, 2010.
2. S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa Publishing House, 5<sup>th</sup> Edition, 2016.
- 3.

**References Books:**

1. Dr. M.D. Rai Singhania, Ordinary and Partial Differential Equations, S.Chand and Company Ltd., 18<sup>th</sup> Edition, 2008.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, John Wiley & Sons, 2011.
3. Murray R. Spiegel, Seymour Lipschutz, Dennis Spellman, Vector Analysis: Schaum's Outlines Series, Tata McGrawHill, 2<sup>nd</sup> Edition, 2009.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.coursera.org/learn/ordinary-differential-equations>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ma15/preview](https://onlinecourses.nptel.ac.in/noc20_ma15/preview)

**Web Reference/E-Books:**

1. ENGINEERING MATHEMATICS-II BY Dr.M.SURYANARAYANA REDDY
2. MATHEMATICS-I BY P. SHIVARAMAKRISHNA DAS, C. VIJAYA KUMARI
3. ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS BY Dr.M.D.RAISINGHANIA

**ENGINEERING PHYSICS**  
**I B.Tech., II SEM**

<b>Course Title: ENGINEERING PHYSICS</b>	<b>Course Code: AS20-00BS04</b>
Teaching Scheme (L:T:P): 3:1:0	Credits: 3
Type of Course: Lecture + Tutorial	Total Contact Periods: 48Hrs +16Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: <ol style="list-style-type: none"><li>1. The student must have basic knowledge of units and dimension of physical quantities, principles of mechanics and laws of optics.</li><li>2. The student must be aware of basics of waves and oscillations, fundamental principles of electromagnetic theory.</li><li>3. The student must have fundamental knowledge of mathematical concepts like</li></ol>	

**Course Overview:**

This course deals with the study of harmonic Oscillators which explore in understanding complex mechanical systems. It deals with wave optics which help to understand the behavior of wave propagation in different medium. It deals with the fundamental properties of dielectric, magnetic and nano materials and explore their application in all engineering streams.

**Course Objective**

1. Student explores different types of harmonic oscillations.
2. Student identifies different properties of physical optics like interference and diffraction
3. Student distinguishes the distribution of particles in solids using different statistical concepts.
4. Student understand the concept of effective mass of electron and Differentiate between the type of semiconductor.
5. Student classifies different dielectric and magnetic properties of solids using basic principles of physics
6. Student interprets the characteristics of lasers and applications of lasers, and characteristics of nano materials and their applications

**Course Outcomes(s)**

CO#	Course Outcomes
C122.1	Analyse the impedances in Mechanical and Electrical Oscillators
C122.2	Interpret the phase difference of coherent light sources using interference and diffraction
C122.3	Summarize the distribution of particles in solids using Maxwell-Boltzmann, Bose-Einstein statistics and Fermi-Dirac statistics
C122.4	Identify the different type of semiconductors using Hall Effect and their applications
C122.5	Explores the different types of Dielectric and Magnetic materials and their applications in different fields.
C122.6	Analyse the different properties of laser, along with the Significance of nano materials and their application in Science and Technology.

**COURSE CONTENT (SYLLABUS)**

**UNIT I: HARMONIC OSCILLATIONS**

Introduction to Mechanical and electrical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion, Damped harmonic oscillator: wave equation, Analysis of under, over damped, critically damped, Energy in a damped harmonic oscillator, Quality factor, forced vibration: equation of motion(Qualitatively) and solution.

**.UNIT II: WAVE OPTICS**

Interference: Superposition of waves, Interference by transmitted and reflected light, Formation of Newton's ring, experimental method for calculation of wavelength, determination of refractive index of a liquid by newton's ring  
Diffraction: Types of Diffraction, Fraunhofer diffraction at a single slit - Intensity distribution in diffraction pattern, Fraunhofer diffraction due to double slit – expression for resultant intensity, Diffraction grating - resolving power of a plane transmission grating(qualitative)

**UNIT III: INRODUCTION TO SOLIDS**

Limitation of Classical statistics, Density of Energy states(qualitative), Fermi distribution function  
Electrons in a periodic potential – Bloch theorem, Kronig – Penny Model(qualitative), Brillouin Zones (E-K curve).  
Concept effective mass of electron, Energy band formation in solids, classification of solids into Metals, Semiconductors and insulators, types of semiconductors(qualitative), Hall effect.

**UNIT IV: DIELECTRICS AND MAGNETIC PROPERTIES OF MATERIALS**

Dielectric properties: Introduction, Types of polarizations (Electronic and Ionic) and calculation of their polarizabilities, Internal fields in solids: (Lorentz Method), Clausius-

Mossotti relation, Piezo-electricity, Ferroelectricity, Pyro-electricity and their applications

Magnetic Properties: Introduction, Bohr magneton, classification of magnetic materials on the basis of magnetic moment, Properties of anti-ferro and Ferri magnetic materials, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Superconductors- Type – I and Type – II Superconductors, Applications of Superconductors

### **UNIT V: LASERS AND NANO MATERIALS**

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO<sub>2</sub>) laser, He-Ne laser, Applications of lasers in science and technology.

Nanomaterials: Introduction, Significance of nanoscience: Surface to volume ratio, Quantum Confinement, Synthesis of Nano materials: Ball Milling Method, Sol-Gel Method, Applications of Nanomaterials in medical and defense

#### **Text Books:**

1. Engineering Physics - B K pandey, S. Chturvedi
2. A Text Book of Engineering Physics- Dr.P.G. Kshirsagar, Dr.M.N. Avadhanulu
3. Engineering Physics - P.K.Palaniswamy
4. Engineering Physics, Malik and Singh, Tata Mc Graw Hill

#### **References Books:**

1. Vibrations of waves & Physics, 3<sup>rd</sup> edition, I. G. Main.
2. Introduction to Solid State Physics - Charles Kittel

#### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. [https://onlinecourses.nptel.ac.in/noc20\\_ph24/preview](https://onlinecourses.nptel.ac.in/noc20_ph24/preview)
2. <https://nptel.ac.in/courses/122/107/122107035/#>
3. <https://www.coursera.org/learn/nanotechnology>

#### **Web Reference/E-Books:**

1. Physics for Engineers by N. K. Verma
2. Wave Optics by R.K Verma

**PROGRAMMING FOR PROBLEM SOLVING**  
**I B.Tech., II SEM**

Course Title: PROGRAMMING FOR PROBLEM SOLVING	Course Code: AS20-05ES01
Teaching Scheme (L:T:P):3:1:0	Credits:3
Type of Course: Lecture +Tutorial	Total Contact Periods: 48Hrs+ 16Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Mathematics knowledge, Analytical and Logical skills	

**Course Overview:**

It introduces students to the field of computer science as a discipline for solving problems through computation and provides the foundation for more advanced courses on programming and software development.

**Course Objective**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

**Course Outcomes(s)**

CO#	Course Outcomes
C123.1	Designs algorithms and draws flowcharts for solving problems.
C123.2	Converts the algorithms/flowcharts to C programs.
C123.3	Develops the code and tests a given logic in C programming language.
C123.4	Dissects a problem into functions and develops modular reusable code.
C123.5	Demonstrates arrays, pointers, strings and structures in C.
C123.6	Explains Searching and sorting problems.

**COURSE CONTENT (SYLLABUS)**

**UNIT - I**

Problem Solving Using Computers :Computer Overview, Introduction to components of a computer system, Algorithms ,Flowchart, Pseudo code with examples, Number systems(Decimal & Binary Conversion).

Overview of C :History of C, Basic structure of C- program, Creating and Running C- Program, Input and output statements.

**UNIT - II**

Fundamentals of C: C-Tokens, Data types, Operators, Expressions, Type

conversions, Types of Errors , Input and output statements.

Control Statements in C

Decision making and branching, Decision making and Looping statements.

**UNIT – III**

Structured Programming :Functions: Syntax, Steps ,Types and Category of Functions, parameter passing mechanism. Recursion and Storage Classes

Dynamic memory allocation: malloc(), calloc(), realloc(), free() with example

**UNIT - IV**

Arrays & Strings: Declaration , Initialization and Accessing Elements, String handling functions, Array of Strings.

Structures and Unions: Defining structures, initializing structures, unions, Array of structures, self referential structures.

Pointers: Types of Pointers Use of Pointers, Dereferencing operations, Examples

**UNIT - V**

Numerical methods: Roots, Integration and Differentiation Methods, Examples

Linked List: Definition, Types, Implementation Using Self referential Structures:

Files: (only if time is available, otherwise should be done as part of the lab)

**Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).
3. Ashok N. Kamthane, Programming in C, 2/e, Pearson Education.
4. Programming with C, by K.R. Venugopal, Tata Mcgraw Hill Publishing Co Ltd

**References Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.coursera.org/learn/computational-thinking-problem-solving>
2. [nptel.ac.in/courses/106105085/4](https://nptel.ac.in/courses/106105085/4)
3. [nptel.ac.in/courses/106105085/2](https://nptel.ac.in/courses/106105085/2)

**Web Reference/E-Books:**

1. [https://onlinecourses.nptel.ac.in/noc18\\_cs33/preview](https://onlinecourses.nptel.ac.in/noc18_cs33/preview)
2. <http://www.thenewboston.com/>
3. <https://www.codesdope.com/>

**ENGINEERING GRAPHICS AND DESIGN**  
**I B.Tech., II SEM**

Course Title: ENGINEERING GRAPHICS AND DESIGN	Course Code: AS20-03ES02
Teaching Scheme (L:T:P): 2:0:3	Credits: 3.5
Type of Course: Lecture + Practical	Total Contact Periods: 32Hrs+ 48 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks

**Course Overview:**

Engineering graphics & Design has a well-defined set of standards by which technical drawings are produced. This course teaches the language of engineering graphics from basic sketching through 3-D solid modeling using computer aided design (CAD) software AutoCAD.

**Course Objective**

The objectives of this course are to

- To know the conventions used in Engineering Drawing and comprehend the tools to be used in AutoCAD software.
- To understand the importance of engineering curves.
- To learn to use the orthographic projections for points, lines, planes and solids in different positions.
- To make the students draw the projections of the planes.
- To understand the isometric projections.
- To create simple solid models of various domain applications.

**Course Outcomes(s)**

At the end of the course, students will be able to

CO#	Course Outcomes
C124.1	Apply the concepts of engineering curves in construction using AutoCAD.
C124.2	Solve the problem of projections of points and lines, in different positions using AutoCAD.
C124.3	Solve the problem of projections of planes and solids in different positions using AutoCAD.
C124.4	Solve the problems of Projections of solids and its positions using AutoCAD.
C124.5	Solve the problems on Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions using AutoCAD.
C124.6	Solve the problems on Orthographic Projections and its conversions using AutoCAD.



**COURSE CONTENT (SYLLABUS)**

Introduction to AutoCAD Software: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

**UNIT I:**

Introduction to Engineering Drawing: Principles of Engineering drawing and their significance, Conventions, Drawing Instruments.

Engineering Curves: Construction of Ellipse, Parabola and Hyperbola – General and Special methods; Cycloidal curves- Epicycloids and Hypocycloids.

**UNIT II:**

Orthographic Projections, Projections of Points & Straight Lines: Principles of Orthographic Projections – Conventions; Projections of Points in all positions; Projections of lines inclined to both the planes.

Projections of Planes: Projections of Planes- Surface Inclined to both the Planes.

**UNIT III:**

Projections of Regular Solids: Projections of Regular Solids inclined to both the Planes – Prisms, Pyramids, Cylinder and Cone.

Sections and Sectional Views: Right regular solids - prism, cylinder, pyramid, cone – use of Auxiliary views.

**UNIT IV:**

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and Compound Solids.

**UNIT V:**

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

Introduction to Solid Modelling: Creation of simple solid models relevant to the domain.

**Text Books:**

1. Engineering Drawing, N. D. Bhatt, 53rd Edition, Charotar Publishing House, 2016.
2. Textbook on Engineering Drawing, K. L. Narayana & P. Kanniah, SciTech Publishers, 2010.
3. Engineering Drawing and Computer Graphics, M. B. Shah & B. C. Rana, Pearson Education, 2010.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
5. Engineering graphics and design, Pradeep Jain, A.P Gautam and Ankitha Maheshwari.

### **References Books:**

1. Mastering AutoCAD 2019 and AutoCAD LT 2019, George Omura and Brian C. Benton (Auto CAD 2019), 1st Edition, John Wiley & Sons, Indianapolis, Indiana.
2. AutoCAD Software Theory and User Manuals.
3. Engineering Design, George E. Dieter, Linda C. Schmidt/third edition.
4. Engineering Drawing and design, Cencell Jonson, Jay D. Helsel, Dennis R. Short.
5. Engineering Drawing, Jolhe/fourth edition.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/103/112103019/>
2. <https://nptel.ac.in/courses/112/104/112104172/>

### **Web Reference/E-Books:**

1. <http://nptel.ac.in/courses/112103019>
2. <http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html>
3. [https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture\\_notes/env\\_health\\_scienc\\_e\\_students/engineeringdrawing.pdf](https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_scienc_e_students/engineeringdrawing.pdf)

**Software Required: AUTOCADD**

**WORKSHOP TECHNOLOGY**

**I B.Tech., - II SEM**

Course Title: WORKSHOP TECHNOLOGY	Course Code: AS20-03ES03
Teaching Scheme (L: T:P): 3:1:0	Credits: 3
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks

**Course Overview:**

Workshop technology which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of workshop technology such as foundry, carpentry, fitting, forging, welding, metal forming, processing of plastics etc.

**Course Objective:**

Student will be able to

- Use basic workshop tools and its operations.
- Understand the process of drilling, foundry, mechanical working of metals.
- Explain the various welding processes applicable in the manufacturing industries.
- Describe the sheet metal work operations.
- describe the fitting, forging, rolling fundamentals
- Describe the various types of extrusion and Processing of Plastics.

**Course Outcomes(s)**

<b>CO#</b>	<b>Course Outcomes</b>
C125.1	Use basic workshop tools and its operations.
C125.2	Explain the drilling, foundry, mechanical working of metals.
C125.3	Distinguish the various welding processes applicable in the manufacturing industries.
C125.4	Explain the sheet metal work operations.
C125.5	Explain the fitting, forging, rolling fundamentals
C125.6	Explain the various types of extrusion and Processing of Plastics.

**COURSE CONTENT (SYLLABUS)**

**UNIT – I**

**Carpentry:** Marking & measuring tools, cutting tools: saws, chisels, planes, boring tools, striking tools, holding devices, Miscellaneous tools, Carpentry Processes, carpentry joints, Wood working machines

**Fitting:** Cutting tools: chisels, files, scrapers, saws, drill bits, reamer, taps, dies and sockets. Striking Tools, Holding Devices, Marking Tools, Miscellaneous Tools, Checking and measuring instruments, Fitting Operations.

**Forging:** Hand forging tools, Equipment, Smith Operations, Machine Forging, Forging defects.

**UNIT – II**

**Sheet Metal Work:** Sheet metal hand tools: Measuring tools, stakes, Sheet Metal Operations: shearing, bending, drawing, squeezing, Sheet Metal Joints: Hem joints, Fastening Methods.

**Drilling:** Type of drilling machines, Drill bits, Operations.

**UNIT – III**

**Foundry:** Introduction, Foundry equipment: Hand moulding tools, sands, types of moulding sand, pattern making, cores.

**Welding:** Classification – Types of welds, welded joints, their characteristics and Design of welded joints; Welding Positions.

