R16 B.TECH MSNT.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. MECHANICAL ENGINEERING (MATERIAL SCIENCE AND NANO TECHNOLOGY)
III YEAR COURSE STRUCTURE & SYLLABUS (R16)

Applicable From 2016-17 Admitted Batch

III YEAR I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	NT501PC	Thermal Engineering	4	1	0	4
2	NT502PC	Machine Tools	4	1	0	4
3	NT503PC	Design of Machine Members -II	4	1	0	4
4	SM504MS	Fundamentals of Management	3	0	0	3
5		Open Elective – I	3	0	0	3
6	ME505PC	Thermal Engineering Lab	0	0	3	2
7	ME506PC	Machine Tools Lab	0	0	3	2
8	NT507PC	Machine Drawing Lab	0	0	3	2
9	*MC500HS	Professional Ethics	3	0	0	0
		Total Credits	**21**	**3**	**9**	**24**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	NT601PC	Engineering Metrology	4	1	0	4
2	NT602PC	Properties of Nano Materials	4	1	0	4
3	NT603PC	Finite Element Methods	4	1	0	4
4		Open Elective – II	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	NT604PC	Metrology and Surface Engineering Lab	0	0	3	2
7	NT605PC	Production Drawing Practice Lab	0	0	3	2
8	EN606HS	Advanced English Communication Skills Lab	0	0	3	2
		Total Credits	**18**	**3**	**9**	**24**

During Summer Vacation between III and IV Years: Industry Oriented Mini Project

Professional Elective - I

NT611PE	Mechanical Vibrations
ME612PE	Refrigeration and Air conditioning
NT613PE	Operations Research
NT614PE	Maintenance and Safety Engineering

***Open Elective** subjects' syllabus is provided in a separate document.

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

Ex: - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

R16 B.TECH MSNT.

THERMAL ENGINEERING

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: NT501PC	**4**	**1**	**0**	**4**

Course Overview:

This course is intended to introduce basic principles of internal combustion engines, compressors and refrigeration are widely used in automobile, agriculture, industry for transport, water pumping, electricity generation, earth moving and to supply mechanical power to grinders, crushers etc. Compressors are used for supply of gases including air at higher pressure. Compressors are used to supply compressed air to all pneumatic equipments and for gases such as cooking gas, oxygen, nitrogen, neon, argon compressors are also used. Thus there is great relevance for this course for mechanical engineers.

Course Objectives:

1. To introduce basic principles of operation of IC engines compressors and refrigeration systems.
2. To understand the procedures of testing and evaluating the performance of these machines.
3. To know the maintenance details and procedures.
4. Teach students to conduct experiments in laboratories and analyze the results with theoretical ones.

Course Outcomes: The student will be able to:

1. Understand main idea and importance behind the 2 - S and 4 - S IC engines.
2. To analyze the working of the basic components in the IC engines, Compressors and Refrigeration systems.
3. Understand the combustion process and also how it does affect the performance of the IC engines.
4. Apply the thermodynamic principles in the design of an IC engines, compressors, and refrigeration system.
5. Formulate and perform the procedures required for the maintenance and operation of IC engines, compressors, and refrigeration systems.
6. Compare different IC engines, compressors, and refrigeration systems and develop a system which meets the requirements.

UNIT – I

Internal Combustion Engines: Introduction, I.C. ENGINE Classification-Engine Systems, Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication. Comparison of Air Standard and Actual Cycles, Volumetric Efficiency.

Combustion in S.I. & C.I. Engines: Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of) - anti knock additives – combustion chamber – requirements, types. Four stages of combustion in C.I. Engines– Delay period and its importance – Diesel Knock– Need for air movement, turbulence– fuel requirements, and fuel rating.

UNIT – II

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

UNIT – III

Compressors – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating: Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance volume, stage compression, inter stage cooling, saving of work, minimum work condition for stage compression.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter stage cooling and reheating –Closed and Semi-closed cycles – merits and demerits of, Brief concepts about compressors, combustion chambers and turbines in the context of Gas Turbine Power Plants.

