Curriculum Structure & Syllabi

of

B. Tech

In

ELECTRICAL ENGINEERING DEPARTMENT

(w.e.f. 2021-22)

Vision

Mission

Program Educational Objectives

Program Outcomes

Program Specific Outcomes

Overall Credit Structure

Curriculum

Syllabus

Offered By

DEPARTMENT OF ELECTRICAL ENGINEERING

M. M. M. UNIVERSITY OF TECHNOLOGY,

GORAKHPUR-273010, UP

August 2021

Department of Electrical Engineering

CURRICULA & SYLLABI

B. Tech. Electrical Engineering

Vision:

To develop intellectual potentials with excellence in electrical engineering & technology for the global needs.

Mission:

1. Empowering students with state-of-art knowledge, technological skills & ethics.
2. Provide research environment for sustainable technical growth in the area of power and energy.
3. Providing effective solutions for industries through research and consultancy.
4. Exposure to standard electrical safety measures and practices.
5. Encourage new and non-conventional energy technology for sustainable development and environmental stewardship.

Programme Educational Objectives (PEO)

1. To provide technical knowledge in electrical engineering to excel in electrical utility & services.
2. To nurture the students to become successful engineer with administrative acumen to ethically handle the critical situations timely.
3. To prepare and motivate the students for higher education, research, and continuous learning in multi-disciplinary areas with innovative ideas for sustainable development.

Programme Outcome (POs)

Students will demonstrate the ability to-

1. Apply the knowledge of mathematics, science, and Engineering in all aspects of Electrical Engineering.
2. To formulate the techniques of using appropriate tools to analyze and/or fabricate electrical systems.
3. Design of different parts of electrical machines, drives &power system network.
4. Align with and upgrade to higher learning and research activities.
5. Model real life problems using different hardware and software platforms, both offline and in real-time.
6. Possess an appreciation of professional, societal, environmental, and ethical issues and proper use of renewable resources.
7. Develop the awareness about non-conventional sources of energy for sustainable development.
8. Promote the good practices of electrical engineering with high ethical values.

9. Work in a team and comprehend his/her scope of work, deliverables and issues in which help is needed by other members of the team.
10. To communicate effectively and to prepare formal technical plans leading to solutions and detailed reports for electrical systems.
11. To be familiar with project management problems and basic financial principles for a multi-disciplinary work such as biomedical instrumentation.
12. A recognition of the need for identifying contemporary issues due to changing technical scenario and an ability to engage in life-long learning to update himself/herself.

Programme Specific Outcome (PSOs)

1. Apply the fundamentals of mathematics, science, and engineering knowledge to identify, formulate, design, and investigate complex engineering problems of electrical circuits, control systems, electrical machines, and power system.
2. Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.
3. Aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively.

PROPOSED OVERALL CREDIT STRUCTURE FOR B.TECH. PROGRAM

<table>
<tr><th colspan="4">Credit Courses</th></tr>
<tr><th colspan="2">Core Courses (CC)**</th><th colspan="2">Electives Courses (EC)**</th></tr>
<tr><th>Category</th><th>Min. Credits</th><th>Category</th><th>Min. Credits</th></tr>
<tr><td>Basic Sciences & Maths (BSM)</td><td>20</td><td>Program Electives (PE)</td><td>12</td></tr>
<tr><td>Engineering Fundamentals (EF)</td><td>18</td><td rowspan="2">Open Electives (OE) (Other Departments)</td><td rowspan="2">3</td></tr>
<tr><td>Professional Skill (PS)</td><td>4</td></tr>
<tr><td>Program Core (PC)</td><td>67</td><td>Humanities & Social Science elective (HSSE)</td><td>4</td></tr>
<tr><td>Management (M)</td><td>4</td><td></td><td></td></tr>
<tr><td>Humanities & Social Science (HSS)</td><td>2</td><td></td><td></td></tr>
<tr><td>Project (P)</td><td>5</td><td></td><td></td></tr>
<tr><td>Seminar (S)</td><td>2</td><td></td><td></td></tr>
<tr><td>Industrial Practice (IP)/ Industrial Elective (IE)</td><td>12</td><td></td><td></td></tr>
<tr><td>Program link basic science and engineering courses (PLBSE)
(To be decided by the department)</td><td>16</td><td></td><td></td></tr>
<tr><td>Sub-total</td><td>150</td><td>Sub-total</td><td>19</td></tr>
<tr><td>Grand Total</td><td colspan="3">169</td></tr>
</table>