**Cutting of Metals:** Oxy Acetylene gas cutting, Plasma cutting.

**UNIT – IV**

**Mechanical working of metals:** introduction, hot working process, cold working process.

**Extrusion of Metals:** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion- Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

**UNIT – V**

**Rolling fundamentals:** theory of rolling, types of Rolling mills and products. Drawing and its types – wire drawing and Tube drawing –Types of presses and press tools.

**Processing of Plastics:** Types of Plastics, Properties, applications, their processing methods and equipment (blow and injection moulding)

**Text Books:**

1. Workshop Technology Vol I & II by Raghuvanshi
2. Manufacturing Technology (Vol I) by P N Rao (Mc Graw Hill)
3. Workshop Technology, R.S. Khurmi/Second edition
4. Workshop Technology, Pakirappa
5. Workshop Technology, Hazra Chowdhary/Sixth edition (Media Promoters)

### **References Books:**

1. Elementary Workshop Technology by HazraChowdary& Bhattacharya (Media Promotors)
2. Production Technology by Jain & Gupta (Khanna Publishers)
3. Production Technology /Sarma P C /S. Chand
4. Workshop Technology and practice, Segun R. Bello
5. Workshop Technology, Bello R.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104195/>
2. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
3. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>

**ENGINEERING PHYSICS LAB**  
**I B.Tech., II SEM**

Course Title: ENGINEERING PHYSICS LAB	Course Code: AS20-00BS05
Teaching Scheme (L:T:P): (0:0:3)	Credits: 1.5
Type of Course: Practical	Total Contact Periods: 48Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: 1. The student must know the usage of basic tools for measurement of physical quantities. 2. The students must have knowledge of error analyses, types of errors, principles of	

**Course Overview:**

The course deals with experiments in various fields of physics such as Wave Optics, Wave mechanics, Electronics, Electricity and Magnetism.

**Course Objective**

1. The student understands the different types of harmonic oscillators.
2. The student understands the electromagnetic modes of energy transmission.
3. The student understands the geometrical and physics properties of light using mercury vapor lamp
4. The student explores the interference and diffraction of light.
5. The student classifies the P-type and n-type semiconductors.
6. The student estimates the quality factor of electrical resonance.

**Course Outcomes(s)**

CO#	Course Outcomes
C126.1	Evaluate the rigidity modulus and spring constant using torsional pendulum and coupled oscillator
C126.2	Explore the different electromagnetic modes of energy transmission using Melde's and Stewart and Gees experiments
C126.3	Identify the difference between interference, diffraction and dispersion of light
C126.4	Explore the interference of light using newtons rings and diffraction of light using diffraction gratings.
C126.5	Classify the p-type and n-type semiconductors using Hall effect.
C126.6	Estimate the quality factor of the resonance using different LCR values

**COURSE CONTENT (SYLLABUS)**

**The students have to perform any eight of the following experiments**

1. Torsional pendulum -Rigidity modulus of given wire.
2. Coupled Oscillator - Determine the spring constant.
3. Melde's experiment –Transverse and Longitudinal modes.
4. Stewart and Gee's method-Magnetic field along the axis of current carrying coil.
5. Spectrometer-Dispersive power of the material of a prism.
6. Diffraction grating – Determination of wavelengths spectral lines of Mercury spectrum by minimum deviation method.
7. Diffraction grating -Wavelength of laser light.
8. Newton's Rings –Radius of curvature of Plano convex lens.
9. Hall effect- Determination of Hall Voltage and Hall Coefficient.
10. LCR Circuit -Determination of quality factor and resonant frequency of LCR circuit.

**References Books:**

1. Practical physics by Dr. Aparna, V.G.S. publications.
2. Physics practical lab manual –SPEC

**Online Resources :**

1. <https://www.futurelearn.com/courses/teaching-practical-science-physics>
2. <https://www.vlab.co.in/broad-area-physical-sciences>

**PROGRAMMING FOR PROBLEM SOLVING LAB**  
**I B.Tech., II SEM**

Course Title: PROGRAMMING FOR PROBLEM SOLVING LAB	Course Code: AS20-05ES02
Teaching Scheme (L:T:P)0:0:3	Credits:1.5
Type of Course: Practical	Total Contact Periods: 48Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites:- Mathematics knowledge, Analytical and Logical skills	

**Course Overview:**

This course provides the fundamental concepts of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

**Course Objective**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

**Course Outcomes(s)**

CO#	Course Outcomes
C127.1	Develops algorithms for simple problems.
C127.2	Translate given algorithms to a working and correct program.
C127.3	Identifies and correct syntax errors as reported by the compilers.
C127.4	Identifies and correct logical errors encountered during execution.
C127.5	Demonstrates data operations using arrays, strings, structures and pointers of different types.
C127.6	Creates, reads and writes to and from simple text and binary files.



## COURSE CONTENT

### Practice Sessions:

Week1:

Tutorial 1: Problem solving using computers(Creating, Compiling & Running Steps , Basic Structure of C Program)-:

Lab1: Familiarization with programming environment

Week2:

Tutorial 2: Variable types and Rules, Formatted I/O statements

Lab 2: Reading and Displaying Different Values Using scanf() & Printf()

Week3:

Tutorial 3: Types of Operators

Lab 3: Simple Computational problems using operators

Week4:

Tutorial 4: Branching and logical expressions:

Lab 4: Problems involving if-then-else structures

Week5:

Tutorial 5: Loops, while, do-while and for loops:

Lab 5: Iterative problems e.g., sum of series, sum of n- natural numbers

Week6:

Tutorial 6: 1D Arrays: searching, sorting:

Lab 6: 1D Array manipulation : insertion, selection and bubble sort

Week7:

Tutorial 7: 2D arrays and Strings

Lab 7: Matrix problems, String operations, string sorting , palindrome string

Week8:

Tutorial 8: Functions, call by value:

Lab 8: Simple functions: factorial ,sum of individual digits, Fibonacci series etc.,

Week9:

Tutorial 9: Recursion, structure of recursive calls

Lab 9: Recursive functions: factorial, Fibonacci, GCD and towers of Hanoi

Week10:

Tutorial 10: Pointers, structures and dynamic memory allocation

Lab 10: Problem solving using Pointers and structures

Week11:

Tutorial 11: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 11: Programming for solving Numerical methods problems

Week12

Tutorial 12: Single Linked List using self referential structures

Lab 12: Implementation of Single linked list using self referential structures

Week13:

Tutorial 13: File data type , File pointer, modes of operations, file handling functions

Lab 13: Programs using file handling functions: File copy, Merging of Files

**Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3<sup>rd</sup> Edition).
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

**References Books:**

1. R.G. Dromey, How to solve it by Computer, Pearson (16<sup>th</sup> Impression).
2. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
3. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4<sup>th</sup> Edition.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <http://nptel.ac.in/courses/106105085/>
2. <http://nptel.ac.in/courses/106106127/>

**Web Reference/E-Books:**

1. [www.leetcode.com](http://www.leetcode.com)
2. [www.thenewboston.com](http://www.thenewboston.com)
3. [www.codesdope.com](http://www.codesdope.com)

**ENGINEERING PRACTICES**  
**I B.Tech. II SEM**

Course Title: ENGINEERING PRACTICES	Course Code: AS20-03ES04
Teaching Scheme (L:T:P): 0:0:4	Credits: 2
Type of Course: Practical	Total Contact Periods: 64 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks

**Course Overview:**

**Mechanical Engineering Practices** is a place where students acquire knowledge on the operation of various processes involved in manufacturing and production. The Workshop Practice course makes students competent in handling practical work in engineering environment.

**Course Objective**

**The objectives of this course are to**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes(s)**

CO#	Course Outcomes
C128.1	Apply the concepts of engineering workshop practice on machine tools and their operations.
C128.2	Expertise on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
C128.3	Recognize the tools and apply different trades of Engineering practices on drilling, material removing, measuring, chiseling etc.
C128.4	Apply basic knowledge on electrical engineering for house wiring practice.
C128.5	Manufacture the given material to desired product in a particular pattern by tin smithy.
C128.6	Mould the component of different size and shape by black smithy in on Furnace

**COURSE CONTENT (SYLLABUS)**

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint).
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit).
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel).
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern).
- V. Welding Practice – ( Arc Welding & Gas Welding).
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light).
- VII. Black Smithy – ( Round to Square, Fan Hook and S-Hook).

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working.

**Text Books:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

**References Books:**

1. Work shop Manual - P. Kannaiyah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/107/112107145/>
2. <https://nptel.ac.in/courses/112/107/112107144/>

**Web Reference/E-Books:**

1. [https://books.google.co.in/books/about/MECHANICAL\\_WORKSHOP\\_PRACTICE.html?id=rHhJlb\\_ ye4C](https://books.google.co.in/books/about/MECHANICAL_WORKSHOP_PRACTICE.html?id=rHhJlb_ ye4C)
2. <https://www.youtube.com/watch?reload=9&v=4gpjof5ESKQ>

**SOFT SKILLS -II**  
**I B.Tech. II SEM**

Course Title: Soft Skills -II	Course Code: AS20-00HS04
Teaching Scheme (L:T:P):2:0:0	Credits: Nil
Type of Course: Lecture	Total Contact Periods: 32 Hrs
Continuous Internal Evaluation: 25Marks	Semester End Exams: 75Marks
Prerequisites: Soft skills-I	

**Course Objective:-**

1. To develop Optimistic Nature.
2. To enhance the skills related to Group Discussion.
3. To make the students to have commitment.
4. To have dedication as well determination.
5. To develop confidence.

**Course Outcomes:**

CO#	Course Outcomes
C129.1	Analyze excellent behavioral attitude.
C129.2	Apply amicable solutions to problematic issues in life.
C129.3	Understand the importance of functional and practical work.
C129.4	Create goal oriented personality.
C129.5	Understand soft skills and life skills.
C129.6	Remember to be committed and determined.

**COURSE CONTENT (SYLLABUS)**

**UNIT I: Linguistic Ability**

Writing Skills - Reading Skills - Listening Skills - Speaking Skills - Just a Minute Program – JAM – Improving Vocabulary.

**UNIT II: Effective Communication**

Introduction – Communicative Methodology – Way to Communicate perfectly – Communicative series – Descriptive Communication – Process of Communication – Barriers of Communication – Essentials of Communication – Improving existing Communication – Strategies to improve Communication – Corporate Communication – Assess the Communication – How to be a successful Communicator.

**UNIT III: Ethical Values**

Meaning of Ethics- Importance of Education – Moral Values – Eradication of problems – Influence of the society – Developing self-motivational skills – Source of Ethics – Develop Ethics – Ethics related to Life.

**UNIT IV: Confidence**

Self Confidence – Self Esteem – Importance of Confidence – Right decision Making – Turn towards Productivity – Things can be had with Confidence – Self Identity – Building good career – Self Reliance – Quotes of Confidence.

**UNIT V:** Introduction – Initiation – Verbal Oriented – Purpose of Group Discussion – Importance of Group Discussion – Involvement in Group Discussion - Learning Attitude – Skill Development Platform – Primary Level Topics and Discussion – Able Participation – Practice Group Discussion.

**Text Books:**

1. Body Language in the work place – Allan and Barbara Pease 2011.
2. Students Handbook: Skill Genie – Higher education department, Government of Andhra Pradesh.
3. Soft Skills – Odhisha State Open University.

**Web References:**

1. Extraordinary Communication Skills - By Sandeep Maheshwari I Hindi & English SpeakingPracticeTips  
<https://www.youtube.com/watch?v=VczVqHJW0gg>
2. Effective Communication Skills Training Video in Hindi  
<https://www.youtube.com/watch?v=kxAXOh5RmwU>
3. A guide to effective communication  
<https://www.youtube.com/watch?v=JwjAAgGi-90>
4. A Failure to Communicate <https://www.youtube.com/watch?v=8Ox5LhIJSBE>
5. Non Verbal Communication <https://www.youtube.com/watch?v=SKhsavlvua0>

**B.TECH  
SECOND YEAR  
FIRST SEMESTER  
SYLLABUS**

**UNIVERSAL HUMAN VALUES II  
II B.TECH I SEM**

Course Title: UNIVERSAL HUMAN VALUES II	Course Code: AS20 – 00HS07
Teaching Scheme (L:T:P): 3:1:0	Credits: 3
Type of Course: Lecture +Tutorial	Total Contact Periods: 48Hrs+ 16Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: <ol style="list-style-type: none"><li>1. The student must have basic knowledge of Need, Basic Guidelines, Content and Process for Value Education</li><li>2. Understanding Harmony in the Human Being - Harmony in Myself</li><li>3. The student must have fundamental knowledge Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</li><li>4. The student can able to Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</li></ol>	

**Course Overview:**

This course is designed for transferring the right understanding and definite human conduct in the students. The conduct of every human differs from human to human. Through this course an attempt is being made to introduce the definite human conduct in students. The conduct of a human being can be definite only if knowledge of right understanding and right human conduct is taught to them.

**Course Objective**

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

**Course Outcome(s)**

CO#	Course Outcomes
C211.1	Basic guideline of human values universally.
C211.2	Understanding the harmony in the human being
C211.3	Learn the rights and responsibilities as an employee, team member and a global citizen
C211.4	To know about society – Harmony @ human relation
C211.5	The student can study the professional ethics and values.
C211.6	Understand the importance of Values and Ethics in their personal lives and Professional careers



## COURSE CONTENT (SYLLABUS)

### UNIT – I

#### **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

Purpose and motivation for the course, recapitulation from Universal Human Values-I-Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels. (Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking)

### UNIT – II

#### **Understanding Harmony in the Human Being - Harmony in Myself!**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' . Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

### UNIT- III

#### **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

### **UNIT - IV**

#### **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and selfregulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

### **UNIT – V**

#### **Implications of the above Holistic Understanding of Harmony on Professional Ethics**

Natural acceptance of human values, Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly, and eco-friendly production systems, c. Ability to identify and develop appropriate, technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up, Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

#### **Text Books**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

#### **Reference Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

#### **E-RESOURCES:**

1. <https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf>
2. [https://web.archive.org/web/20080311200942/https://kroc.nd.edu/ocpapers/op\\_16\\_1.pdf](https://web.archive.org/web/20080311200942/https://kroc.nd.edu/ocpapers/op_16_1.pdf)
3. [https://kroc.nd.edu/ocpapers/op\\_16\\_1.pdf](https://kroc.nd.edu/ocpapers/op_16_1.pdf)
4. [https://www.google.com/search?sa=X&biw=1366&bih=657&sxsrf=ALeKk032tvNCeLhiX\\_fL4ciefThZdeN\\_vQ:1607766793377&q](https://www.google.com/search?sa=X&biw=1366&bih=657&sxsrf=ALeKk032tvNCeLhiX_fL4ciefThZdeN_vQ:1607766793377&q)
5. [https://www.researchgate.net/publication/270388493\\_Variations\\_in\\_Value\\_Orientation](https://www.researchgate.net/publication/270388493_Variations_in_Value_Orientation)

WEB REFERENCES:

1. <https://furhhd.org/our-programmes/education-and-ethics/universal-human-values-ethics/>
2. [https://www.google.com/search?sa=X&biw=1366&bih=657&sxsrf=ALeKk032tvNCeLhiX\\_fL4ciefThZdeN\\_vQ:1607766793377&q](https://www.google.com/search?sa=X&biw=1366&bih=657&sxsrf=ALeKk032tvNCeLhiX_fL4ciefThZdeN_vQ:1607766793377&q)WEB RESOURCES
3. <https://www.un.org/press/en/2003/sgsm9076.doc.htm>

<https://www.kobo.com/ebook/the-psychology-of-conservatism-routledge-revivals>

**MECHANICS OF SOLIDS**  
**II B.Tech., I SEM**

Course Title: MECHANICS OF SOLIDS	Course Code: AS20-03PC01
Teaching Scheme (L:T:P): 3:1:0	Credits:3
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs+ 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Mechanics	

**Course Overview:** Student will learn Properties and strength of material.

**Course Objective**

- Student is exposed to the concept of different types of loads, stresses, strains and analysis of members for axial loads.
- Student will acquire knowledge in drawing bending and shear force diagrams of beams of various loads and configurations.
- Student becomes familiar with methods of evaluation of deflection of beams of various configurations and stresses that arise due to simple bending.
- Student is exposed to the concept of shear stresses in beams, principal stresses, strains and phenomenon of torsion.
- Student will acquire knowledge in estimating stresses for thin, thick cylindrical shells and buckling of columns.