UNIT – IV

Steam Generators & Nozzles: Steam Boilers (Steam Generators) Working Principle and Classification, Function of Steam nozzles – applications - types, Flow through nozzles, thermodynamic analysis – assumptions – nozzle exit velocity - Ideal (Isentropic) and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, degree of under cooling - Wilson line.

UNIT – V

Steam Turbines: Classification –Impulse turbine; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. **De-Laval Turbine** - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction – velocity diagram – Parson's reaction turbine – condition for maximum efficiency. **Steam Condensers:** Classification of condensers – working principle of different types.

TEXT BOOKS:

1. I.C. Engines - V. GANESAN, TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.

REFERENCES:

1. Thermal Engineering-P. L. Bellaney/ Khanna Publishers.
2. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.

MACHINE TOOLS

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: NT502PC	**4**	**1**	**0**	**4**

Course Overview:

At the very outset of engineering development materials were cut by means of simple hand tools. Gradually, with the development of civilization and engineering, work done by hand tools gives way to the work performed by special machines which are called machine tools.

Hand tools are tools which are held and used by the hands for shaping and sizing a work and there is no mechanism in them. The cutting away of the excess metal in the form of chips or small pieces is simply done by the muscular efforts of man. As a result, the process is time consuming and not gives satisfactory surface finish. It includes files, saw, chisel, scrapper, etc. which are very commonly used in bench and fitting works and assembly of machines.

Course Objectives:

1. Machine tools is one of the important subject in mechanical engineering faculty, not only in educational institutional, but it has very much of importance in industrial domain. Without a machine tool, there is no industry.
2. A source of power is always needed in various workshop processes particularly in cutting and forming of metal in a machine tool. In the metal-working industry work pieces of most different shapes and dimensions and of different materials are worked. In every industry we need shaping of materials.
3. This shaping of materials is done by either non-cutting process or cutting process. For example forging, pressing, drawing, etc are non- cutting shaping processes. Turning, drilling, mailing etc are comes under cutting shaping operations.
4. The process of metal cutting in which chip is formed is affected by relative motion between the work piece and the hard edge of a cutting tool held against the work piece. Such relative motion is produced by combination of rotary and translating movements either of work piece or the cutting tool or of both.
5. Machining process also include other processes like grinding, slotting, shaping, honing, planning, lapping, and broaching operations.
6. After completion of the machine tools course, students can be able to identify various applications of different tools, can be able to differentiate various tools for different machining operations, and also they can be able to solve many industrial problems regarding machine tools. And also as the kinematics of machines studied, students can be able to design various machine tools for various machines.

Course Outcomes:

1. An ability to understand the basic parameters in the metal cutting operation, to Calculate analytically the forces and other parameter associated with orthogonal cutting
2. An Ability To Know the various cutting fluids and their application methods, to

understand the importance of lathe, its many varieties and basic structure of center lathe

3. An ability to Understands operation of shaper, slotter , planer and drilling machine, the characteristics feature of the milling and drilling machine
4. An ability To Know the various types of milling machine ,grinding machine, boring machine s and their application and their operations, need for jigs and fixtures and Design jigs for practical application
5. An ability to Know the various types of milling machine ,grinding machine, boring machines and their applications and their operations

UNIT – I

Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

UNIT – II

Engine lathe – Principle of working, specification of lathe – types of lathe – work and tool holding devices, Taper turning, Thread turning – Lathe attachments. Turret and capstan lathe – Principal features of automatic lathes – classification: Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – III

Shaping, slotting and planing machines – Principles of working – Principal parts – specification, classification, operations performed. Kinematic scheme of the shaping, slotting and planing machines, machining time calculations.

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig boring machine. Deep hole drilling machine. Kinematics scheme of the drilling and boring machines

UNIT – IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Geometry of milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling machines.