PROPOSED CURRICULUM FOR B.TECH. PROGRAMMES

First Year, Semester I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BSM-101	Calculus and Linear Algebra	3	1	0	4
2.	EF	BEC-101	Fundamentals of Electronics Engineering	3	1	2	5
3.	PS	BEE-106	Electrical Wiring	0	0	4	2
4.	EF	BME-101	Technical Art	0	0	4	2
5.	PLBSE	BCS-101	Introduction to Computer Programming	3	0	2	4
6.	HSSE	BHM-104	Human Values & Professional Ethics	2	0	0	2
			Total	**12**	**2**	**10**	**19**
1.	ECA-I		Induction Program	**-**	**-**	**-**	**0**

***This can be taught either in first semester or in second semester as per the departmental decision*

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Note: subjects to be taught for more than one branch may be scheduled in both odd and even semesters i.e. one/two/three branch in odd semester and rest in even semester for optimum distribution of teaching load of faculty members.

First Year, Semester II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BSM-177	Engineering Physics	3	0	2	4
2.	EF	BEE-151	Fundamentals of Electrical Engineering	3	1	2	5
3.	BSM	BSM-152	Ordinary and Partial Differential Equations	3	1	0	4
4.	PS	BEE-157	Basics of Measuring & Protective Equipments	0	0	4	2
5.	EF	BCE151	Engineering Graphics	0	0	4	2
6.	PLBSE	BME-154	Fundamentals of Mechanical Engineering	3	0	2	4
7.	HSS	BHM-151	Professional Communication	2	0	0	2
			Total	**15**	**2**	**12**	**23**
1.	ECA-II			**-**	**-**	**-**	**0**

Second Year, Semester III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	Math	Engineering Mathematics-III	3	1	0	4
2.	EF	ECE	Digital Electronics & Circuits	3	0	2	4
3.	HSSE***	HMS	Human Values & Professional Ethics	2	0	0	2
4.	PC	BEE-201	Electromechanical Energy Conversion-I	3	1	2	5
5.	PC	BEE-202	Basic System Analysis	3	1	0	4
6.	PLBSE	CSED	Environmental Chemistry	2	0	0	2
			Total	**16**	**3**	**4**	**21**
	ECA-III			**-**	**-**	**-**	0
	AC			**1/2**	**-**	**-**	**1/2**

*********This can be taught either in third semester or in fourth semester as per the departmental decision.*

Second Year, Semester IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	Math	Engineering Mathematics-IV	3	1	0	4
2.	PC	BEE-253	Electrical Measurement & Measuring Instruments	3	0	2	4
3.	PC	BEE-254	Network Analysis and Synthesis	3	1	2	5
4.	PC	BEE-255	Electromechanical Energy Conversion-II	3	1	2	5
5.	PC	BEE-256	Power System-I	3	1	0	4
6.	PLBSE	BEE-257	Simulation Technique	0	0	4	2
			Total	**15**	**4**	**10**	**24**
	ECA-IV			**-**	**-**	**-**	0
	AC			1/2	-	-	1/2
	DM			3	1	0/2	4/5

Third Year, Semester V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	HMS	Industrial Management	2	0	0	2
2.	PC	BEE-301	Power System-II	3	0	2	4
3.	PC	BEE-302	Control System Engineering	3	1	2	5
4.	PC	BEE-303	Power Electronics	3	1	2	5
5.	PE1	BEE-326	Electrical Engineering	3	1	0	4
6.	PLBSE	BEE-305	Microprocessor: Architecture, Programming & Interfacing	3	0	2	4
			Total	**17**	**3**	**8**	**24**
	ECA-V			**-**	**-**	**-**	0
	DM			3	1	0/2	4/5