**Course Outcomes (s)**

CO#	Course Outcomes
<b>C212.1</b>	Determine stresses and strains in members subjected to axial loads and temperature changes.
<b>C212.2</b>	Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending.
<b>C212.3</b>	Determine slope and deflection for various configurations of beams using different methods. Analyze stress, strain and deflection due to torsion in circular members
<b>C212.4</b>	Analyze shear stress distribution in different sections of beams and find out principal stresses and strains.
<b>C212.5</b>	Find out stresses and strains in thin, thick cylindrical shells and also able to calculate critical buckling loads in columns and struts
<b>C212.6</b>	Design cylinders and torsions to support a given load.

**COURSE CONTENT (SYLLABUS)**

**UNIT-I:**

**Stresses and Strains:** Definitions, types of stresses and strains, elasticity and plasticity. Hooke's law, stress strain diagrams for engineering materials, modulus of elasticity. Poisson's ratio, relationship between elastic constants, linear and volumetric strains, bars of uniform strength, temperature stresses, compound bars.

**UNIT-II:**

**Beams:** Definition of bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams; simple theory of bending, moment of resistance, modulus of section.

**UNIT-III:**

**Slopes and Deflections:** Slope and deflection calculations of cantilever, simply supported beams subjected to point loads and uniformly distributed loads with Macaulay's and double integration methods.

**Torsion:** Derivation of torsion formula for circular sections, power transmission, effect of combined bending and torsion.

**UNIT-IV:**

**Shear Stresses in beams:** Distribution of shear stresses in rectangular, I-section, T-section, solid and hollow circular sections.

**Compound stresses:** Principal stresses and strains. Mohr's circle of stress.

**UNIT-V:**

**Cylinders:** Stresses in thin and thick cylinders with internal and external pressures. Stresses in compound cylinders.

**Columns and struts:** Euler's and Rankine's formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

**TEXT BOOKS:**

1. S.S.Rattan, "Strength of Materials", 3/e, Tata Mc-Graw Hill, 2016.
2. S. Ramamrutham, "Strength of Materials", Dhanpatrai and Sons, 1993.
3. G.H.Ryder, "Strength of Materials", 3/e, Macmillan India Limited, Delhi 2002.
4. Strength of materials – R.S. Kurmi and Gupta.
5. Solid Mechanics, by Popov.

**REFERENCES:**

1. S.S. Bhavakatti, "Strength of Materials", Vikas Publication, 2003.
2. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd.
3. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
4. James M Gere, "Mechanics of materials", 8/e, Cengage learning, 2013.
5. R.C. Hibbeler, "Mechanics of Materials", 9/e, Pearson, 2018.
6. Mechanics of Structures Vol -I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.

**E-RESOURCES:**

1. <https://nptel.ac.in/courses/105/104/105104160/>
2. <https://nptel.ac.in/courses/112/102/112102284/>
3. <https://nptel.ac.in/courses/112/107/112107146/>
4. <https://nptel.ac.in/courses/112/107/112107147/>
5. <https://nptel.ac.in/courses/112/106/112106141/>
6. <https://nptel.ac.in/courses/105/105/105105108/>

**PRODUCTION TECHNOLOGY**  
**II B.Tech., I SEM**

Course Title: PRODUCTION TECHNOLOGY	Course Code: AS20-03PC02
Teaching Scheme (L: T:P): 3:1:0	Credits:3
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Workshop Technology	

**Course Overview:**

Manufacturing which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of manufacturing process such as casting, welding, metal forming, processing of plastics etc.

**Course Objective**

Student will able to

- Describe the Casting Process and terminology used in casting
- Describe the various types of patterns, gating systems and solidification of pure and alloy metals
- Identify various welding processes used in Manufacturing industry
- Explain the advanced welding processes.
- Explain the different deformation processes
- Explain the various extrusion, forging process and Processing of Plastics

**Course Outcomes(s)**

CO#	Course Outcomes
C213.1	Classify the types, materials, allowances and defects in casting
C213.2	Explain different types of patterns used in casting, design of gating systems and solidification.
C213.3	Distinguish the various welding processes applicable in the manufacturing industries.
C213.4	Explain the advanced welding processes, defects and testing of welds
C213.5	Develop process-maps for metal forming processes using plasticity principles.
C213.6	Explain the various types of extrusion, forging processes and Processing of Plastics.

**COURSE CONTENT (SYLLABUS)**

**UNIT I:**

**Casting:** Steps involved in making a casting -Advantage of casting and its applications; Patterns -Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principles of Gating– Requirements – Types of gates, Gating Ratio, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die-casting, Investment casting, shell moulding; Solidification of casting – Solidification of pure metal, Directional Solidification.

**Melting furnaces used in metal casting:** Crucible furnace, Cupola furnace, Electric furnace, induction furnace, open hearth furnace

**UNIT II:**

**Welding:** Classification – Types of welds, welded joints, their characteristics and Design of welded joints; Welding Positions - Gas welding - Types, Gas welding, Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding and Plasma welding.

**Cutting of Metals:** Oxy Acetylene gas cutting, Plasma cutting. Standard time and cost calculations.

**UNIT III:**

Inert Gas Welding \_ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding.

**Welding defects** – causes and remedies; destructive and non- destructive testing of welds.

**UNIT IV:**

**Hot and cold working:** strain hardening, recovery, recrystallisation and grain growth. Comparison of properties of cold and hot worked parts.

**Sheet metal Operations:** Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing.

**Rolling fundamentals:** theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing –. Types of presses and press tools. Forces and power requirement in the above operations.

**UNIT V:**

**Extrusion of Metals:** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion- Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

**Forging Processes:** Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging.

**Processing of Plastics:** Types of Plastics, Properties, applications, their processing methods and equipment (blow and injection moulding)

### **Text Books:**

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill
2. Manufacturing Engineering & Technology / SeropeKalpakjian / Steven R. Schmid / Pearson
3. Production Technology /Sarma P C /S. Chand
4. Production Technology / R.K. Jain/Khanna Publishers
5. Industrial Management and Production Management, Martand T.Telsang/S.Chand Publications

### **References Books:**

1. Metal Casting / T.V Ramana Rao / New Age
2. Production Technology / G. Thirupathi Reddy / Scitech
3. Manufacturing Processes/ J.P. Kaushish / PHI Publications

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
2. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>



**MATERIAL SCIENCE AND METALLURGY**  
**II B.Tech., I SEM**

Course Title: MATERIAL SCIENCE AND METALLURGY	Course Code: AS20-03ES05
Teaching Scheme (L:T:P): 3:1:0	Credits:3
Type of Course: Lecture + Assignment	Total Contact Periods: 48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Chemistry	

**Course Overview:** Materials Science and metallurgy is concerned with the generation and application of knowledge relating the composition, structure and processing of materials to their uses. The field encompasses the spectrum of materials that covers metals, ceramics, polymers, semiconductors, and combinations of materials or composites. Metallurgical engineering is a broad field that studies the physical and chemical behaviour of metallic elements, inter metallic compounds and their alloys. Extractive metallurgy involves extracting metal from ore. Chemical metallurgy deals with chemical properties of metals including uniting of different metals with one another to form alloys.

**Course Objective:** The subject deals with the materials and their properties, commonly used for the manufacturing various components in industry. It also focuses on study of various phase diagrams of alloy materials. The ferrous materials and Non Ferrous materials, their properties and applications in the industries are incorporated. The importance of polymers, ceramics and composite materials are included.

**Course Outcomes(s)**

CO	Course Outcomes
C214.1	Explain basic concepts of crystal structure such as unit cells, crystal systems of metals etc.
C214.2	Demonstrate the concept of alloying and formation of different types of phases in alloys.
C214.3	Differentiate ferrous and non-ferrous alloys.
C214.4	Explain various heat treatment processes.
C214.5	Classify and explain polymers, ceramics and composites.
C214.6	Explain Properties of Nano materials

**COURSE CONTENT (SYLLABUS)**

**UNIT I: CRYSTAL STRUCTURE** Unit cells, crystal systems of metals, crystal planes and directions, slip systems, Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms, determination of grain size, effect of grain size on the properties of alloys and Hall - Petch equation.

**UNIT II: ALLOYS & PHASE DIAGRAMS** Alloys- substitutional and interstitial solid solutions. Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructure of ledeburite, austenite, ferrite and cementite.

**UNIT III: FERROUS AND NON FERROUS ALLOYS** Alloying of steel, properties of stainless steel and tool steels, maraging steels; cast irons-grey, white, malleable and spheroidal cast irons; copper and copper alloys- brass, bronze and cupro-nickel; Aluminium and Aluminium alloys.

**UNIT IV: HEAT TREATMENT OF STEEL** Annealing, tempering, normalizing and spheroidising, austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening. Isothermal transformation diagrams for Fe-C alloys and microstructure development, Continuous cooling curves and interpretation of final microstructures and properties.

**UNIT V: POLYMERS, CERAMICS AND COMPOSITES** Classification, properties and applications of polymers, ceramics, composites and nano materials.

**Text Books:**

1. V. Raghavan, –Material Science and Engineering’, Prentice Hall of India Private Limited, 1999.
2. U. C. Jindal, –Engineering Materials and Metallurgy, Pearson, 2011.
3. Sidney H. Avener (2007,) Introduction to Physical Metallurgy, 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
4. Material Science and Engineering, Hugh Schercliff
5. Material Science and Engineering, David G. Rethwisch and William Callister

**References Books:**

1. W. D. Callister, 2006, –Materials Science and Engineering-An Introduction, 6th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, –Engineering Materials, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
3. V. D. Kodgire (2006), Material Science and Metallurgy for engineers, 1st Edition, Everest, Pune, India. Web
4. An introduction to materials, Hector L. Mancini
5. The science and engineering materials, Donald Askeland, third S.I edition

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://ocw.mit.edu/courses/materials-science-and-engineering/>
2. <https://www.mooc-list.com/tags/materials-science>

**THERMODYNAMICS**  
**II B.Tech., I SEM**

Course Title: THERMODYNAMICS	Course Code: AS20-03PC03
Teaching Scheme (L:T:P): 3:1:0	Credits:03
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Chemistry, Engineering Physics	

**Course Overview:**

Develops understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. Covers first and second laws of thermodynamics, perfect gas law, properties of real gases, and the general energy equation for closed and open systems.

**Course Objective:**

To be able to state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy.

To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems.

**Course Outcome(s):**

CO#	Course Outcomes
<b>C215.1</b>	Understand the after completing this course various thermodynamic systems and processes
<b>C215.2</b>	Understand the after completing this course basic laws of thermodynamics
<b>C215.3</b>	Evaluate the performance of energy conversion devices.
<b>C215.4</b>	Understand property values during any process by using concepts of a mixture of gasses
<b>C215.5</b>	Analyze the thermodynamic cycles and evaluate performance parameters
<b>C215.6</b>	Estimate the analysis of Air standard cycles with air water – vapour mixtures.

**COURSE CONTENT (SYLLABUS)**

**Unit – I**

**Introduction: Basic Concepts:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle - Reversibility - Quasi - static Process, Irreversible Process, Causes of Irreversibility - Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics - Concept of Temperature - Principles of Thermometry - Reference Points - Const. Volume gas Thermometer - Scales of Temperature, Ideal Gas Scale.

**Unit – II**

PMM I - Joule's Experiments - First law of Thermodynamics - Corollaries - First law applied to a Process - applied to a flow system - Steady Flow Energy Equation. Limitations of the First Law - Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase - Energy Equation, Availability and Irreversibility - Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations - Elementary Treatment of the Third Law of Thermodynamics

**Unit – III**

Pure Substances, p-V-T-surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations - Triple point at critical state properties during change of phase, Dryness Fraction - Clausius - Clapeyron Equation Property tables. Mollier charts - Various Thermodynamic processes and energy Transfer – Steam Calorimetry. Perfect Gas Laws - Equation of State, specific and Universal Gas constants - various Non- flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy - Throttling and Free Expansion Processes - Flow processes

**Unit – IV**

Deviations from perfect Gas Model - Vander Waals Equation of State - Compressibility charts - Mixtures of perfect Gases - Mole Fraction, Mass fraction Gravimetric and volumetric Analysis - Dalton's Law of partial pressure, Avogadro's Laws of additive volumes - Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

**Unit - V**

**Power Cycles :** Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle - Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

**Text Books:**

1. Engineering Thermodynamics, P.K. Nag, TMH, 3<sup>rd</sup> Edition.
2. Thermodynamics, C.P. Arora.
3. Thermodynamics, S.C. Gupta / Pearson Education India
4. Engineering Thermodynamics, R.K. Rajput / Third edition
5. Thermal physics, Kittel / second edition

### **References Books:**

1. Thermodynamics, An Engineering Approach – Yunus Cengel & Boles, TMH
2. Thermodynamics, J.P. Holman, TMH.
3. Engineering Thermodynamics – Jones & Dugan.
4. An introduction to Thermodynamics, YVC Rao, New Age.
5. Heat and Thermodynamics, Zemansky and Dittman/Seventh edition/intermediate textbook

### **Web Reference/E-Books:**

- W1** <http://scienze-como.uninsubria.it/mella/chimfissbac/thermodynamics.pdf>
- W2.** <https://www.saylor.org/site/wp-content/uploads/2013/08/BolesLectureNotesThermodynamicsChapter10.pdf>

### **VIDEO REFERENCES:**

- V1 <https://www.youtube.com/watch?v=wSxh54XqV74>
- V2. <https://www3.nd.edu/~powers/ame.20231/planckdover.pdf>
- V3. [nptel.ac.in/courses/102106026](http://nptel.ac.in/courses/102106026)

**MECHANICS OF SOLIDS LAB**  
**II B.Tech., I SEM**

Course Title: MECHANICS OF SOLIDS LAB	Course Code: AS20-03PC04
Teaching Scheme (L:T:P): 0:0:3	Credits:1.5
Type of Course: Practical	Total Contact Periods:48 Hours
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Mechanics, Mechanics of Solids	

**Course Overview:** Student will learn Properties and Strength of Materials.

**Course Objective:** The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

**Course Outcomes(s)**

CO#	Course Outcomes
<b>C216.1</b>	Calculate modulus of Elasticity for given material from the Tension test, deflection test on simply supported, cantilever and continuous beams. To verify Maxwell's reciprocal theorem on given beam.
<b>C216.2</b>	Calculate direct stress (normal and shear) from Compression and Shear tests on given specimen.
<b>C216.3</b>	Calculate modulus of rigidity of given material from Torsion test on circular shaft and spring test.
<b>C216.4</b>	Calculate Impact strength and hardness of given material from Charpy /Izod impact tests and Brinell / Rockwell hardness tests.
<b>C216.5</b>	Calculate strain in given cantilever beam using electrical resistance strain gauge.
<b>C216.6</b>	Design cylinders and torsions to support a given load.