Lapping, honing and broaching machines – comparison of grinding, lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features speed and feed Units, machining time calculations

UNIT –V

Finishing Processes: Grinding – fundamentals – theory of grinding – classification of grinding machines – cylindrical and surface grinding machine-Tool and cutter grinding machine – special types of grinding machines, Different types of abrasives – bonds

specification of a grinding wheel and selection of a grinding wheel, Kinematic. scheme of grinding machines.

TEXT BOOKS:

1. Production Technology/HMT/Tata McGraw Hill
2. Production Technology / R.K. Jain and S.C. Gupta/Khanna Publishers.

REFERENCE BOOKS:

1. Principles of Machine Tools/ Bhattacharya A and Sen.G.C/ New Central Book Agency.
2. Workshop Technology – Vol.-II/ B.S. Raghuvamsi
3. Elements of Work Shop Technology – Vol. II/Hajra Choudry/ Media Promoters.
4. Fundamentals of Metal Machining and Machine Tools/ Geofrey Boothroyd/ McGraw Hill
5. Manufacturing Processes/JP Kaushish/Prentice Hall/2nd Edition
6. Machine Tools/C Elanchezhian & M. Vijayan/Anuradha Publications

DESIGN OF MACHINE MEMBERS – II

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: NT503PC	**4**	**1**	**0**	**4**

Note: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Pre-requisites: Study of engineering mechanics, design of machine members-I and theory of machines.

Course objectives:

- To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs , belts, gears etc.
- To design the components using the data available in design data books.

Course Outcomes:

- Knowledge about journal bearing design using different empirical relations.
- Estimation of life of rolling element bearings and their selection for given service conditions.
- Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.

UNIT – I

Sliding contact bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design.

UNIT – II

Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – III

Engine Parts: Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Design of co-axial springs, Design of leaf springs.

Belts & Pulleys: Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V

Gears : Spur gears& Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:

1. Design of Machine Elements / Spotts/ Pearson
2. Machine tool design / V. Bhandari / Mc Graw Hill

REFERENCE BOOKS:

1. Design of Machine Elements-II / Annaiah / New Age
2. Design of Machine Elements / Sharma and Purohit/PHI

FUNDAMENTALS OF MANAGEMENT

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: SM504MS	**3**	**0**	**0**	**3**

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

Course Outcome: The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation, and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT-I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT-II

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT-III

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT-IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT-V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency, and Methods.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

THERMAL ENGINEERING LAB

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: ME505PC	**0**	**0**	**3**	**2**

List of Experiments

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

Note: Perform any 10 out of the 12 exercises.

MACHINE TOOLS LAB

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: ME506PC	**0**	**0**	**3**	**2**

Course Objectives:

- To import practical exposure to the Machine tools.
- To conduct experiments and understand the working of the same.

List of Experiments:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper
2. Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine.
4. Thread cutting and knurling on -lathe machine.
5. Drilling and Tapping
6. Shaping and Planning
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles

MACHINE DRAWING LAB

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: NT507PC	**0**	**0**	**3**	**2**

Course Overview:

Machine Drawing gives representation of a machine component or machine by lines according to certain set rules. Machine drawing generally gives all the external and internal details of the machine components from which it can be manufactured. The machining symbols, tolerances, bill of material, etc. are specified on the drawing when it is being manufactured, then it is called production drawing.

Course Objectives:

1. Understand the different steps in producing drawings according to bureau of Indian standards (B.I.S.) as per SP:46 (1988)
2. Understand the application of industry standards and techniques applied in Machine Drawing
3. Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.