Third Year, Semester VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	HMS	Engineering and Managerial Economics	2	0	0	2
2.	PC	BEE-356	Instrumentation & Process Control	3	1	0	4
3.	PC	BEE-357	Power System Protection & Switchgear	3	0	2	4
4.	PC	BEE-358	Digital Control Systems	3	1	0	4
5.	PE2	BEE-376	Electrical Engineering	3	1	0	4
6.	P	BEE-370	Project Part-I	0	0	4	2
7.	S	BEE-380	Seminar	0	0	4	2
			Total	**14**	**3**	**10**	**22**
	ECA-VI			-	-	-	0
	DM			3	1	0/2	4/5

Final Year, Semester VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	PC	BEE-401	Electric Drives	3	1	2	5
2.	PC	BEE-402	Power System Operation and Control	3	1	0	4
3.	PC	BEE-403	Power Quality	3	0	0	3
4.	PE3	BEE-426	Electrical Engineering	3	1	0	4
5.	OE			2	1	0	3
6.	P	BEE-440	Project Part-II	0	0	6	3
			Total	**14**	**4**	**8**	**22**
	ECA-VII			-	-	-	0
	DM			3	1/0	0/2	4/5

Final Year, Semester VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	IP	BEE-490	Industrial Practice	0	0	24	12
Without Industrial Practice (IP)							
2.	MP	BEE-480	Minor Project	0	0	8	4
3.	IE*	BEE-491	Industrial Elective	3	1	0	4
4.	IE*	BEE-492	Industrial Elective	3	1	0	4
			Total	**0/6**	**0/2**	**8/24**	**12**
	DM		Research Project*	0	0	4	2

University level Theory based courses run by the department

*For Theory based Department Minor only

Note: Department may consider PE1, PE2, PE3 to be taught through MOOCs. The MOOC courses may replace any Program Core (PC) subject if the course content of MOOCs courses matches more than 75% with the course content of PC subject.

LIST OF PROPOSED COURSE CURRICULUM FOR OTHER DEPARTMENT TO BE TAUGHT BY EED

First Year, Semester I (CSE & ECE Department)

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	EF	BEE-101	Fundamentals of Electrical Engineering	3	1	2	5

First Year, Semester I (Chemical Engineering Department)

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	EF	BEE-104	Introduction to Electrical Engineering	2	0	0	2

First Year, Semester I (ITCA Department)

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	EF	BEE-105	Basic Concepts of Electrical Engineering	2	0	2	3

First Year, Semester II (Civil Engineering Department)

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	EF	BEE-152	Principles of Electrical Engineering	3	1	0	4

First Year, Semester II (Mechanical Engineering Department)

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	EF	BEE-153	Basic Electrical Engineering	3	0	2	4

SYLLABI

BSM-101 **Calculus and Linear Algebra**

Course category	:	Basic Sciences & Math's (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Two Minor tests and One Major Theory Examination
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of basic differential operators in various engineering problems.
2. Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
3. Solve linear system of equations using matrix algebra.
4. Know about qualitative applications of Gauss, Stoke's and Green's theorem.
5. To know the applications of double and triple integration in finding the area and volume.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Differential Calculus: Limit, Continuity and Differentiability, Mean value theorems. Leibnitz theorem, Partial derivatives, Euler's theorem for homogenous function, Total derivative, Change of variable. Taylor's and Maclaurin's theorem. Expansion of function of two variables, Jacobian, Extrema of function of several variables.

UNIT-II 9

Linear Algebra: Symmetric, Skew-symmetric matrices, Hermitian, Skew Hermitian Matrices, orthogonal and unitary matrices and basic properties, linear independence and dependence of vectors, Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues, Eigen-vectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT-III 9

Multiple Integrals: Double and triple integrals, change of order of integration, change of variables. Application of multiple integral to surface area and volume. Beta and Gamma functions, Dirichlet integral.

UNIT-IV 9

Vector Calculus: Gradient, Divergence and Curl. Directional derivatives, line, surface and volume integrals. Applications of Green's, Stoke's and Gauss divergence theorems (without Proofs).