**COURSE CONTENT (SYLLABUS)  
LIST OF EXPERIMENTS**

Perform any ten out of the twelve Exercises.

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam - deflection test.

**Web References & E Resources:**

1. <https://www.alljntuworld.in/download/strength-materials-lab-manual/>
2. <https://nptel.ac.in/courses/112/107/112107146/>
3. <https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf>
4. <https://www.youtube.com/watch?v=QyJHs5v-JKc>
5. <https://www.youtube.com/watch?v=AV5VXW4CaUU>
6. [https://www.youtube.com/watch?v=jpogdcw\\_Uh0](https://www.youtube.com/watch?v=jpogdcw_Uh0)
7. <https://www.youtube.com/watch?v=T3tc33pd3hQ>

**PRODUCTION TECHNOLOGY LAB**  
**II B.Tech., I SEM**

Course Title: PRODUCTION TECHNOLOGY LAB	Course Code: AS20-03PC05
Teaching Scheme (L: T:P): 0:0:3	Credits:1.5
Type of Course: Practical.	Total Contact Periods:48 Hours
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks

**Course Overview:**

manufacturing which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of manufacturing process such as casting, welding, metal forming, processing of plastics etc.

**Course Objective**

Students will able to

- Explain the process of pattern making (Understanding)
- Explain the properties of moulding sand and steps in Moulding, Melting and Casting (Understanding)
- Explain the Fabrication of joints using gas welding and arc welding (Understanding)
- Explain the Process of Blanking & Piercing operation and study of simple, compound and progressive press tool. (Understanding)
- Explain the process of deep drawing, bending and extrusion process (Understanding)
- State the process of injection moulding and blow moulding (Remembering)

**Course Outcomes(s)**

CO#	Course Outcomes
C217.1	Execute the pattern making by considering suitable allowances
C217.2	Execute casting process and sand properties testing for a given material.
C217.3	Execute Fabricated joints using gas welding and arc welding
C217.4	Execute blank and pierce on a given component by using blanking and piercing operation
C217.5	Execute deep drawing, bending and extrusion process for a given Component.
C217.6	Execute the injection moulding and blow moulding for a given component.



**COURSE CONTENT (SYLLABUS)**

**I. Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

**II. Welding Lab:**

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises  
(Water Plasma Device)

**III. Mechanical Press Working:**

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

**IV. Processing of Plastics**

1. Injection Moulding
2. Blow Moulding

**References Books:**

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104195/>
2. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
3. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>

**MATERIAL SCIENCE AND METALLURGY LAB**  
**II B.Tech., I SEM**

Course Title: MATERIAL SCIENCE AND METALLURGY LAB	Course Code: AS20-03ES06
Teaching Scheme (L: T:P): 0:0:3	Credits: 1.5
Type of Course: Practical.	Total Contact Periods: 48 Hours
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: -Engineering Chemistry Lab	

**Course Overview:**

Provides an overview of Materials Science and Engineering as a basis for understanding how structure/property/processing relationships are developed and used for different types of materials. Illustrates the role of materials in modern society by case studies of advances in new materials and processes. Laboratory/discussion periods will be devoted to demonstrations and experiments that illustrate the lectures.

**Course Objective**

The purpose of this course is to make the students learn the concepts of Metallurgy and Material Science role in all manufacturing processes, which convert raw materials into useful products adapted to human needs.

**Course Outcomes(s)**

CO#	Course Outcomes
C218.1	Preparation and study of the microstructure of pure metals like iron, copper and Aluminum
C218.2	Study and execute of the microstructures of Cast Irons
C218.3	Study of the microstructures of non-ferrous alloys
C218.4	Study and execute of microstructure in Heat Affected Zone (HAZ) of welded joint
C218.5	To strengthen a given Al - 4.5% Cu alloy by Age-hardening process.
C218.6	To find out the hardness of various treated and un treated steels

**COURSE CONTENT (SYLLABUS)  
LIST OF EXPERIMENTS**

Perform any ten out of the twelve Exercises.

1. Preparation and study of crystal structures
2. Preparation and study of the microstructure of pure metals like iron, copper and Aluminum
3. Preparation and study of the microstructure of Mild steels, low carbon steels, High carbon steels
4. Study of the microstructures of Cast Irons
5. Study of the microstructures of non-ferrous alloys
6. Study of the microstructures of heat treated steels
7. Hardenability of steels by Jomney end quench test
8. To find out the hardness of various treated and un treated steels
9. Study of microstructure in Heat Affected Zone (HAZ) of welded joint
10. Study of Hardness variation across Heat Affected Zone (HAZ) of welded joint.
11. To study the effect of Tempering on hardened steel specimens and to observe the microstructure.
12. To strengthen a given Al - 4.5% Cu alloy by Age-hardening process.

**References Books:**

1. W. D. Callister, 2006, –Materials Science and Engineering-An Introduction, 6th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, –Engineering Materials, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://ocw.mit.edu/courses/materials-science-and-engineering/>
2. <https://www.mooc-list.com/tags/materials-science>

**ENVIRONMENTAL SCIENCES**

**II B. Tech I SEM**

Course Title: Environmental Sciences	Course Code: AS20-00MC01
Teaching Scheme (L:T:P): 3:0:0	Credits: 0
Type of Course: Lecture	Total Contact Periods: 48 Hours
Continuous Internal Evaluation- Nil	Semester End Exams-100 Marks

**Course Objective:**

To learn

- The importance of ecological balance for sustainable development.
- The impacts of developmental activities and mitigation measures.
- The environmental policies and regulations.
- New developmental projects for sustainable development of nations.

**Course Outcomes (s)**

CO#	Course Outcomes
C219.1	Understand the importance of ecological balance and principles
C219.2	Evaluates the impact of developmental activities on ecological balance
C219.3	Understand various environmental acts and policies
C219.4	Gain knowledge about effect of Environment on Human health
C219.5	Understands the importance of environmental regulations helping in sustainable development
C219.6	Develop technologies for the sustainable development based on ecological principles

**COURSE CONTENT (SYLLABUS)**

**UNIT-I**

**Ecosystem:** Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web, Ecological Pyramids, Flow of energy, biochemical cycles, bio accumulation, bio magnification, Carrying capacity, ecosystem value services.

**UNIT-II**

**Natural resources:** Water resources: use and over utilization of surface and ground water, floods and droughts, measures taken to mitigate the intensity of floods and droughts. Dams: benefits and problems. Mineral resources: Use and exploitation, Environmental effects of extracting mineral resources, Land resources: Forest resources, uses of forests, causes of Deforestation. Energy resources: Growing energy needs, Renewable and non-renewable energy sources. Use of alternative energy sources and case studies. Projects of renewable energy resources in different states of India.

### UNIT-III

**Biodiversity and Biotic resources:** Introduction, definition, genetic, species and ecosystem diversity. Value of biodiversity, Consumptive use, productive use, social, ethical, aesthetic and optional values. India as a megadiversity nation. Hot spots of biodiversity. Threats to biodiversity, conservation of biodiversity: in-situ and ex-situ conservation and national biodiversity act.

### UNIT-IV

**Environmental pollution and control technologies:** Environmental pollution: classification of pollution, Air pollution: primary and secondary pollutants, Automobile and Industrial pollution, ambient air quality standards. Water pollution: sources and types of pollution, drinking water quality standards. Soil pollution: sources and types, impacts of modern agriculture, Degradation of soil. Noise pollution: sources and health hazards, standards. Solid waste: characterization and management. e-waste and its management. **Pollution control technologies:** Wastewater treatment methods: primary, secondary and tertiary. Overview of air pollution control technologies. **Global environmental problems and global efforts:** Climate change and impacts on human environment. Ozone depletion and ozone depleting substances (ODS). International conventions/protocols: Earth summit, Kyoto protocol and Montreal protocol.

### UNIT-V

**Environmental policy, legislation and EIA:** Environmental protection act, legal aspects, Air act-1981, Water act, Forest act, Wild life act, Municipal solid waste management and handling rules, biomedical waste management and handling rule, Hazardous waste management and handling rule. EIA: EIA structure, methods of base line data acquisition, overview on impacts of air, water, biological and socio-economical aspects, strategies for risk assessment, concepts of environmental management plan (EMP). Towards sustainable future: concept of sustainable development, population and its explosion, crazy consumerism, Rain water harvesting, Environmental education, Urban sprawl, Human health, Environmental ethics, Concept of green building, Life cycle assessment(LCA).

### TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
2. Textbook of Environmental Science and Technology- Dr. M. Anji Reddy, BS Publications.
3. Environmental Studies by Anubha Kaushik, New Age International Publishers.

### REFERENCE BOOKS:

1. Environmental Studies by R. Rajagopalan, Oxford University press.
2. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.
3. Environmental Science: Towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd, NewDelhi.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/120/108/120108002/>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ge16/preview](https://onlinecourses.nptel.ac.in/noc20_ge16/preview)
3. <https://nptel.ac.in/courses/121/106/121106014/>
4. <https://nptel.ac.in/courses/120/108/120108004/>

**CREO FOR BEGINNERS  
VALUE ADDED COURSE\*  
II B.Tech. Mech -I SEM**

Course Title: CREO FOR BEGINNERS	Course Code: AS20-03PW01
Teaching Scheme (L:T:P): 0:0:2	Credits: 1
Type of Course: Project work	Total Contact Periods: 32 hrs
Continuous Internal Evaluation-25Marks	Semester End Exams-75Marks
Prerequisites: Introduction to Creo Parametric 6.0, or equivalent experience with Creo	

**Course Overview:**

CREO is more than a pro engineering release; it renders completely new approach to product development. The tool CREO Parametric owns core-modeling strengths that anyone can expect from industry's leading software. It is renowned software with breakthrough capabilities in the field of additive manufacturing, model-based definition, and smart connected design.

**Course Objective**

This course aims to help product designers and engineers in developing a product design virtually. CREO is equipped with all the capabilities that are required for completing a product design. This course in CREO will help in sketching, modeling, validation of design, and visualize the product design.

**Course Outcomes(s)**

**At the end of the course, students will be able to**

<b>CO#</b>	<b>Course Outcomes</b>
<b>C2110.1</b>	Understand the concepts of CAD and CAM tools
<b>C2110.2</b>	Design and create Part Models and Assembly Models
<b>C2110.3</b>	Understand concepts 3D Modelling: Concepts, Wireframe, Surface, and Solid Modeling
<b>C2110.4</b>	Create Engineering Drawings by using Part and Assembly models Share the data with other CAD Packages
<b>C2110.5</b>	Create Loft features, references and curves.
<b>C2110.6</b>	Understand Assembly Modeling Tools.

**COURSE CONTENT (SYLLABUS)**

**UNIT-I**

Introduction to CAD, CAE Features of Creo, Concepts:-Modeling ,Parametric , Associative ,Feature based Creo Graphical User Interface - Feature manager design tree, , Handles, mouse buttons, keyboard shortcuts, Understanding the Windows Menu Hardware and Software requirements. Sketch Entities – Inference line, Centerline line, Line, Circle, Arc, Ellipse, Rectangle, Slots, Polygon, Parabola, Ellipse, Partial Ellipse, Spline, Spline tools, Spline on surface, Equation driven curve, Points, Text, Construction geometry, Snap, grid.

**UNIT-II**

Sketch Tools - Fillet, Chamfer, Offset, Convert entities, Trim, Extend, Split, Jog, Mirror, Dynamic Mirror, Move, Copy, Rotate, Scale, Stretch, Sketch pattern. Relations - Adding Sketch Relation, Automatic relations. Dimensioning - Smart, Horizontal, Vertical, Ordinate, Horizontal ordinate, Vertical ordinate, Align ordinate, Fully define sketch. Sketch Diagnosis, Sketch Expert, 3D Sketching, Rapid Sketch.

**UNIT-III**

Part Modeling Tools Creating reference planes Creating Extrude features – Direction1, Direction2, From option, Thin feature, Applying draft, Selecting contours. Creating Revolve features – Selecting Axis, Thin features, Selecting contours.

Creating Swept features-Selecting, Profile and Path, Orientation/twist type, Path Alignment, Guide Curves, Start/End tangency, Thin feature.

**UNIT-IV**

Creating Loft features – Selecting Profiles, Guide curves, Start/End Constraints, Centerline parameters, Sketch tools, Close loft. Selecting geometries – Selection Manager, Multiple Body concepts. Creating Reference - points, axis, coordinates. Creating curves - Split curve, Project curve, Composite curve, Curve through points, Helix and Spiral.

**UNIT-V**

Creating Fillet features, Inserting Hole types Assembly Modeling Tools Introduction to Assembly Modeling & Approaches – Top down and Bottom up approach. Applying Standard Mates- Coincident, Parallel, Perpendicular, Tangent, Concentric, Lock, Distance, Angle.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.youtube.com/watch?v=9Vs6Ls5Y9Bc>
2. <https://www.youtube.com/watch?v=BTiJUpaIg0U>
3. <https://www.youtube.com/watch?v=BYqbliTnUI4>
4. <https://www.youtube.com/watch?v=61Wd5TCEk4s>
5. <https://www.youtube.com/watch?v=5VrL82Banos>

**Web Resources:**

1. <https://nptel.ac.in/courses/112/106/112106064/>
2. <https://nptel.ac.in/courses/112/102/112102101/>
3. [https://drive.google.com/file/d/0BxHoQac6LA7\\_LUlnQVJoNWIVNk0/view?resourcekey=0-SFFLlxc5C5M3xktKflJp5w](https://drive.google.com/file/d/0BxHoQac6LA7_LUlnQVJoNWIVNk0/view?resourcekey=0-SFFLlxc5C5M3xktKflJp5w)



**CATIA FOR BEGINNERS  
VALUE ADDED COURSE  
II B.Tech. Mech -I SEM**

Course Title: CATIA FOR BEGINNERS	Course Code: AS20-03PW02
Teaching Scheme (L:T:P): 0:0:2	Credits: 1
Type of Course: Project work	Total Contact Periods:32 hrs
Continuous Internal Evaluation-25Marks	Semester End Exams-75Marks
Prerequisites: Introduction to Creo Parametric 6.0, or equivalent experience with Creo	

**Course Overview:**

This course is designed to give you a working understanding in how to use CATIA V5 software which is used in key engineering industries to develop 3D models, enabling engineers to visualize, create and modify complex designs. Applying you will the skills to develop your CATIA training further.

**Course Objective**

This Course will help you to acquire CAD Skill Set in CATIA V5 by:

1. Understanding CATIA V5 user interface
2. Learning sketch tools to create 2D profiles
3. Learning part design feature tools to create 3D geometry from 2D profiles
4. Learning assembly tools and constraints to assemble the 3D part files in a spatial relationship to function as a single product
5. Learning Drafting tools to create Engineering 2D Drawings to convey important manufacturing information
6. Learning Wire-frame and Surface modeling tools to create surface based 3D models.