Course Outcomes:

1. After going through this course, the student shall be able to understand the drawings of mechanical components and their assemblies along with their utility for design and development of mechanical system.
2. Work effectively with engineering and science teams as well as with multidisciplinary designs.
3. Skillfully use modern engineering tools and techniques such as CAD- CAM softwares for mechanical engineering design, analysis and application

PART - A

Machine drawing conventions: Need for drawing conventions – introduction to ISI conventions - Conventional representation of materials, common machine elements such as screws, nuts, bolts, keys, gears, webs, ribs. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features. Title boxes, their size, location and details - common abbreviations and their liberal usage. Types of Drawings – working drawings for machine parts.

Drawing of machine element: Simple parts - Selection of Views, additional views for the following machine elements and parts with every drawing proportions. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. Keys, cottered joints and knuckle joint. Riveted joints for plates. Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

PART - B

Assembly drawings: Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions. Engine parts – stuffing boxes, cross heads, Eccentrics - Connecting Rod – Piston Assembly. Machine tool parts: Tail stock, Tool Post, Machine Vices - Screws jacks- Plummer block. **Valves**: Spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

Question Paper: Should have 25% for Part A - 3 out of 4 Questions and
75% for Part B- No choice one assembly figure

TEXT BOOKS:

1. Machine Drawing /K. L. Narayana/ New Age International Publishers
2. Textbook of Machine Drawing/K.C. John/PHI/Eastern Economy Edition

REFERENCE BOOKS:

1. Machine Drawing / P.S.Gill.
2. Machine Drawing / Junnarkar N.D./ Pearson Edu.
3. Machine Drawing/Bhattacharya/Oxford University Press
4. Machine Drawing/N.D. Bhat/ Charotar
5. A Textbook of Machine Drawing/R. K. Dhawan/ S. Chand

PROFESSIONAL ETHICS

	L	T	P	C
B.Tech. III Year I Sem.				
Course Code: MC500HS	**3**	**0**	**0**	**0**

Course Objective: To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

Course Outcome: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT - I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT - III

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession.

Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT - IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT - V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCES

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

R16 B.TECH MSNT.

ENGINEERING METROLOGY

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT601PC	**4**	**1**	**0**	**4**

Course overview: To provide a basic understanding of the wide range of activities encompassed by personnel working in standards and calibration laboratories. It covers the measurement process, types and correct use of measurement and test equipment, and measurement standards. It provides an opportunity for students to learn about measurement uncertainty and risk analysis. The course includes the procedures necessary to set up and to have knowledge on calibration. At the end of this subject the student is expected: It is expected to enforce, validate and verify predefined standards for traceability, accuracy, reliability, and precision. All of these are factors that would affect the validity of measurement. Although these standards vary widely, these are mandated by the government, the agencies, and some treaties. Consequently, these standards are verified and tested against a recognized quality system in calibration laboratories

Course Objectives:

1. To be familiar with the different instruments those are available for linear, angular, roundness and roughness measurements.
2. To be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc.)
3. It is the aim of this course to provide students with practical skills associated with each of these areas. Metrology activities include precision measurement of component features, form and geometry utilizing specialized measuring instruments and equipment.
4. Effectively designing product processing methods.
5. To enhance the ability of students to apply scientific methods of protection

Course Outcomes:

1. Graduates will demonstrate basic knowledge in mathematics, science and engineering
2. Graduates will demonstrate an understanding of their professional and ethical responsibilities
3. Graduates will demonstrate the ability to function on engineering and science laboratory teams, as well as on multidisciplinary design teams
4. Graduates will demonstrate the ability to identify, formulate and solve mechanical engineering problems
5. Graduates will have the confidence to apply engineering solutions in global and societal contexts. Graduates should be capable of self-education and clearly understand the value of life-long learning. Graduates will have ability to communicate in written, oral and graphical forms.

UNIT - I

Systems of limits and fits: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types - unilateral and bilateral tolerance system, hole and shaft basis systems -

interchangeability and selective assembly. Indian standard Institution system - British standard system, International Standard system for plain ad screwed work.