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.
3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.
4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd.,

BEC-101/ 151 **Fundamentals of Electronics Engineering**

Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, assignments, quizzes, practical work, record, viva voce and two Minor Test and One Major Theory & Practical Examination
Course Objectives		The objective of this course is to gain knowledge of basic electronic components and develop the understanding of the working principle of different electronic devices such as voltmeter, multimeter, CRO, etc

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Able to memorize the basic concept of electronic circuits using Diode, BJT (Bipolar Junction Transistor), FET (Field Effect Transistor), etc.
2. Able to execute and examine the general characteristic of electronic circuits.
3. Illustrate the basics of Boolean algebra and logic gates with their realisation using discrete electronic components.
4. Compute different parameters for characterising different circuits like rectifier, amplifiers, integrators, etc.
5. Examine the working principle of digital voltmeter, multimeter using block diagram approach.
6. Discuss and calculate voltage, current, phase and frequency using CRO.

Topics Covered

UNIT-I 9

Semiconductor materials and properties: electron-hole concepts, Basic concepts of energy bands in materials, concept of forbidden gap, Intrinsic and extrinsic semiconductors, donors and acceptors impurities, Junction diode, p-n junction, depletion layer, v-icharacteristics, diode resistance, capacitance, diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). Diode Applications in rectifier, filters, voltage multipliers, load regulators, clipper and clamper circuits, Breakdown mechanism (Zener and avalanche),Break down characteristics, Zener resistance, Zener diode ratings, Zener diode application as shunt regulator

UNIT-II 9

Transistors (BJT);Basic construction, transistor action, CB, CE and CC configurations, input/output characteristics, Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits. Transistor Amplifier: Graphical analysis of CE amplifier, concept of voltage gains, current gain, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE and CC amplifier configurations.

UNIT-III 9

Field Effect Transistors (JFET and MOSFET): Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed & self-biasing.

MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics. Computation of Av,Ri, Ro ,of single FET amplifiers using all the three configurations.

Switching theory and logic design: Number systems, conversion of bases, Boolean algebra, logic gates, concept of universal gate, canonical forms, Minimization using K-map.

UNIT-IV 9

Operational Amplifiers and Electronics Instruments:

Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators Working principle of digital voltmeter, digital multi-meter (block diagram approach),CRO (its working with block diagram),measurement of voltage, current, phase and frequency using CRO

Experiments

1. To plot the forward/ Reverse Characteristics of Si P-N junction diode.
2. To plot the forward/Reverse Characteristics of Zener diode
3. Study and plot the characteristic of Zener diode as voltage regulator
4. Study of half wave rectifier and draw the nature of input / output signal. Calculate the value of I_{dc}, I_{rms} and ripple factor.
5. Study of Full wave rectifier and draw the nature of input / output signal. Calculate the value of I_{dc}, I_{rms} and ripple factor.
6. Study of Bridge Rectifier and draw the nature of input / output signal. Calculate the value of I_{dc}, $I_{rms}$and ripple factor.
7. Draw input output characteristic curve of n-p-n transistor in CE configuration
8. Draw input output characteristic curve of n-p-n transistor in CB configuration
9. Draw the drain and transfer curve of JFET
10. Study of OPAMP(741)and calculate the gain in(i)Inverting mode and (ii)Non-inverting mode
11. Study of OP-AMP as a (i) Summer (ii) Integrator (iii) Differentiator; and plot the nature of input & output waveform

Study of CRO and multi-meter measurement voltage, frequency, phase difference using CRO along with the testing of electronics component

Books & References

1. Electronic Devices and Circuits-Boylestad and Nashelsky, 6e, PHI, 2001
2. Electronic Devices and Circuits, A Mottershead, PHI,2000, 6e
3. Digital Computer Design, Morris Mano, PHI,2003
4. Electronic Instrumentation-H.S. Kalsi, 2e,TMH, 2007

BEE-106/ 156 **Electrical Wiring**

Course category	:	Basics of Electrical Engineering
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 0, Tutorial: 0, Practical: 4
Number of Credits	:	2