**Course Outcomes(s)**

**At the end of the course, students will be able to**

CO#	Course Outcomes
C2110.1	Understand about CATIA Software, the interface, viewing and manipulation tools.
C2110.2	Create new part, sketch geometry and constraining a model
C2110.3	Design Features and Draft, stiffener, threads, taps and edit
C2110.4	Create Duplicate features, transform a body, copy and paste data, insert from a catalogue.
C2110.5	Create CATPRODUCT, assemble in base component
C2110.6	Understand new drawing for creating views and dimensions

**COURSE CONTENT (SYLLABUS)**

**Module 1: Introduction to CATIA** - Understanding CATIA Software, understanding the interface, viewing and manipulation tools.

**Module 2: Profile Creation** - Initiate a new part, create sketch geometry, constraining the sketch, sketch tools, geometry creation tools and additional tools.

**Module 3: Basic Features** - Determine a base feature, create

**Module 4: Additional Part Features** - Feature profile and axis systems, multi-profile sketch feature, basic wireframe, shaft & groove features, shell the model, thin features, additional sketcher & part design tools.

**Module 5: Dress-up Features** - Draft, stiffener, threads & taps and editing features.

**Module 6: Reusing Data** - Duplicate features, transform a body, copy and paste data, insert from a catalogue.

**Module 7: Finalizing Design Intent** - Apply material properties, analyse the model, create formulae and parameters.

**Module 8: Assembly Design** - Create CATPRODUCT, assemble in base component, manipulate the position of component, assemble and fully constrain components.

**Module 9: Designing in Context** - Open existing assembly, Insert new model, create sketch in context and assembly level features.

**Module 10: Drafting** - Start new drawing, create views, create dimensions & annotations, additional views, view modifications, saving and printing the drawing.

**Module 11: CATIA Fundamentals Master Project** - Project that encompasses and utilises all of the skills obtained in CATIAv5 Fundamentals course.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. [https://www.youtube.com/watch?v=Co9FF\\_ZaD-8](https://www.youtube.com/watch?v=Co9FF_ZaD-8)
2. <https://www.youtube.com/watch?v=YGb9OVPGNts>
3. <https://www.youtube.com/watch?v=zAWMkHAsCVo>
4. <https://www.youtube.com/watch?v=EsFJ6PuQ1ME>
5. <https://www.youtube.com/watch?v=brmOHopzNCQ>

**Web Resources:**

1. <https://nptel.ac.in/courses/112/104/112104031/>
2. <https://nptel.ac.in/courses/112/102/112102102/>
3. <https://www.youtube.com/watch?v=CiMr-4Dirfs>

**MATLAB FOR BEGINNERS  
VALUE ADDED COURSE  
II B.Tech. Mech -I SEM**

Course Title: MATLAB FOR BEGINNERS	Course Code: AS20-03PW03
Teaching Scheme (L:T:P): 0:0:2	Credits: 1
Type of Course: Project work	Total Contact Periods:32 hrs
Continuous Internal Evaluation-25Marks	Semester End Exams-75Marks
Prerequisites: Introduction to Creo Parametric 6.0, or equivalent experience with Creo	

**Course Overview:**

MATLAB or (Matrix Laboratory) is a high performance fourth generation programming language which is used for technical computing. It provides multi paradigm numerical computing environment and was developed by Math Works. It is used for integrating computation, visualization, and programming so that the programming environment becomes easy to use. The applications of MATLAB are immense. It is a powerful linear algebra tool with a very good collection of toolboxes; therefore it finds applications in research and teaching on domains of robotics and automation.

**Course Objective**

1. To Impart the Knowledge to the students with MATLAB software. [This enhances programming knowledge in Research and Development].
2. To provide a working introduction to the Mat lab technical computing environment. [Themes of data analysis, visualization, and programming].
3. To introduce students the use of a high-level programming language, Mat lab. [scientific problem solving with applications and examples from Engineering].

**Course Outcomes(s)**

**At the end of the course, students will be able to**

CO#	Course Outcomes
C2110.1	Understand Matlab data types , matrices and arrays Operators
C2110.2	Design the operator vectors in console window
C2110.3	Create the 2D and 3D matrices programmes in program window
C2110.4	Apply the Simulink matrices in various industries
C2110.5	Understand various tool bars in software
C2110.6	Understand matrices and arrays

**COURSE CONTENT (SYLLABUS)**

**1. Basics of Matlab and MATLAB Compiler The Matlab user interface**

Working with Matlab data types  
Creating matrices and arrays  
Operators and control statements  
Using scripts and functions  
Data import and export  
Using the graphical features

**2. Programming with simple examples**

**3. Discussion of Toolboxes with Applications**

**Text books :**

- [1] The MathWorks Inc. MATLAB 7.0 (R14SP2). The MathWorks Inc., 2005.
- [2] S. J. Chapman. MATLAB Programming for Engineers. Thomson, 2004.
- [3] C. B. Moler. Numerical Computing with MATLAB. Siam, 2004.

**Reference books :**

- [1] C. F. Van Loan. Introduction to Scientific Computing. Prentice Hall, 1997.
- [2] D. J. Higham and N. J. Higham. MATLAB Guide. Siam, second edition edition, 2005.
- [3] K. R. Coombes, B. R. Hunt, R. L. Lipsman, J. E. Osborn, and G. J. Stuck. Differential Equations with MATLAB. John Wiley and Sons, 2000.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/103/106/103106118/>
2. [https://onlinecourses.nptel.ac.in/noc21\\_ge10/preview](https://onlinecourses.nptel.ac.in/noc21_ge10/preview)
3. <https://www.youtube.com/watch?v=zJm8VHg4TbQ>
4. <http://www.digimat.in/nptel/courses/video/103106118/L02.html>

**Web Resources:**

1. <https://www.youtube.com/watch?v=83S48Fs9WhY>
2. [https://www.youtube.com/watch?v=83S48Fs9WhY&list=RDCMUCNuB-vNeYDoDLuIZ4lLWeLw&start\\_radio=1&rv=83S48Fs9WhY&t=0](https://www.youtube.com/watch?v=83S48Fs9WhY&list=RDCMUCNuB-vNeYDoDLuIZ4lLWeLw&start_radio=1&rv=83S48Fs9WhY&t=0)
3. [https://www.youtube.com/watch?v=83S48Fs9WhY&list=RDCMUCNuB-vNeYDoDLuIZ4lLWeLw&start\\_radio=1&rv=83S48Fs9WhY&t=0](https://www.youtube.com/watch?v=83S48Fs9WhY&list=RDCMUCNuB-vNeYDoDLuIZ4lLWeLw&start_radio=1&rv=83S48Fs9WhY&t=0)

**PROJECT BASED LEARNING USING C++  
VALUE ADDED COURSE  
II B.Tech.-I SEM**

Course Title: PROJECTBASED LEARNING USING C++	Course Code: AS20-05PW02
Teaching Scheme (L:T:P): 0:0:2	Credits: 1
Type of Course: Project work	Total Contact Periods: 32 hrs
Continuous Internal Evaluation-25Marks	Semester End Exams-75Marks

**Course Overview:**

This course introduces the student to object-oriented programming through a study of the concepts of program specification and design, algorithm development, and coding and testing using a modern software development environment. Students learn how to write programs in an object-oriented high level programming language. Students will be equipped with fundamental programming, Arrays, Functions, Exception, class, objects, etc.

**Course Objective:** The objective of this Course is:

- Understand and use the basic programming constructs of C++
- Manipulate various C++ data types, such as arrays, strings, and pointers
- Isolate and fix common errors in C++ programs
- Use memory appropriately, including proper allocation/deallocation procedures
- Apply object-oriented approaches to software problems in C++

**Course Outcomes(s)**

CO#	Course Outcomes
C2110.1	Understand the Basics of object and class in C++.
C2110.2	Understand the Basic concept of Object Orientation, object identity and Encapsulation.
C2110.3	Analyze the given problem statements to create basic program designs.
C2110.4	Implement different functions for input and output, various data types, basic operators, files and functions.
C2110.5	Implement programming techniques to solve problems in the C++ programming language
C2110.6	Apply the concepts and principles of the programming language to the real-world problems and solve the problems through project-based learning.

**COURSE CONTENT (SYLLABUS)**

Week 1: Login and Registration System

Week 2: Car Rental System.

Week 3: Bookshop inventory system.

Week 4: Student Report Management System.

Week 5: Sudoku Game.

Week 6: Using Graphics to Draw and Move Shapes

Week 7: Customer Billing System

Week 8: Phonebook Application

Week 9: Snake Game.

Week 10: Payroll Management System

**REFERENCE BOOKS:**

1. Reeta Sahoo, C++ Projects- Khanna Book Publication
2. Stanley Lippman, Josée Lajoie, Barbara Moo, C++ Primer-Fifth edition
3. Bruce Eckel, Thinking in C++: Introduction to Standard C++-Second Edition

**Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. [https://onlinecourses.swayam2.ac.in/aic20\\_sp06/preview](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview)
2. [https://onlinecourses.nptel.ac.in/noc19\\_cs38/preview](https://onlinecourses.nptel.ac.in/noc19_cs38/preview)
3. [https://onlinecourses.nptel.ac.in/noc21\\_cs02/preview](https://onlinecourses.nptel.ac.in/noc21_cs02/preview)

**Web Reference/E-Books:**

1. <https://www.javatpoint.com/cpp-tutorial>
2. <https://www.tutorialspoint.com/cplusplus/index.htm>
3. <https://www.cplusplus.com/doc/tutorial/>
4. <https://www.learncpp.com/>

**HYBRID & ELECTRIC VEHICLE DESIGN TRAINING  
VALUE ADDED COURSE  
II B.Tech. I SEM**

Course Title: HYBRID & ELECTRIC VEHICLE DESIGN TRAINING	Course Code: AS20-02 PW09
Teaching Scheme (L:T:P): 0 0 2	Credits: 1
Type of Course: Project work	Total Contact Periods: 32 hrs
Continuous Internal Evaluation-25Marks	Semester End Exams-75Marks
Prerequisites: Electrical Drives and Control, Power Semiconductor Drives.	

**Course Overview:**

This course provides to analyzing and understanding the performance delivered by conventional vehicles and archive the same with electric vehicles by environmental friendly methods. It gives a clear understanding on Hybrid and Electrical vehicle Design, Control and its implementation in traction system. Different energy storage systems and its management is being discussed.

**Course Objective**

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

**Course Outcomes(s)**

CO#	Course Outcomes
C2110.1	Understand the performance and characteristics of conventional vehicles
C2110.2	Understand the Performance and environmental impact of hybrid vehicles
C2110.3	Understand the Performance of hybrid vehicles and Electric vehicle in traction system.
C2110.4	Understand different Electric components and controls used in Hybrid and Electric Vehicles
C2110.5	Understand the different strategies related to energy storage systems
C2110.6	Understand the different strategies related to energy management systems

**COURSE CONTENT (SYLLABUS)**

**UNIT - I**

**Introduction:**

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

**UNIT - II**

**Introduction To Hybrid Electric Vehicles:**

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

### **Hybrid Electric Drive-Trains:**

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

### **UNIT- III**

#### **Electric Trains: Electric Drive-trains:**

Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

#### **Electric Propulsion Unit:**

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

### **UNIT - IV:**

#### **Energy Storage: Energy Storage:**

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

### **UNIT-V:**

#### **Energy Management Strategies:**

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

#### **Case Studies:**

Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

### **TEXT BOOKS:**

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

### **REFERENCE BOOKS:**

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

### **ONLINE RESOURCES (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/108/103/108103009/>
2. <https://nptel.ac.in/courses/108/106/108106170/>
3. <https://www.udemy.com/course/electric-and-hybrid-vehicle-engineering/>
4. <https://www.edx.org/course/hybrid-vehicles>
5. <https://skill-lync.com/courses/masters-hybrid-electric-vehicle-design-analysis>



**B.TECH  
SECOND YEAR  
SECOND SEMESTER  
SYLLABUS**

**PROBABILITY, STATISTICS & COMPLEX VARIABLES  
II B.Tech., II SEM**

Course Title: PROBABILITY, STATISTICS & COMPLEX VARIABLES	Course Code: AS20-00BS11
Teaching Scheme (L:T:P):3:1:0	Credits:3
Type of Course: Lecture + Tutorial	Total Contact Periods:48Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: 1.Fundamental Concepts of Probability, Knowledge of Basic Statistics Awareness of Complex Number System	

**Course Overview:** Course include

- Basics of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basics of statistics including measures of central tendency
- The study of statistical methods for data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.
- Understanding of Mobius transformation

**Course Objective** To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

**Course Outcomes**

CO#	Course Outcomes
C221.1	Formulate and solve problems involving random variables and Apply Statistical methods for analyzing experimental data.
C221.2	Evaluate the statistical parameters of Probability distributions
C221.3	Test the Hypothesis and Make important decisions for large and small samples
C221.4	Analyze the complex functions with reference to their analyticity Using C-R equations and Harmonic functions
C221.5	Evaluation of integrals by Cauchy integral and find the Taylor's and Laurent's series expansion of complex functions
C221.6	Evaluation of integrals using Residue theorem and bilinear transformation

**COURSE CONTENT (SYLLABUS)**

**UNIT - I:RANDOM VARIABLES**

Introduction to Basic Probability; Random variables: Discrete random variables and continuous random variables, Expectation of Random Variables: Moments, Variance of random variables.

**UNIT - II: PROBABILITY DISTRIBUTIONS**

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution. Continuous random variables and their properties, parameters for these distributions.

**UNIT - III: TESTING OF HYPOTHESIS**

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region. Large sample test for single proportion, difference of proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances.

**UNIT - IV: ANALYTIC FUCTIONS**

Introduction to Complex functions; Analyticity, Cauchy-Riemann equations (without proof), Finding harmonic conjugate.

**UNIT - V: COMPLEX INTEGRATION**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions,

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Edition, 2014.
2. R.K. Jain, S.R.K. Iyengar Advanced Engineering Mathematics, Narosa Publishing House Pvt. Ltd. 5<sup>th</sup> Edition, 2016.
3. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Khanna Publications

**REFERENCE BOOKS:**

1. Sheldon. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications Reprint, 2010.
3. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.mooc-list.com/course/probability-basic-concepts-discrete-random-variables-edx>
2. <https://study.sagepub.com/landers2e/student-resources/data-skill-challenges/chapter-5-sampling-distributions>
3. <https://www.mooc-list.com/course/calculus-two-sequences-and-series-coursera>

**KINEMATICS OF MACHINES**  
**II B.Tech., II SEM**

Course Title: KINEMATICS OF MACHINES	Course Code: AS20-03PC06
Teaching Scheme (L:T:P): 3:1:0	Credits:3
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Mechanics	

**Course Overview:** Student will learn the relative motion between the parts of machines.

**Course Objective**

1. Understand the basic principles of kinematics and the related terminology of machines.
2. Discriminate mobility; enumerate links and joints in the mechanisms.
3. Formulate the concept of analysis of different mechanisms.
4. Understand the working of various straight line mechanisms, gears, gear trains, steering gear mechanisms, cams and a Hooke's joint.
5. Analyze a mechanism for displacement, velocity and acceleration of links in a machine.

**Course Outcomes (s)**

CO#	Course Outcomes
C222.1	Ability to describe the principles of kinematic pairs, chains and their classification.
C222.2	Ability to explain the Degrees Of Freedom, inversions, equivalent chains and planar mechanisms.
C222.3	Analyze the planar mechanisms for position, velocity and acceleration
C222.4	Ability to draw the profiles of cams and followers for specified motions.
C222.5	Evaluate gear tooth geometry and select appropriate gears for the required applications
C222.6	Construct planar four bar and slider crank mechanisms for specified kinematic conditions.