UNIT - II

Linear Measurement: Length standard, line and end standard, slip gauges - calibration of the slip gauges, Dial indicator, micrometers. **Measurement of Angles and Tapers**: Different methods - Bevel protractor - angle slip gauges - spirit levels - sine bar - Sine plate, rollers and spheres used to determine the tapers. **Limit Gauges**: Taylor's principle - Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

UNIT - III

Optical Measuring Instruments: Tool maker's microscope and its uses - collimators, optical projector - optical flats and their uses, interferometer. **Flat Surface Measurement:** Measurement of flat surfaces - instruments used - straight edges - surface plates - optical flat and auto collimator.

UNIT - IV

Surface Roughness Measurement : Differences between surface roughness and surface waviness-Numerical assessment of surface finish - CLA, R, R.M.S Values - Rz values, Rz value, Methods of measurement of surface finish-profilograph. Talysurf, ISI symbols for indication of surface finish.

UNIT - V

Screw Thread Measurement: Element of measurement - errors in screw threads - measurement of effective diameter, angle of thread and thread pitch, profile thread gauges. **Measurement Through Comparators:** Comparators - Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production. MACHINE TOOL **Alignment Tests**: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools.. Preparation of acceptance charts.

Gear Measurement: Gear measuring instruments, Gear tooth profile measurement. Measurement of diameter, pitch pressure angle and tooth thickness. Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS

1. Engineering Metrology / I C Gupta./ Danpath Rai
2. Engineering Metrology / R.K. Jain / Khanna Publishers

REFERENCE BOOKS

1. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Principles of Engineering Metrology, Rajendra
3. Metrology & Measurement, Bewoor, Anand K

PROPERTIES OF NANOMATERIALS

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT602PC	**4**	**1**	**0**	**4**

Course Objectives:

1. To familiarize about the various properties of nanostructures.
2. To bring out the differences between nano and macro structures
3. To discuss applications specific properties

Course Outcomes: To bring out the distinct properties like electrical, magnetic, optical, thermal and other mechanical properties of nanostructures

UNIT - I

Material Classes, Structure, and Properties:

Classes of Materials: Metallic, Ceramic, Polymeric, Composite, Electronic, Bio and Nanomaterials, Mechanical Behavior: Stress, Strain, Stiffness and Strength, Origin of Strength. Thermal Behavior: Intrinsic Thermal Properties and the Physics of Thermal Properties, Electrical Behavior: Resistivity and Conductivity, Dielectric Behavior and the Physics of Electrical Properties. Magnetic Behavior: Magnetic Fields: Vacuum, Materials. Measuring Magnetic Properties and the physics of Magnetic Behavior. Optical Behavior: The Interaction of Materials and Radiation, Specular and Diffuse Reflection, Absorption, Transmission, Refraction and the physics of Optical Properties. Acoustic Behavior: Sound Velocity and wavelength, Sound Management, Sound Wave Impedance and Radiation.

Nanomaterials and Nanotechnologies: An Overview, Why Nanomaterials? Scale, Structure and behavior, Nanomaterials and Nanostructures in nature, Nano materials in Art and Cultural Heritage.

UNIT - II

Nanomaterials: classes and fundamentals: Classification of Nanomaterials, Size effects, Surface to Volume ratio versus shape, Magic Numbers, Surface Curvature, Strain Confinement, Quantum effects.

UNIT - III

Nanomaterials Properties: Mechanical Properties, Scale and Properties, Scale dependence of Material Properties of Nanostructured materials, Thermal Properties of Nanomaterials, Properties: Electrical, Magnetic, Optical, Acoustic. Special Cases: Carbon nanotubes, nanocomposites

UNIT - IV

Mechanical Properties: Density And Elasticity: Density considered as an Example Property, The Rule of Mixtures Applied to Density, The importance of Grain Morphology, Density as a function of Grain size, The Elasticity of Nanomaterials, The Physical Basis of

Elasticity, and Elasticity of discrete Nanomaterials, Elasticity of Nanodevices Materials, and Elasticity of Bulk Nanomaterials.