Course Assessment methods	:	Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce and Major practical examination
Course O**bjective**	:	**1.** To demonstrate and understand the Service mains, meter board and distribution board, concealed and conduit wiring, switching control schemes. **2.** To demonstrate and understand the protective devices: fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock, necessity of Earthing.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Basics of Electrical home Wiring
2. Basics of earthing phenomena in home wiring and any premises.
3. Protection of human body from electric shocks and utility of MCB and fuses.
4. Basic principles Fan windings and small motor windings.
5. Learn different types of Joints of cable and overhead conductor.
6. Analysis of different types of wiring and Safety measures

List of Experiments:

1. To perform single way wiring system.
2. To perform two-way wiring system.
3. To perform staircase wiring system.
4. Design of earthing system.
5. To repair a fan and its winding.
6. Design of single-phase motor winding.
7. To perform tube light wiring.
8. To perform different types of cable joints

Books & Reference Books:

1. Electrical Wiring Estimating and Costing by S. L. Uppal. Khanna Publishers.
2. Practical Handbook on Electric Motors, Starters and Controllers by M.P. Krishna Pillai, Standard Publishers Distributers.
3. Advanced Home Wiring by Black & Decker, 5th Edition, Editors of Cool Spring press

BME 101/BME 151 Technical Arts

Course category	:	Professional Skill (PF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 0, Tutorial: 0, Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through one Viva voce, Practical work/record, attendance, and Major Practical Examination
Course **Objective**	:	NA

Course Outcomes: After completion of this course the students are expected to be able to demonstrate following knowledge, skills, and attitudes

1. Understand the importance, materials, applications, and safety in different shops for the development of a product/component.
2. The knowledge of tools and processes used in carpentry and foundry shops for the development of products through casting process and study of different casting defects.
3. The knowledge of forming process will develop skills for producing products using different tools and processes in black smithy, welding, and sheet metal shops.
4. The knowledge of conventional and non-conventional machining will develop ability of producing various products.

Introduction:

- Need for and importance of Technical Arts.
- Shop Layout: Concept and Importance.
- Mechanical properties of metals& non-metals.
- Ferrous Metals and alloys- composition and applications.
- Non-Ferrous Metals and alloys- composition and applications.
- Safety precautions at shopfloor.

Carpentry Shop:

- Draw layout of carpentry shop
- Study of tools & operations and carpentry joints.
- Preparation of half-lap corner joint, mortise &Tennon joint
- Simple exercise on woodworking lathe

Fitting Shop:

- Layout of fitting shop
- Study of tools & operations
- Simple exercises involving fitting work
- Simple exercises involving drilling/tapping/die

Black Smithy Shop:

- Layout of Smithy Shop
- Study of tools & operations
- Hot and cold working
- Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

Welding Shop:

- Layout of welding shop
- Study of equipment of gas welding & arc welding
- Preparation of simple butt and lap welded joints.
- Oxy-acetylene flame cutting
- Study of welding defects.

Sheet-metal Shop:

- Layout of Sheet metal shop
- Metals used in sheet metal work such as Galvanized iron, Copper sheet, Aluminum sheet
- Study of tools & operations

- Fabrication of Funnel, toolbox, tray, electric panel box etc.

Machine Shop:

- Layout of Machine shop
- Study of Lathe, Drilling, Shaper, Planer and Milling Machines and commonly done operations on these machines
- Single point and Multi-point Cutting tools
- Making a job on lathe involving plane turning step turning, taper turning, and threading operations

Foundry Shop:

- Layout of foundry shop
- Study of tools & operations
- Study on pattern allowances
- To prepare a Mould with the use of a core and cast it
- Study of casting defects

Advanced Machining Lab:

- Layout of the Advanced Machining Lab.
- Study about Computerized Numerically Controlled and Non- conventional machining processes.
- Study of Flexible Manufacturing System.
- Simple experiments on CNC turning and milling.

Project:

Each group will fabricate a simple utility project using above different shops.