**COURSE CONTENT (SYLLABUS)**

**UNIT-I**

**Mechanisms** : Elements or Links , Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs , sliding, turning, rolling, screw and spherical pairs lower and higher pairs, closed and open pairs, constrained motion, completely, partially or successfully constrained and incompletely constrained .

**Machines** :Mechanism and machines, classification of machines, kinematic chain , inversion of mechanism, inversion of mechanism , inversions of quadric cycle, chain , single and double slider crank chains.

### UNIT-II

**Straight Line Motion Mechanisms:** Exact and approximate copiers and generated types Peaucellier, Hart and Scott Russell Grasshopper Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

**Steering Mechanisms:** Conditions for correct steering Davis Steering gear, Ackermann's steering gear velocity ratio.

**Hooke's Joint:** Single and double Hookes joint Universals coupling application problems.

### UNIT-III

**Kinematics:** Velocity and acceleration - Motion of link in machine - Determination of Velocity and acceleration diagrams - Graphical method - Application of relative velocity method four bar chain.

**Plane motion of body:** Instantaneous center of rotation, centroids and axodes - relative motion between two bodies - Three centres in line theorem - Graphical determination of instantaneous center, diagrams for simple mechanisms and determination of angular velocity of points and links.

### UNIT-IV

**Cams:** Definitions of cam and followers their uses Types of followers and cams Terminology Types of follower motion - Uniform velocity Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

**Analysis of motion of followers:** Roller follower circular cam with straight, concave and convex flanks.

### UNIT-V

**Gears:** Higher pairs, friction wheels and toothed gears types law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding phenomena of interferences. Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact - Introduction to Helical, Bevel and worm gearing.

**Gear Trains:** Introduction - Train value - Types - Simple and reverted wheel train Epicycle gear Train. Methods of finding train value or velocity ratio - Epicycle gear trains. Selection of gear box-Differential gear for an automobile.

### Text Books:

1. S. S. Rattan [2009], Theory of Machines, TMH Publishers, New Delhi.
2. Sadhu Singh [2012], Theory of Machines, Pearson Education, New Delhi.
3. C.S. Sharma and K. Purohit [2010], Theory of Mechanisms and Machines , PHI publishers, New Delhi.
4. Theory of machines ,R.S Khurmi,Fourth edition
5. Theory of Mechanisms& machines,Ghosh,third edition

### Reference Books:

1. Ballaney [2005], Theory of Machines, Khanna Publishers, New Delhi.
2. Thomas Bevan [2005], Theory of Machines, CBS Publishers, New Delhi.
3. J.S. Rao and R.V. Dukkupati [2008], Mechanisms and Machine Theory, NAI Publishers, New Delhi.
4. J.E. Shigley [2010], Theory of Machines and Mechanisms, McGraw Hill Publishers, New York.
5. Theory of Machines and Mechanisms, Gordon R pennock & J Uicker, Oxford Higher education, Fourth edition

### Web References:

1. <http://www.umt.fme.vutbr.cz/~ruja/vyuka/kinematics/LectureNotes.pdf>
2. <http://nptel.ac.in/courses/112104121>
3. <https://www.iitg.ernet.in/mech/files/courses/ME224.pdf>
4. <http://www.amu.ac.in/newdata/depttmom/8758.pdf>

### **E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

**THERMAL ENGINEERING – I**  
**II B.Tech., II SEM**

Course Title: THERMAL ENGINEERING – I	Course Code: AS20-03PC07
Teaching Scheme (L:T:P): 3:1:0	Credits:03
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Thermodynamics	

**Course Overview:**

Thermal Engineering is a specialized sub-discipline of mechanical engineering and chemical engineering that deals with the movement of heat energy and transfer. The energy can be transformed between two mediums or transferred into other forms of energy. Many plants use heat exchangers in their operations.

**Course Objective:**

To apply the laws of Thermodynamics to analyze air standard cycles and to understand and evaluate the perform analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

**Course Outcomes:**

CO#	Course Outcomes
C223.1	Understand working principles of an IC Engine
C223.2	Analyze combustion in SI and CI engines
C223.3	Study performance of an IC Engine
C223.4	Understand working principles of Air-Compressors and Analyze Reciprocating Air- Compressors
C223.5	Understand working principles of Rotary air compressor and to analyze Centrifugal and Axial flow compressors
C223.6	Understand the basic concepts of power and refrigeration cycles. Their efficiency and coefficients of performance.

**COURSE CONTENT (SYLLABUS)**

**UNIT – I**

**I.C. Engines:** Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system.

**UNIT – II**

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of

engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

### UNIT - III

**Testing and Performance:** Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

**Reciprocating Compressors:** Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

### UNIT – IV

**Rotary Compressor (Positive displacement type):** Roots Blower, vane sealed compressor, mechanical details and principle of working – efficiency considerations.

**Dynamic Compressors:** Centrifugal compressors: Mechanical details and principle of operation –velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

**Axial Flow Compressors:** Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations– Polytrophic efficiency.

### UNIT – V

**Gas Turbines:** Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ratio for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle, Regeneration, Intercooling and Reheating – Closed and Semi-Closed Cycle

**Refrigeration:** Mechanical Refrigeration and types – units of refrigeration–Air Refrigeration system, details and principle of operation–applications of air refrigeration, Vapour compression refrigeration systems – calculation of COP.

#### **Text Books:**

1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill
3. Thermal engineering in power systems, B.Sunden, R.S.Amano, WIT Press
4. Thermal engineering, D.K Chavan, G.K Pathak/Rajson publications Pvt.Ltd/Second edition.
5. Thermal engineering, S.L Gavhale/Niraliprakashan publications

#### **References Books:**

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson.
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern.



3. Internal Combustion Engines Fundamentals – John B. Heywood – McGraw Hill Ed.
4. Thermal science and Engineering, M.L Mathur, F.S. Mehta / third edition / Jain Brothers
5. Thermal engineering, R.S Khurmi, J.K Gupta / S.Chand publications

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. Fundamentals of conduction and radiation- SWAYAM
2. Convective heat transfer- SWAYAM
3. Below are the NPTEL references

### **Web References:**

- Classification, Working principles, Valve and Port Timing Diagrams  
<http://nptel.ac.in/courses/103105110/1>  
<https://www.youtube.com/watch?v=hV3LImCslpo>
- Introduction, Comparison of Air Standard and Actual Cycles  
<http://nptel.ac.in/courses/103105110/2>
- Time Loss Factor, Heat Loss Factor,  
<http://nptel.ac.in/courses/103105110/3>
- *Combustion in S.I. Engines* Normal Combustion and abnormal combustion  
<http://nptel.ac.in/courses/103105110/7>  
<https://www.youtube.com/watch?v=fNcZDrFT498>
- Diesel Knock, Need for air movement  
<http://nptel.ac.in/courses/103105110/14>  
<https://www.youtube.com/watch?v=UfqXhnr2Ho4>
- open and divided combustion chambers and nozzles used  
<http://nptel.ac.in/courses/103105110/15>
- Testing and performance: Parameters of performance  
<http://nptel.ac.in/courses/101101001/26>
- Brake power, Determination of frictional losses and indicated power,  
<http://nptel.ac.in/courses/101101001/29>

**FLUID MECHANICS & HYDRAULIC MACHINERY**  
**II B.Tech., II SEM**

Course Title: FLUID MECHANICS & HYDRAULIC MACHINERY	Course Code:AS20-03PC08
Teaching Scheme (L:T:P): 3:1:0	Credits:3
Type of Course: Lecture + Tutorial	Total Contact Periods:48 Hrs + 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Mechanics	

**Course Overview:**

Mechanics of Fluid is a fundamental subject dealt for Mechanical, Electrical, Chemical, Civil and Aeronautical Engineering branches in an interdisciplinary manner. Machineries associated with fluid handling are of utmost importance for the aforesaid Engineers. The characteristic performances of these machines are studied to ascertain the suitability of the same for the specific purpose. The dynamics of fluid deals with all kinds of understanding the intricacies of the subject. The subject deals with various elements that are used in Hydro Electric power plant and ocean power plant. Various equipment's are studied with their performance like Pelton turbine, Francis Turbine and various other pumps. The purpose of studying this course is to imbibe the basic knowledge on fluid mechanics. This will be useful for Mechanical, civil and electrical engineering students for designing and applying to flow systems. Flow systems are applied for turbines, pumps, pipes etc.

**Course Objective:**

- basic principles of fluid mechanics.
- various types of flows.
- boundary layer concepts and flow through pipes.
- performance of hydraulic turbines.
- functioning and characteristic curves of the pumps.

**Course Outcome (s)**

CO	Course Outcomes
C224.1	<b>Explain</b> the effect of fluid properties on a flow system.
C224.2	<b>Identify</b> the fluid flow pattern and <b>describe</b> continuity equation.
C224.3	<b>Analyse</b> a variety a practical fluid flow and measuring devices and utilise fluid mechanics principles in design.
C224.4	<b>Explain</b> the Boundary Layer Theory Concepts in Fluid Flow Systems.
C224.5	<b>Analyse</b> an appropriate turbine with reference to given situation in power plants.
C224.6	<b>Estimate</b> performance parameters of a given centrifugal and reciprocating pump

**COURSE CONTENT (SYLLABUS)**

**Unit-I**

**Fluid Statics:** Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension, capillarity- vapour pressure-atmospheric, gauge and vacuum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

**Unit- II**

**Fluid kinematics:** stream line, path line and streak line and stream line, classification of flows steady & unsteady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

**Fluid dynamics:** Surface & body forces, Euler's & Bernoulli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venturi meter and orifice meter, flow nozzle.

**Unit- III**

**Closed conduit flow:** Reynolds's experiment, Darcy Weisbach equation, minor losses in pipes, pipes in series and pipes in parallel, total energy line-hydraulic gradient line.

**Boundary layer concepts:** Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift.

**Unit-IV**

**Basics and hydraulic turbine turbo machinery:** Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

**Unit-V**

**Performance of hydraulic turbines and pumps:** Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

**Centrifugal pumps:** Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

**Reciprocating pumps:** Working, discharge, slip, indicator diagrams.

**Text Books:**

1. Fluid mechanics and hydraulic machines by R.K.Bansal.
2. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH.
3. Fluid mechanics, SI version, Munson, Okhshi, Huebsch, Rothmayer, Wiley Student edition
4. Fluid mechanics, Frank M White/seventh edition
5. Fluid mechanics, Fox, McDonald and Pritchard/Eight edition

### **References:**

1. Fluid Mechanics by Yunus A. Cengel, John M. Cimbala
2. Fluid mechanics and fluid power engineering by D.S.Kumar, Kotaria and sons.
3. Fluid mechanics and machinery by D. Rama Durgaiyah, New age international.
4. Hydraulic machines by Banga and Sharma, Khanna publishers.
5. Fluid mechanics and hydraulic machines, Subramanya.K

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

### **Web Reference/E-Books:**

1. <http://www.musaliarcollege.com/e-Books/ME/Fluid%20Mechanics%20&%20Hydraulic%20Machines.pdf>

**INSTRUMENTATION AND CONTROL SYSTEMS**  
**II B.Tech., II SEM**

Course Title: INSTRUMENTATION AND CONTROL SYSTEMS	Course Code: AS20-03ES07
Teaching Scheme (L:T:P): 3:1:0	Credits: 3
Type of Course: Theory + Tutorial	Total Contact Periods: 48 Hrs+ 16 Hrs
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Basic of Electrical and electronic Engineering	

**Course Overview:** Student will learn about properties, characteristics of thermal system

**Course Objective:** Student will understand the basic characteristic of a typical instrument and identifying errors and their types that would occur in an instrument. Identifying properties used for evaluating the thermal systems. The concept of transducer and various types and their characters.

**Course Outcomes(s)**

CO#	Course Outcomes
C225.1	understand about types of measurements and devices
C225.2	understand about pressure and flow measurements
C225.3	analyse about speed, accelerating devices
C225.4	apply measuring techniques
C225.5	able to understand about temperature control devices
C225.6	understand about humidity and measuring devices

**COURSE CONTENT (SYLLABUS)**

**UNIT - I**

**INTRODUCTION:** Definition, Basic principles of measurement, Measurement systems, generalized configuration and functional descriptions of measuring instruments, examples. Dynamic performance characteristics, sources of error, Classification and elimination of error.

**MEASUREMENT OF DISPLACEMENT:** Theory and construction of various transducers to measure displacement, Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

**UNIT - II**

**MEASUREMENT OF PRESSURE:** Units, classification, different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement, Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

**MEASUREMENT OF LEVEL:** Direct method, Indirect methods, capacitive, ultrasonic, magnetic, Bubbler level indicators.

**FLOW MEASUREMENT:** Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot, wire anemometer, Laser Doppler Anemometer (LDA).

**UNIT - III**

**Measurement of Force, Torque and Power:** Elastic force meters, load cells, Torsion meters, Dynamometers.

**MEASUREMENT OF SPEED:** Mechanical Tachometers, Electrical tachometers, Noncontact type of tachometer- Stroboscope.

**MEASUREMENT OF ACCELERATION AND VIBRATION:** Different simple instruments, Principles of Seismic instruments, Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

**UNIT - IV**

**STRESS STRAIN MEASUREMENTS:** Various types of stress and strain measurements, electrical strain gauge, gauge factor, method of usage of resistance strain gauge for bending compressive and tensile strains, usage for measuring torque, Strain gauge Rosettes.

**MEASUREMENT OF TEMPERATURE:** Classification, Ranges, Various Principles of measurement Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

**UNIT - V**

**MEASUREMENT OF HUMIDITY:** Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

**ELEMENTS OF CONTROL SYSTEMS:** Introduction, Importance, Classification, Open and closed Systems, Servomechanisms, Examples with block diagrams, Temperature, speed & position control systems.

**TEXT BOOKS:**

1. Principles of Industrial Instrumentation and Control Systems /Alavala / Cengage
2. Instrumentation, Measurement and Analysis/ B.C. Nakra and K.K. Choudhary/ Mc Graw Hill.
3. Mechanical Measurements and Controls/ D.S. Kumar, 4th edition, Metropolitan Book Co. Pvt Ltd., New Delhi, India.
4. Instrumentation and control systems,W.Bolton
5. Instrumentation and control systems,K.PadmaRaju,Y J Reddy/Mc Graw Hill Eduaction

**REFERENCE BOOKS:**

1. Process Control Instrumentation Technology/ Curtis D. Johnson / Person
2. Mechanical Measurements / Sirohi and Radhakrishna / New Age International
3. Mechanical Measurements& Instrumentation,Er.R.K Rajput/Katson Books

4. Industrial Instrumentation and Control, S.K. Singh / third edition
5. Instrumentation, Walt Boyes.

### **Web References:**

1. [http://en.wikipedia.org/wiki/Instrumentation\\_and\\_control\\_engineering](http://en.wikipedia.org/wiki/Instrumentation_and_control_engineering)
2. <http://en.wikipedia.org/wiki/Instrumentation>
3. <http://www.sciencedirect.com/science/book/9780750664325>
4. [http://www.pacontrol.com/download/Instrumentation-Training\\_Tutorial2.pdf](http://www.pacontrol.com/download/Instrumentation-Training_Tutorial2.pdf)
5. <https://www.slideshare.net/RiddhiPatel129/open-loop-and-closed-loop>
6. <https://lecturenotes.in/subject/446/instrumentation-and-control-system-ics>

### **E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

**THERMAL ENGINEERING LAB**  
**II B.Tech., II SEM**

Course Title: THERMAL ENGINEERING LAB	Course Code: AS20-03PC09
Teaching Scheme (L: T:P): 0:0:3	Credits:1.5
Type of Course: Practical.	Total Contact Periods:48 Hours
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Fluid Mechanics & Hydraulics Lab, Fuels Lab & Heat Transfer Lab	

**Course Overview:**

IC Engines which is grassroots knowledge of any Automobile Industries. Boiler Industries, Compressor Industries and this Lab course Designed in Practical in such a way that students are able to understand and perform of basics of Thermodynamics, Fluid Mechanics and Heat Transfer such as Performance characteristics of IC Engines, Volumetric Efficiency, Mechanical Efficiency, Valve Timing and Port Timing Diagrams.