UNIT - V

Plastic Deformation of Nanomaterials: Continuum descriptions of Plastic Behavior, The physical basis of yield strength, Crystal and Crystal Plasticity, Strengthening Mechanisms in Single Crystal Metals, From Crystal Plasticity to Polycrystal Plasticity, the yield strength of Nanomaterials.

TEXT BOOKS:

1. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
2. Nanomaterials - Mechanics and Mechanism by K.T. Ramesh.
3. Nanotechnology – Principles and Practices by Sulabha K. Kulkarni
4. Nanostructure and Nanomaterials by Guozhong Cao, Ying Wang.
5. Textbook of Nanoscience and Nanotechnology – B. S. Murthy, P. Shankar, Baldev Raj, B. B. Rath and James Murday, University Press-IIM Series in Metallurgy and Materials Science.
6. A Textbook of Nanoscience and Nanotechnology – T. Pradeep, Tata McGraw Hill edition.

FINITE ELEMENT METHODS

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT603PC/ME611PE	**4**	**1**	**0**	**4**

Course Objective: The aim of the course is to provide the participants an overview on Finite Element Method, Material models, and Applications in Civil Engineering. At the end of the course, the participants are expected to have fair understanding of:

- Basics of Finite Element Analysis.
- Available material models for structural materials, soils and interfaces/joints.
- Modeling of engineering systems and Soil–Structure Interaction (SSI).
- Importance of interfaces and joints on the behavior of engineering systems.
- Implementation of material model in finite element method and applications

Course Outcomes: At the end of the course, the student will be able to, Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer. Formulate and solve problems in one dimensional structures including trusses, beams and frames. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems. Implement and solve the finite element formulations using MATLAB.

UNIT – I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. Strain – Displacement relations. Stress – strain relations.

One Dimensional Problems : Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

Analysis of Trusses: Stiffness Matrix for Plane Truss and Space Truss Elements, Stress Calculations.

Analysis of Beams: Element stiffness matrix for two node, two degrees of freedom per node beam element, Load Vector, Deflection, Stresses

UNIT – III

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of Load Vector, Stresses

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

UNIT – IV

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two dimensional analysis of thin plate.

Analysis of a uniform shaft subjected to torsion.

UNIT – V

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation. techniques such as semi automatic and fully Automatic use of softwares such as ANSYS, NISA, NASTRAN, etc.

TEXT BOOKS:

1. Finite Element Methods: Basic Concepts and applications/Alavala/PHI
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu/Pearson

REFERENCE BOOKS:

1. An Introduction to the Finite Element Method / J.N.Reddy/ Mc Graw Hill
2. Finite Element Analysis / SS Bhavikatti / New Age
3. Finite Element Method/ Dixit/Cengage

MECHANICAL VIBRATIONS
(Professional Elective - I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT611PE	**3**	**0**	**0**	**3**

Pre-requisites: Engineering Mechanics

Course objectives: Understand various levels of vibrations and remedies for each of them.

Course Outcomes: At the end of the course, the student will be able to, Understand the causes and effects of vibration in mechanical systems. Develop schematic models for physical systems and formulate governing equations of motion. Understand the role of damping, stiffness and inertia in mechanical systems Analyze rotating and reciprocating systems and compute critical speeds. Analyze and design machine supporting structures, vibration isolators and absorbers.

UNIT - I

Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

UNIT - II

Single degree of Freedom systems - II: Response to Non Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT - III

Two degree freedom systems: Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers;

Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

UNIT - IV

Continuous system: Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Torsional vibrations of shafts.

Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.

Numerical Methods: Rayleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.

Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT - V

Sound level and subjective response to sound: Subjective response to sound, frequency dependent human response to sound, sound-pressure dependent human response, the decibel scale, relationship among sound power, sound intensity and sound pressure level, relationship between sound power level and sound intensity, relationship between sound intensity level and sound pressure level, sound measuring instruments.