Textbooks:

1. Fundamental of Modern Manufacturing: Materials, Processes and Systems: M. P. Groover (John Wiley)
2. Fundamental of Manufacturing Processes: G. K. Lal and S. K. Choudhary (Narosa).
3. Manufacturing technology – Machine Tools: P. N. Rao (TMH)
4. Manufacturing technology – Foundry, Forming and Welding: P. N. Rao (TMH).
5. Manufacturing Engineering & Technology: Kalpakjian (Pearson)
6. Advanced Machining Processes: V. K. Jain (Allied Publishers)
7. Manufacturing Science: A. Ghosh and A.K. Mallik (East- West Press).
8. Workshop Technology Vol-I: B. S. Raghuvanshi (Dhanpat Rai and Sons)

Workshop Technology Vol-II: B. S. Raghubanshi (Dhanpat Rai and Sons)

BCS-101 **Introduction to Computer Programming**

Course category	:	PLBSE
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 0 & Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Two Minor tests and One Major Theory & Practical Examination.

Course **Objective** : This course is an introduction to computer programming using C and assumes no prior programming knowledge.

1. To teach how to write modular, efficient, and readable C programs
2. To impart knowledge in creating and using Arrays of the C data types.
3. To demonstrate creation of derived data types and perform operations on files.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Read and understand C programs.
2. Discuss basic theory and practice of programming.
3. Design and implement practical programs using C language.
4. Use compiler and feel comfortable with Windows environment
5. Identify and fix common C errors.
6. To describe the techniques for creating program modules in C using functions and recursive functions.

Topic Covered

UNIT-I

Basics of Computer: Introduction to Digital Computer, Basic Operations of Computer, Functional Components of Computer, Classification of Computers. Introduction to Operating System: DOS, Windows, Linux, Function, Services and Types. Basics of Programming: Approaches to Problem Solving, Concept of Algorithm and Flow Charts, Types of Computer Languages: Machine Language, Assembly Language and High-Level Language, Concept of Assembler, Compiler, Loader and Linker. **9**

UNIT-II

Standard I/O in "C", Fundamental Data Types: char, int, short, long, float, double, long double. Storage Classes: Automatic, Register, Static, External. Operators and Expressions: Using Numeric and Relational Operators, Mixed Operands and Type Conversion, Logical Operators, Bit Operations, Operator Precedence and Associativity. C Conditional Program Execution: Applying if and Switch Statements, Nesting if and else, Restrictions on switch Values, Use of Break. Program Loops and Iteration: Uses of while, do and for Loops, Multiple Loop Variables, Assignment Operators, Use of break and continue keywords. **9**

UNIT-III

Functions: Designing Structured Programs, Functions in C, User Defined and Standard Functions, Formal vs. Actual Arguments, Function Category, Function Prototype, Parameter Passing, Recursive Functions. Arrays: One Dimensional& Multidimensional Arrays and their Applications, Declaration and Manipulation of Arrays. Strings: String Variable, String Handling Functions, Array of Strings. Storage Classes revisited. **9**

UNIT-IV

Pointers: Pointer Variable and its Importance, Pointer Arithmetic and Scale Factor, Compatibility, Dereferencing, L value and R-Value, Pointers and Arrays. Structure and **9**

Union: Declaration and Initialization of Structures, Structure and array, Structure Pointers, Declaration and Initialization of union, Union vs Structure. Implement the concept of Ohm's law, Kirchhoff's current and voltage law, series and parallel RLC circuits. Implement the Bisection, Newton Raphson, Interpolation, Trapezoidal and Simpson methods.