**Course Objective**

1. Explain the Valve Timing/Port Timing Diagrams.
2. To apply the working principles of IC Engines.
3. To apply the working principles of Compressors
4. Evaluate the performance parameters IC Engines.
5. Explain the Operation Process of Boilers.

**Course Outcomes(s)**

CO#	Course Outcomes
C226.1	Calculate with help of crank angle, the student able to draw the Valve Timing Diagram/Port Timing Diagram.
C226.2	Calculate and Analyze volumetric Efficiency of the Compressor with Arial flow Compressor of Two state Compressor.
C226.3	Ability to Analyze the Fire Tube Boilers water Tube Boilers.
C226.4	Ability to Analyze the Boilers and Compressors, Abnormal Combustion, Pre-ignition
C226.5	Evaluate and using single cylinder four stroke Diesel engine performance Test, Heat Balance sheet and exhaust Gas Emissions of present Environmental Conditions
C226.6	Calculate Performance Indicators with help of VCR Engine



**COURSE CONTENT (SYLLABUS)**

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI Engines.
3. I.C. Engines Performance Test for 2 Stroke SI Engines.
4. I.C. Engines Morse, Retardation, Motoring Tests.
5. I.C. Engine Heat Balance – CI/SI Engines.
6. I.C. Engines Economical speed Test on a SI Engine.
7. I.C. Engines effect of A/F Ratio in a SI Engine.
8. Performance Test on Variable Compression Ratio Engine.
9. IC engine Performance Test on a 4S CI Engine at Constant Speed.
10. Volumetric efficiency of Air – Compressor Unit.
11. Dis-assembly / Assembly of Engines.
12. Study of Boilers

**References Books:**

1. IC Engines-V.Ganeshan
2. Hand Book of IC Engines – Dr. Ing .E. H. Richard van
3. Thermal Engineering Hand Book-B. Sreenivasa Reddy and K.Hemachandra Reddy

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/103/112103262/>
2. <https://coureseera.org/internal-combustion-engines>
3. <https://mech.iitm.ac.in/meiitm/course/internal-combustion-engines/>
4. [https://www.iitk.ac.in/dordold/templates/r\\_d/data/Facilities/ERL.pdf](https://www.iitk.ac.in/dordold/templates/r_d/data/Facilities/ERL.pdf)

**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB  
II B.Tech., II SEM**

Course Title FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	Course Code: AS20-03PC10
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practical.	Total Contact Periods:48 Hours
Continuous Internal Evaluation-30 Marks	Semester End Exams-70 Marks
Prerequisites: Engineering Mechanics	

**Course Overview:** Fluid Mechanics and Hydraulic Machinery Lab is a common lab for Mechanical, Electrical, and Civil and Aeronautical Engineering branches in an interdisciplinary manner. Machineries associated with fluid handling are of utmost importance for the aforesaid Engineers. The characteristic performances of these machines are studied to ascertain the suitability of the same for the specific purpose. This lab deals with various elements that are used in Hydro Electric power plant and ocean power plant. Various equipment's are studied with their performance like Pelton turbine, Francis Turbine and various other pumps. The purpose of studying this course is to imbibe the basic knowledge on fluid mechanics practically. This will be useful for Mechanical, civil and electrical engineering students for designing and applying to flow systems. Flow systems are applied for turbines, pumps, pipes etc.

**Course Objective:**

1	Understanding the basic principles of fluid mechanics.
2	Understanding the frictional losses through pipes.
3	Evaluating the performance of hydraulic turbines.
4	Understanding the functioning and characteristic curves of the pumps.

**Course Outcome(s):**

CO	Course Outcomes
C227.1	Explain the effect of fluid properties on a flow system.
C227.2	Identify the fluid flow pattern and describe continuity equation.
C227.3	Analyse a variety a practical fluid flow and measuring devices and utilise fluid mechanics principles in design.
C227.4	Analyse an appropriate turbine with reference to given situation in power plants.
C227.5	Estimate performance parameters of a given centrifugal pump
C227.6	Estimate performance parameters of a given reciprocating pump

**COURSE CONTENT (SYLLABUS)  
LIST OF EXPERIMENTS**

Perform any 10 out of the 12 Exercises.

1. Verify Berboulli's Theorm.
2. Calibration of Venturimeter.
3. Calibration of Orificemeter.
4. Determination of friction factor for a given pipeline.
5. Determination of loss of head due to sudden contraction in a pipeline.
6. Impact of Jets.
7. Performance Test on Pelton Wheel.
8. Performance Test on Francis Turbine.
9. Performance Test on Kaplan Turbine.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

**Web Reference/E-Books:**

1. <http://www.musaliarcollege.com/e>
2. <Books/ME/Fluid%20Mechanics%20&%20Hydraulic%20Machines.pdf>

**INSTRUMENTATION AND CONTROL SYSTEMS LAB**  
**II B.Tech.,II SEM**

Course Title: INSTRUMENTATION AND CONTROL SYSTEMS LAB	Course Code: AS20-03ES08
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practical	Total Contact Periods: 48 Hours
Continuous Internal Evaluation-30Marks	Semester End Exams-70Marks
Prerequisites: ICS	

**Course Overview:** Student will learn about properties, characteristics of thermal system

**Course Objective:** Students will able to at the end of the course, the student will be able to Characterize and calibrate measuring devices. Identify and analyze errors in measurement. Analyze measured data using regression analysis. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

**Course Outcomes(s)**

CO#	Course Outcomes
C228.1	understand about types of Pressure Gauges,devices
C228.2	analyse about pressure and flow measurements
C228.3	analyse about speed, accelerating devices
C228.4	apply measuring techniques
C228.5	understand about temperature control devices
C228.6	understand about humidity and measuring devices

**COURSE CONTENT (SYLLABUS)**  
**LIST OF EXPERIMENTS**

Perform any 12 out of the 15 Exercises.

1. Calibration of Pressure Gauges.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.

10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detector with SCADA.
15. Measurement and control of flow of a process using SCADA systems.

### **Web References:**

1. [http://en.wikipedia.org/wiki/Instrumentation\\_and\\_control\\_engineering](http://en.wikipedia.org/wiki/Instrumentation_and_control_engineering)
2. <http://en.wikipedia.org/wiki/Instrumentation>
3. <http://www.sciencedirect.com/science/book/9780750664325>
4. [http://www.pacontrol.com/download/Instrumentation-Training\\_Tutorial2.pdf](http://www.pacontrol.com/download/Instrumentation-Training_Tutorial2.pdf)
5. <https://www.slideshare.net/RiddhiPatel129/open-loop-and-closed-loop>
6. <https://lecturenotes.in/subject/446/instrumentation-and-control-system-ics>

### **E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

**GENDER SENSITIZATION**  
**II B.Tech. II SEM**

Course Title: Gender Sensitization	Course Code: AS20-00MC02
Teaching Scheme (L:T:P): 3: 0: 0	Credits: 0
Type of Course: Lecture	Total Contact Periods: 48 Hours
Continuous Internal Evaluation: Nil	Semester End Exams : 100 Marks

**Course Objective:**

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work.
4. To help students reflect critically on gender violence.

**Course Outcomes(s)**

CO#	Course Outcomes
C229.1	Develop a better understanding of important issues related to what gender is in contemporary India.
C229.2	Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
C229.3	Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
C229.4	Understand what constitutes sexual harassment and domestic violence and be made aware of new forums of Justice.
C229.5	Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.
C229.6	Develop a sense of appreciation women in all walks of life

**COURSE CONTENT (SYLLABUS)**

**UNIT I: Understanding Gender: Introduction**

What is Gender and why does it matter

Gender Relations and Status in the Household

Masculinities

Gender Analysis and mainstreaming

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit - 1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit – 2

Introduction. Preparing for Womanhood. Growing up Male. First lessons in

Caste. Different Masculinities.

**UNIT II Gender And Biology:**

**Missing Women:** Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4), Declining Sex Ratio. Demographic Consequences.

Teacher's Role in Promoting/Advancing Gender Sensitization

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

### **UNIT III: Gender and Labour:**

**Housework:** the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

**Women's Work:** Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Sexual Harassment—Women at all levels of employment and all levels of workplace are affected.

### **UNIT IV: Issues Of Violence**

**Sexual Harassment:** Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

**Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

### **Promoting gender equality to prevent violence against women**

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim—"I Fought for my Life...." - Additional Reading: The Caste Face of Violence.

### **UNIT V: Gender: Co – Existence**

**Just Relationships:** Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

### **Text Books:**

1. Towards a World of equals. A bilingual text book on Gender written by A. Suneetha. Telugu Academy, Hyderabad in 2015.
2. Seeing like a feminist: Menon Nivedita. Zubaan Penguin books. New Delhi in 2012.
3. Gender Sensitization by C. Rajya Lakshmi, D. S. Vittal, by Himalaya Publishing House.

### **e- books:**

1. <https://fybblog.com/ignou-book-bgdg-172-hindi-english>
2. [http://saha.ac.in/web/images/administration/pdf/Gender%20Sensitization%20New-10-4-2017\\_545c7.pdf](http://saha.ac.in/web/images/administration/pdf/Gender%20Sensitization%20New-10-4-2017_545c7.pdf)
3. [https://www.researchgate.net/publication/329541569\\_EMPOWERING\\_WOMEN\\_THROUGH\\_GENDER\\_SENSITIZATION](https://www.researchgate.net/publication/329541569_EMPOWERING_WOMEN_THROUGH_GENDER_SENSITIZATION)

### **Web References:**

1. <https://nptel.ac.in/courses/110/105/110105080/>
2. [https://onlinecourses.nptel.ac.in/noc19\\_hs57/preview](https://onlinecourses.nptel.ac.in/noc19_hs57/preview)
3. <https://nptel.ac.in/content/storage2/courses/109103023/download/Lecture%2027.pdf>

**SOLID WORKS**  
**II B.Tech. – II SEM**  
**VALUE ADDED COURSE**

Course Title: SOLID WORKS	Course Code: AS20003PW04
Teaching Scheme (L:T:P): 0:0:2	Credits: 1
Type of Course: Project work	Total Contact Periods:32 hrs
Continuous Internal Evaluation: 25 Marks	Semester End Exam: 75 Marks

**Course Overview**

SOLID WORKS is a 3D mechanical CAD (computer-aided design) program that runs on Microsoft Windows. SolidWorks is highly regarded 3D mechanical design software with powerful 3D design capabilities. Students in this course are introduced to basic sketching exercises, 3D modelling and assemblies using SolidWorks. It covers creation, retrieval and modification of 3-D and layout drawings using basic SolidWorks commands.

**Course Objectives**

The objectives of this course are to

- Demonstrate competency with multiple drawing and modification commands in Solid works.
- Create three-dimensional solid models.
- Create three-dimensional assemblies incorporating multiple solid models.
- Apply industry standards in the preparation of technical mechanical drawings.

**Course Outcomes**

At the end of the course, students will be able to

<b>CO</b>	<b>Course Outcome Statement</b>
C2210.1	Create the solid models of cone and cuboid
C2210.2	Create the solid models of cylinder and pentagonal pyramid
C2210.3	Create the solid models of sections of hollow cone
C2210.4	Create the solid models of sections of solid pentagonal prism
C2210.5	Create part modeling
C2210.6	Create assembly solid models



**COURSE CONTENT (SYLLABUS)**

Sketcher - Solid modeling –Extrude, Revolve, Sweep, Variational sweep, Loft ,etc  
Surface modeling –Extrude, Sweep, Trim and so on. Mesh of curves, Free form etc.  
Feature manipulation – Copy, Edit, Pattern, Suppress, History operations etc.  
Assembly-Constraints, Exploded Views, Interference check.  
Drafting-Layouts, Standard & Sectional Views, Detailing & Plotting.  
CAD data Exchange formats- IGES, PDES, PARASOLID, DXF and STL.  
Exercises in Modelling and drafting of Mechanical Components.  
Assembly using Parametric and feature based Package SOLID WORKS.  
Practices on simple components having curved and holed machine components [3D models in engineering graphics practices]  
Part Modelling of Machine Components such as Couplings, Gears, Tool Head of a Shaper, Tail stock, Armour Press.  
Assembly of the above machine components.

**Text Books:**

1. SOLIDWORKS 2021 for Designers (19th Edition) / Sham Tickoo (Purdue University) - USA /CADCIM Technologies, USA
2. <https://files.solidworks.com/pdf/introsw.pdf>
3. [https://www.solidworks.com/sw/images/content/Training/SolidWorks\\_Simulation\\_Student\\_Guide-ENG.pdf](https://www.solidworks.com/sw/images/content/Training/SolidWorks_Simulation_Student_Guide-ENG.pdf)
4. [https://www.solidworks.com/sw/docs/Student\\_WB\\_2011\\_ENG.pdf](https://www.solidworks.com/sw/docs/Student_WB_2011_ENG.pdf)

**Reference Books :**

1. Solid works 2021 / Gaurav Varma / Cadcamcae works
2. Solidworks 2020 for Beginners and Intermediate Users/ Sandeep Dogra /Notion Press.
3. [https://www.solidworks.com/sw/support/54117\\_ENU\\_HTML.htm?product=SOLIDWORKS%20CAD](https://www.solidworks.com/sw/support/54117_ENU_HTML.htm?product=SOLIDWORKS%20CAD)

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://www.solidworks.com/support/resource-center>
2. <https://my.solidworks.com/training/catalog>
3. <https://www.coursera.org/courses?query=solidworks>
4. <https://www.udemy.com/topic/solidworks/>

**Web Resources:**

1. <https://www.engineersrule.com/top-5-resources-to-learn-solidworks-at-home-and-for-free/>
2. <https://www.cadimensions.com/blog/category/education/>
3. <https://www.mlc-cad.com/solidworks-online-resources/>
4. <https://www.design-point.com/resource/designpointers/simplify-cad-models-from-online/>

**HYPERMESH**  
**II B.Tech. – II SEM**  
**VALUE ADDED COURSE\***

Course Title: HYPERMESH	Course Code: AS20003PW05
Teaching Scheme (L:T:P): 0:0:2	Credits:01
Type of Course: project Work	Total Contact Periods:32 Hrs
Continuous Internal Evaluation: 25 Marks	Semester End Exam: 75 Marks
Prerequisites: Design and modeling, FEM	

**Course Overview**

HyperMesh is a popular multi-disciplinary pre and post8-processor, which manages the generation of large and complex models. It provides a highly interactive visual environment for product design analysis. Also, it allows users in modifying the legacy of meshes without re-meshing. Its direct interfaces to commercial CAD and CAE systems, makes it the consistent analysis platform for the entire industry. Overall, this software helps geometrically optimize the shape of the model.