TEXT BOOKS:

1. Elements of Vibration Analysis / Meirovitch/ Mc Graw Hill
2. Principles of Vibration / Benson H. Tongue/Oxford

REFERENCE BOOKS:

1. Mechanical Vibrations / SS Rao / Pearson
2. Mechanical Vibration /Rao V. Dukkipati , J Srinivas/ PHI

REFRIGERATION AND AIR CONDITIONING
(Professional Elective – I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: ME612PE	**3**	**0**	**0**	**3**

Pre-requisite: Thermodynamics

Course Objective: To apply the principles of Thermodynamics to analyze different types of refrigeration and air conditioning systems and to understand the functionality of the major components.

Course Outcomes: At the end of the course, the student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems. Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.

UNIT – I

Introduction to Refrigeration: - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycle of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts- Air systems – Application of Air Refrigeration, Justification – Types of systems – Problems.

UNIT – II

Vapour compression refrigeration – working principle and essential components of the plant – Simple Vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts – Problems.

UNIT - III

System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – classification – Working Principles. Evaporators – classification – Working Principles. Expansion devices – Types – Working Principles. Refrigerants – Desirable properties – common refrigerants used – Nomenclature – Ozone Depletion – Global Warming – Azeotropes and Zeotropes.

UNIT - IV

Vapor Absorption System – Calculation of max COP – description and working of NH3 – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features.

Steam Jet Refrigeration System – Working Principle and Basic Components
Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT – V

Introduction to Air Conditioning: Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP.

Concept of human comfort and effective temperature –Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

Air Conditioning systems - Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers.

Heat Pump – Heat sources – different heat pump circuits – Applications.

TEXT BOOKS:

1. Refrigeration and Air conditioning / CP Arora / Mc Graw Hill
2. Refrigeration and Air-Conditioning / RC Aora / PHI

REFERENCE BOOKS:

1. Principles of Refrigeration - Dossat / Pearson
2. Basic Refrigeration and Air-Conditioning / Ananthanarayanan / Mc Graw Hill

R16 B.TECH MSNT.

OPERATIONS RESEARCH
(Professional elective – I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT613PE	**3**	**0**	**0**	**3**

Course Objectives: Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

Course Outcome: Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization Tech

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III

Sequencing – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines-graphical model. **Replacement:** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V

Waiting Lines: Introduction–Terminology-Single Channel–Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming: Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:

1. Operations Research / N.V.S. Raju / SMS
2. Operations Research / ACS Kumar / Yes Dee

REFERENCE BOOKS:

1. Operations Research /J. K. Sharma / MacMilan.
2. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi / Pearson.

MAINTENANCE AND SAFETY ENGINEERING
(Professional Elective - I)

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT614PE	**3**	**0**	**0**	**3**

UNIT - I

Introduction, Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance Strategy for the 21st Century, Engineering Maintenance Objectives and Maintenance in Equipment Life Cycle, Terms and Definitions.

Maintenance Management and Control: Maintenance Manual, Maintenance, Facility Evaluation, Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices.

UNIT - II

Types Of Maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and Improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

Inventory Control In Maintenance: Inventory Control Objectives and Basic Inventory Decisions, ABC Inventory Control Method, Inventory Control Models Two-Bin Inventory Control and Safety Stock, Spares Determination Factors Spares Calculation Methods

UNIT - III

Quality And Safety In Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to Improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and Steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT - IV

Reliability, Reliability Centered Maintenance, Rcm: Goals And Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement Indicators, RCM Benefits and Reasons for Its Failures, Reliability Versus Maintenance and Reliability in Support Phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

UNIT - V

Maintainability: Maintainability Importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

TEXT BOOKS:

1. Reliability, Maintenance and Safety Engineering/ Dr. A. K. Guptha/ Laxmi Publications.
2. Industrial Safety Management/ L.M. Deshmukh/TMH

REFERENCES:

1. Maintenance Engineering & Management / R. C. Mishra/ PHI
2. Reliability Engineering / Elsayed/ Pearson
3. Engineering Maintenance a modern approach/ B.S Dhallon/ C.R.R Publishers
4. A Text Book of Reliability and Maintenance Engineering/Alakesh Manna/IK International Publishing House
5. Plant Maintenance and Reliability Engineering/NVS Raju/Cengage Learning

METROLOGY AND SURFACE ENGINEERING LAB

B.Tech. III Year II Sem.	**L**	**T**	**P**	**C**
Course Code: NT604PC	**0**	**0**	**3**	**2**

Course Overview:

By the end of the course student will be able to perform the measurements Length, Depth, Diameter measuring using vernier calipers & micrometer. Bore measurement using bore gauge Use of gear teeth caliper for checking the chordal addendum and chordal height of spur gear. Angle and taper measurements using Bevel protractor, Sine bar and slip gauges.

Course Objectives:

1. To create awareness on various mechanical measuring instruments.
2. To make students familiar with various operations on machine tools.

Course Outcomes:

1. Hands on experience on lathe machine to perform turning, facing, threading operations.
2. Practical exposure on flat surface machining, milling and grinding operations.
3. Skill development in drilling and threading operations.
4. Linear and angular measurements exposure.

List of Experiments:

1. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
2. Machine tool alignment of test on the lathe.
3. Tool makers microscope and its application
4. Angle and taper measurements by bevel protractor and sine bars.
5. Use of spirit level and optical flats in finding the flatness of surface plate.
6. Thread measurement by 2-wire and 3-wire methods.

PRODUCTION DRAWING PRACTICE LAB

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: NT605PC	**0**	**0**	**3**	**2**

Course Overview: This course is an introduction to technical graphics and computer-aided design. The course includes sketching, production drawing, and a significant amount of hands-on experience on a CAD system. The production drawing portion covers topics like multi-view drawings, section views, auxiliary views and dimensioning.

Course Objectives: Upon completion of this course the student will be able to:

1. Draw orthographic projections and section views of objects with dimensions using standard specifications and practices
2. Learn to use CAD systems using AutoCAD and Autodesk Inventor for Parametric Solid Modeling
3. Produce engineering drawings and models using AutoCAD and Autodesk Inventor.

UNIT – I

Conventional representation of Materials – conventional representation of parts – screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits – methods of indicating notes on drawings.

UNIT – II

Limits and Fits: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

UNIT – III

Form and Positional Tolerances: Introduction and indication of the tolerances of from and position on drawings, deformation of runout and total runout and their indication.

UNIT – IV

Surface roughness and its indication: Definitions – finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.
Heat treatment and surface treatment symbols used on drawings.

UNIT – V

Detailed and Part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.
Part drawing using computer aided drafting by CAD software

TEXT BOOKS:

1. Production and Drawing – K.L. Narayana & P. Kannaiah/ New Age
2. machine Drawing with Auto CAD- Pohit and Ghosh, PE

REFERENCE BOOKS:

1. Geometric dimensioning and tolerancing- James D. Meadows/ B.S Publications
2. Engineering Metrology, R.K. Jain, Khanna Publications

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

	L	T	P	C
B.Tech. III Year II Sem.				
Course Code: EN606HS	**0**	**0**	**3**	**2**

Introduction

A course on *Advanced English Communication Skills (AECS) Lab* is considered essential at the third year level of B.Tech and B.Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

Course Objectives: This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioral skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

Course Outcomes: Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

Syllabus

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments… etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process,

Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

Minimum Hardware Requirement: Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics**
- **Eight round tables with five movable chairs for each table.**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **Computer with suitable configuration**

Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**

REFERENCES:

1. Kumar, Sanjay and Pushpa Lata. English for Effective Communication, Oxford University Press, 2015.
2. Konar, Nira. English Language Laboratories – A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011.