EXPERIMENTS

1. Write a program that finds whether a given number is even or odd.
2. Write a program that tells whether a given year is a leap year or not.
3. Write a program that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
    a. Between 90-100%----------Print "A"
    b. 80-90%----------Print "B"
    c. 60-80%----------Print "C"
    d. Below 60%----------Print "D"
4. Write a program that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
5. Write a program to print sum of even and odd numbers from 1 to N numbers.
6. Write a program to print the Fibonacci series.
7. Write a program to check whether the entered number is prime or not.
8. Write a program to find the reverse of a number.
9. Write a program to print Armstrong Numbers from 1 to 100.
10. Write a program to convert binary number into decimal number and vice versa.
11. Write a program that simply takes elements of array from user and finds sum of these elements.
12. Write a program that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
13. Write programs to implement the concept of Ohm's law, Kirchhoff's current and voltage law.
14. Write programs to implement the concept of Series and Parallel RLC circuits.
15. Write programs to implement the Bisection, Newton Raphson, Interpolation, Trapezoidal and Simpson methods.

Textbooks:

1. Jeri R. Hanly and Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson.
2. Schildt, Herbert, Complete Reference with C, Tata McGraw Hill Publication.
3. Kerninghan and Ritchie, The C programming Language, 2nd Edition, Prentice Hall.

BHM-104/154 Human Values & Professional Ethics-1

Course category	:	Humanities & Social Science Elective (HSSE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 0
Number of Credits	:	2

Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Two Minor tests and One Major Theory & Practical Examination.

Course **Objective** : The Course aims:

1) To give basic insights and inputs to the students to inculcate Human values to grow as a responsible human being with holistic personality.
2) To instil Professional Ethics in the student and enabling them to maintain ethical conduct while discharging their professional duties.
3) To enable them to understand and appreciate versatility and universality of human values and their pivotal role in professional field.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1) To create conducive environment for professionals to grow as good and responsible human beings imbibing values and ethics.
2) Understanding the significance of environment.
3) Developing humanitarian outlook.
4) Assess their own ethical values and the social context of problems.
5) Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human.
6) Identify the multiple ethical interests at stake in a real-world situation or practice.

Topic Covered

UNIT-I

Origin, Meaning, and Definition of Value, Types of Values, Individual Value, Family Value, Societal Value, Human Value, Value in Education System, Understanding Happiness and Prosperity, Self-Exploration and Natural Acceptance. **6**

UNIT-II

Harmony in family, Harmony in Society, Values Leading to Harmony, Creating a world family, Harmony in Nature, Environment and Sustainable Developmental, Legal aspects of Environment, Holistic Perspectives of Values, Existence and Co-existence. **6**

UNIT-III

Origin, Meaning and Definition of Ethics, Ethics: The science of the Morality of The Art of Correct Living,Ethics in Human Acts, Ethics and Religion, Ethical Norms and Laws,Ethics in Literature, Ethics in Science and Technology. **6**

UNIT-IV

Ethical Approaches: Theistic Approach, Atheistic Approach, General and Special Ethics, Professional Ethics: Ethics at work-place, Ethics as Skill, Values and Ethics, Ethics with Value Education, Managerial and Business & Corporate Ethics, Corporate Social Responsibilities. **6**

Textbooks:

1. Bangaria,G.P et.al,(2010)*A foundation course in Human Values and Professional Ethics*, Excel books.
2. Govindrajan, M. (2013)*Professional Ethics and Human Values*, Eastern Economy Edition.

3. Naagrazan, R.S. (2018)*Textbook on Professional Ethics and Human Values*, New age International. Misra, Anuranjan and Shukla, Dr. R.K.,*Human values and Professional Ethics*.
4. Fernando, A.C.,(2009) *Business Ethics: An Indian Perspective*, Pearson,India.

BSM-127/177 **Engineering Physics**

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	Physics at 12th standard
Contact hours/week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Two Minor tests and One Major Theory & Practical Examination.
Course **Objective**	:	Understanding of the principle and concepts of Crystallography, Quantum Mechanics, Basic principles of electricity and magnetism, Maxwell's Equations, of and Advanced Materials for their applications Engineering.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

Basics of crystallography and its applications in Engineering.

1. Quantum Mechanics and its application to understand material properties at atomic level.
2. Basic principles of electricity and magnetism applied in Engineering.
3. Maxwell's equation of electromagnetic theory and its applications in engineering.
4. Basic principles of semiconducting materials and its application.
5. Basic Principles of advanced materials and their applications in Engineering.