**Course Objectives**

This course is designed to help students and professionals to use Hypermesh to manage and receive high-quality meshes efficiently. Moreover, this course will help you learn to use geometry editing tools for preparing CAD and CAE models used in the meshing process. Also, through this course, you will learn FEM analysis

**Course Outcomes**

At the end of the course, students will be able to

<b>CO</b>	<b>Course Outcome Statement</b>
C2210.1	aviation and aerospace industry for the analysis of local structures
C2210.2	identification and removal of redundant material
C2210.3	Speeds up CAD to Finite Element Modeling (FEM) creation with the help of building tools.
C2210.4	Meshing and automated model construction in the automotive industry.
C2210.5	Acoustic cavity meshing to analyze noise and vibration of a vehicle in the automobile industry.
C2210.6	Vibration of a vehicle in the automobile industry.

**COURSE CONTENT (SYLLABUS)**

- Fundamentals of Finite Element Analysis (FEA) – Applications of FEA, Math Behind FEA - Engineering problem-solving methods – Discretization – Meshing – 1D, 2D and 3D Elements, Axisymmetric Elements, Subparametric, Superparametric and Isoparametric Elements - Types of CAE process – Model setup - meshing software.
- Introduction & Basics of Hypermesh – Modelling of Components using Basic Geometric tools and tools menu introduction – Geometry cleanups (including auto cleanup) – Midsurface creation
- Geometric Tools utilization in Complex 3D Components – Batch Mesher Macro – Criteria files for geometry cleanup – MNode's creation & node edits – Point edit - Edge edit.
- Modelling using 1D Meshing - Different types of 1D elements - 5Masses, Bar, Rod, Rigid, RBE3, Springs, Gaps – Connectors, HYPER BEAM, Linemesh, Linear 1D –Utilization of tools such as Edit, Element, Split, Replace, Detach – Order change, configuration edit, element type
- Geometry Cleanup and Midsurface – surface clean-up on a given geometry – Extraction of the mid-surface using an in-built tool - Auto-mid-surface – Distorted surface while dealing with a complex geometry – Midsurface generation - Handling distorted surfaces.
- Quality Criteria - quality check and the different quality-checks in HyperMesh. Concept of modifying the Areas failed in quality check - key concepts - 1D Element quality check - 2D Element quality check - Understanding the quality parameters for 2D meshing.
- Advance 2D Meshing – Rectification of manual mid surfacing - auto-mid surfacing option fails. Handling symmetric geometry - model and its significance, and free edges along with their significance – Handling symmetric geometry –Free edge checks - Normal check.
- 3D Meshing – Tools and techniques to generate a hexamesh, Tetra mesh for a given geometry -techniques to generate tetra meshes, and to rectify areas that have failed these checks.
- Connectors -meshes interspersed - Connectors - interface between two different kinds of meshes, for Seam weld, Spot weld, Bolt connection, Spring element, Adhesive modelling - HEXA
- Batch Meshing - uses of batch meshing and its applications – Understanding quality parameter and criteria files -Optimizing these files according to the requirement.
- Morphing Techniques and Macro Generation with constraints, volumes, and geometry - Manipulation of TCL commands, running a TCL command using the inbuilt run options - Morph constraints, Morph volumes, Map to geometry, Basic macro generation using TCL commands.
- Additional Practices on:

Shell, Hexa and Tetra Meshing, Assemblies: Welding and Swapping Parts, Shape Generation HyperMesh, Mesh quality parameters, Mesh editing and correction, Advanced meshing, Solver interfacing

**Text Books:**

1. Finite Element Modeling (Hyperworks engineering guide books)  
HyperMesh based(Chinese Edition) Paperback – January 1, 2015 - FU YA LAN. XIE SU MING (Author)
2. Practical Finite Element Analysis, Gokhale Nitin S,

**Reference Books:**

1. [https://altairuniversity.com/free-ebooks/free-ebook-practical-aspects-of-finite-element-simulation-a-study-guide/?\\_\\_hstc=142694250.e9e174835f8d75dc025319beb04b75d0.1628156666985.1628156666985.1628156666985.1&\\_\\_hssc=142694250.1.1628156666987&\\_\\_hsfp=1414547400](https://altairuniversity.com/free-ebooks/free-ebook-practical-aspects-of-finite-element-simulation-a-study-guide/?__hstc=142694250.e9e174835f8d75dc025319beb04b75d0.1628156666985.1628156666985.1628156666985.1&__hssc=142694250.1.1628156666987&__hsfp=1414547400)
2. <https://imechanica.org/files/HM%20Advanced%20Training.pdf>

**Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. <https://webcache.googleusercontent.com/search?q=cache:Pz5JDnNiaN8J:https://www.altair.com/hypermesh/+&cd=1&hl=en&ct=clnk&gl=in>
2. <https://forum.altair.com/topic/30056-how-do-i-cite-hypermesh-as-a-software-in-my-pape>

**Web Resources:**

1. <https://www.youtube.com/watch?v=oJNoUWwQs3c>
2. <https://www.youtube.com/watch?v=FTJnsNBi5Xg>
3. <https://www.youtube.com/watch?v=1k2SP1kqAcI>

**SCI LAB**  
**VALUE ADDED COURSE**  
**II B.Tech. – II SEM**

Course Title: SCI LAB	Course Code:AS20003PW06
Teaching Scheme (L:T:P): 0: 0: 2	Credits: 1
Type of Course: Project work	Total Contact Periods: 32 hrs
Continuous Internal Evaluation: 25 Marks	Semester End Exam: 75 Marks
Prerequisites: Basic programming knowledge in Computers, Basic knowledge in Mechanical Engineering Design Courses	

**Course Overview**

In this section, we present an overview of Scilab. The first subsection introduces the open source project associated with the creation of this document. Then we present the software, license and scientific aspects of Scilab. In the third subsection, we describe the methods to download and install Scilab on Windows, GNU/Linux and Mac operating systems. In the remaining subsections, we describe various sources of information needed when we have to get some help from Scilab or from other users. We describe the built-in help pages and analyse the mailing lists and wiki which are available online. Finally, we take a moment to look at the demonstrations which are provided with Scilab.

**Course Objectives**

Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB. Application of the above such languages for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

**Course Outcomes**

At the end of the course, students will be able to

<b>CO</b>	<b>Course Outcome Statement</b>
C2210.1	Understand the need for simulation/implementation for the verification of mathematical functions.
C2210.2	Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning.
C2210.3	Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB.
C2210.4	Interpret and visualize simple mathematical functions and operations thereon using plots/display.
C2210.5	Analyze the program for correctness and determine / estimate / predict

	the output and verify it under simulation environment using MATLAB/SCILAB tools.
C2210.6	Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.

### **COURSE CONTENT (SYLLABUS)**

#### **Introduction**

1. Definition, need, and types of programming languages and their selection criterion - Introduction to MATLAB/SCILAB (Features, capabilities and applications) and development environment.
2. Program execution process, Program format.
3. Concept and examples of built-in functions and the concept of toolboxes.

#### **Variables and Constants**

1. Variables and constants: Definition, naming (identifiers or labels for different entities), initialization and accessing of variables. Constants and their representation.
2. Data types-classification, memory requirement, range of values, usage and type specifiers.
3. Operators and Operands: Unary and binary operators. Arithmetic, logical, relational, combinational assignment and special operators. Precedence and associativity. Unary and binary operands.
4. Statements-tokens and expressions, Standard input and output statements and plot functions, Escape characters.

#### **Control Structure**

1. Branching: Conditional (if, if-else, nested and ladder if-else, switch constructs) and unconditional (break, continue and go to statements).
2. Looping: Entry controlled (for and while).

#### **Arrays/Matrices and Strings**

1. Definition, declaration, initialization (static and run-time or dynamic) and arrays, matrices and strings.
2. Accessing of strings, array and matrices elements and relevant operations.

#### **Functions**

1. Concept, advantages, classification, creation and application of functions.
2. Comparison of built-in, library and user-defined functions.

### **Text Books:**

1. MATLAB for Mechanical Engineers/ Dukkipati R.V./New Age Intl. Pub., India
2. A Handbook of MATLAB Programming for Mechanical Engineers/Md. Irfan Ali / Studium Press LLC

### **Reference Books:**

1. MATLAB Programming for Engineers (2006 Edition)/Stephen J Chapman/ CENGAGE Publications.
2. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, 2009.
3. SCILAB(a Free Software to Matlab),Er. Hema Ramachandran and Dr. Achutsankar Nair, S. Chand Publishers, 2011.

### **Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):**

1. [https://onlinecourses.nptel.ac.in/noc20\\_ge05/preview](https://onlinecourses.nptel.ac.in/noc20_ge05/preview)
2. <https://www.coursera.org/learn/matlab>
3. <https://www.scilab.org/resources/documentation/tutorials>

### **Web Resources:**

1. <https://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming-fall-2011/download-course-materials/>
2. [https://in.mathworks.com/services/training/courses.html?s\\_tid=gn\\_mlac\\_co cs](https://in.mathworks.com/services/training/courses.html?s_tid=gn_mlac_co cs)
3. [https://in.mathworks.com/academia.html?s\\_tid=gn\\_acad#learn-basics](https://in.mathworks.com/academia.html?s_tid=gn_acad#learn-basics)

**SENSOR TECHNOLOGY  
VALUE ADDED COURSE  
ME II B.Tech. II SEM**

Course Title: Sensor Technology	Course Code: AS20-04PW04
Teaching Scheme (L:T:P) 0:0:2	Credits:1
Type of Course: Project Work	Total Contact Periods:32 hrs
Continuous Internal Evaluation: 25 Marks	Semester End Exam: 75 Marks

**Course Overview:**

This course will deliver the knowledge in introducing various types of sensors, their performance and error analysis. The course also provides concepts on intensity polarization and interferometric sensors.

**Course Objective**

- To provide in depth knowledge in physical principles applied in sensing, measurement and a comprehensive understanding on how measurement systems are designed, calibrated, characterised, and analysed.
- To introduce the students to sources and detectors of various Optical sensing mechanisms and provide in-depth understanding of the principle of measurement, and theory of instruments and sensors for measuring velocity and acceleration.
- To give a fundamental knowledge on the basic laws and phenomena on which operation of sensor transformation of energy is based.
- To impart a reasonable level of competence in the design, construction, and execution of mechanical measurements strain, force, torque and pressure.

**Course Outcomes(s)**

CO#	Course Outcomes
C2210.1	Use concepts in common methods for converting a physical parameter into an electrical quantity
C2210.2	Choose an appropriate sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
C2210.3	Design and develop sensors using optical methods with desired properties
C2210.4	Evaluate performance characteristics of different types of sensors
C2210.5	Locate different type of sensors used in real life applications and paraphrase their importance
C2210.6	Create analytical design and development solutions for sensors.



## COURSE CONTENT

### **UNIT-1      Sensor fundamentals and characteristics**

Sensor Classification, Performance and Types, Error Analysis characteristics

#### **Optical Sources and Detectors**

### **UNIT-2:**

Electronic and Optical properties of semiconductor as sensors, LED, Semiconductor lasers, Fiber optic sensors, Thermal detectors, Photo multipliers, photoconductive detectors, Photo diodes, Avalanche photodiodes, CCDs.

#### **Intensity Polarization and Interferometric Sensors**

### **UNIT-3:**

Intensity sensor, Microbending concept, Interferometers, Mach Zehnder, Michelson, FabryPerot and Sagnac, Phase sensor: Phase detection, Polarization maintaining fibers.

#### **Strain, Force, Torque and Pressure sensors**

### **UNIT-4:**

Strain gages, strain gage beam force sensor, piezoelectric force sensor, load cell, torque sensor, Piezo-resistive and capacitive pressure sensor, optoelectronic pressure sensors, vacuum sensors.

#### **Position, Direction, Displacement and Level sensors**

### **UNIT-5:**

Potentiometric and capacitive sensors, Inductive and magnetic sensor, LVDT, RVDT, eddy current, transverse inductive, Hall effect, magneto resistive, magneto strictive sensors. Fiber optic liquid level sensing, Fabry Perot sensor, ultrasonic sensor, capacitive liquid level sensor.

### **Text Books:**

- 1 Jacob Fraden, "Hand Book of Modern Sensors: physics, Designs and Applications", 2015, 3rd edition, Springer, New York.
2. Jon. S. Wilson, "Sensor Technology Hand Book", 2011, 1st edition, Elsevier, Netherland.

### **References Books:**

1. Gerd Keiser, "OpticalFiber Communications", 2012, 4th edition, McGraw-Hill Science, Delhi.
2. John G Webster, "Measurement, Instrumentation and sensor Handbook", 2014, 2nd edition, CRC Press, Florida.
3. Eric Udd and W.B. Spillman, "Fiber optic sensors: An introduction for engineers and scientists", 2013, 2nd edition, Wiley, New Jersey.
4. Bahaa E. A. Saleh and Malvin Carl Teich, "Fundamentals of photonics", 2012, 1st edition, John Wiley, New York.

**SOLAR PLANT DESIGN AND ENGINEERING**  
**VALUE ADDED COURSE\***  
**ME II B.Tech. II SEM**

Course Title: SOLAR PLANT DESIGN AND ENGINEERING	Course Code: AS20-02PW05
Teaching Scheme (L:T:P) 0:0:2	Credits:1
Type of Course: Project Work	Total Contact Periods:32 hrs
Continuous Internal Evaluation: 25 Marks	Semester End Exam: 75 Marks

**Course Overview:**

Learn the design fundamentals of photovoltaic projects. Gain knowledge and skills from engineers with real-life experience in solar energy and electrical delivery fields. One will also understand solar plant components and PV modules; DC system and AC collector design; civil and geotechnical issues; and interconnection to distribution and the bulk power grid.

**Course Objective:**

- To understand the fundamental concepts, principles, analysis and design of solar power plant
- To know the various possibilities, advantages, limitations of solar power plant.

**Course Outcomes(s)**

CO#	Course Outcomes
C2210.1	Understand the performance and characteristics of conventional vehicles
C2210.2	Understand the Performance and environmental impact of hybrid vehicles
C2210.3	Understand the Performance of hybrid vehicles and Electric vehicle in traction system.
C2210.4	Understand different Electric components and controls used in Hybrid and Electric Vehicles
C2210.5	Understand the different strategies related to energy storage systems
C2210.6	Understand the different strategies related to energy management systems

COURSE CONTENT (SYLLABUS)

**Unit – I**

**Introduction**

Energy Scenario, Solar Energy, Average energy received from sun, History of PV cell, Terminology Used in Solar PV System, Fundamentals of Solar PV Cell, Equivalent Circuit of Solar Cell, Design and Structure of Solar PV Module/Panel, Number of Solar Cells in a Panel  
Effect of Environmental Parameters on the Performance of a Solar PV Panel; effect of Tilt angle and shading

**Unit – II**

**Design of an on-grid solar system**

Energy requirement, Panel capacity and quantity, Position of panels; Tilt and Azimuth, Maximum power tracking (MPPT), MPPT device; usage and advantages  
Series, Parallel and Mixed layout connection of panels, Selection of layouts and Inverters

**Unit – III**

**Electrical characteristics of solar panels**

Voltage- Current curve of solar panel; Definitions of Open circuit voltage, short circuit current, maximum power voltage, maximum power current, maximum power

**Unit – IV**

**Performance analysis of solar panels**

Losses in panel; shadow and cable, Panel efficiency, Inverter efficiency, Overall efficiency of panel  
Performance Ratio (PR); Standard definition, Formula of PR, Classification, An example of simple PR calculation.

**Unit – V**

**Protection devices for on-grid solar power plant**

Lightning arrester, Earthing, DC/AC Box, Fuse, Surge protection device, Miniature circuit breaker, Solar meter, Net meter.