Topic Covered

UNIT-I

Crystal Structures and X-ray Diffraction: Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. **9**

UNIT-II

Quantum Mechanics: De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle; Particle in a box (one dimensional) **9**

UNIT-III

Electrodynamics –I: Basic concepts of Gauss's law, Ampere's law and faradays law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current), Maxwell's equation, transformation from integral form to differential form, physical significance of each equation **9**

Electrodynamics –II: Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and k vectors, Maxwell's equations in dielectric and conducting medium, velocity of e. m. wave, comparison with free space, penetration depth

UNIT-IV

Physics of Advanced Materials **9**

Semiconducting Materials**,** Concept of energy bands in solids, concept of direct and indirect band gap, Carrier concentration and conductivity in semiconductors, Optoelectronic Materials, Superconducting Materials**,** Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), Introduction of nanoscience and technology

EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To study the variation of magnetic field along the axis of current carrying circular coil.
3. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
4. To study the energy band gap of n- type Germanium using four probe method
5. To determine e/m of electron using Magnetron valve
6. To draw hysteresis curve of a given sample of ferromagnetic material

Textbooks:

1. Introduction to Solid State Physics- Kittel , 7th edition, Wiley Eastern Ltd.
2. Solid State Physics - S. O. Pillai, 5th edition, New Age International.
3. Quantum Mechanics: Theory and Applications- Ajoy Ghatak, Tata McGraw-Hill
4. Introduction to Electrodynamics- David J. Griffiths Pearson, New International Edition
5. Semiconductor Devices and Application - S.M. Sze, Wiley
6. Introduction to Nano Technology - Poole Owens, Wiley India
7. Engineering Physics by B. K. Pandey and S. Chaturvedi, 2e Cengage Learning Pvt. Limited, India

BEE-101/ 151 Fundamentals of Electrical Engineering

Course category : Engineering Fundamentals (EF)

Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and One Minor tests and One Major Theory & Practical Examination.
Course **Objective**	:	**1.** To demonstrate and understand the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context. **2.** To demonstrate and understand the basic concepts of analysis of simple DC and AC circuits, Magnetic Circuits, Transformers and Electrical Machines.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Understand the basic properties of electrical elements, and solve problem based on basic electrical circuits & DC network theorems.
2. Understand the fundamental behaviour of AC circuits and solve AC circuit problems.
3. Apply the knowledge gained to explain the behaviour of the circuit at series & parallel resonance of circuit & the effect of resonance.
4. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits
5. Explain construction and working principle of transformer with background of magnetic circuits.
6. Classify and compare different types of Electrical machines.

Topic Covered

UNIT I

D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem. **9**

UNIT II

Steady- State Analysis of Single-Phase AC Circuits: **9**

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasor, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and Parallel circuit

Three Phase AC Circuits: Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power, and its measurement

UNIT III

Magnetic Circuit & Single-Phase Transformers: **9**

Magnetic circuit, concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis, and eddy current losses.

Single Phase Transformer: Principle of operation, Construction, EMF equation, Power losses, Efficiency, O.C & S.C Test and Introduction to auto transformer.

UNIT IV

Electrical Machines: **9**

Concept of electromechanical energy conversion DC machines: Types, EMF equation of generators and torque equation of motor, Characteristics, and applications of DC Generators & motors.

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Induction Motor: Types, Principle of operation, Torque-slip characteristics, Applications

EXPERIMENTS

1. Verification of Kirchhoff's Law.
2. Verification of Norton's Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Superposition Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. Verification of Series R-L-C circuit.
7. Verification of Parallel R-L-C circuit.
8. Measurement of Power and Power factor of three phase inductive load by two wattmeter method.
9. To perform O.C. and S.C. test of a single-phase transformer.
10. To draw the magnetization characteristics of separately excited dc motor.
11. To perform the external load characteristics of dc shunt motor.

Textbooks:

1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O. Sadiku; TATA McGraw-Hill.
2. Principles of Electrical Engineering, V. Del Toro; Prentice Hall International.
3. Electrical and Electronics Technology, Edward Hughes; Pearson.
4. Basic Electrical Engineering, D P Kothari, I.J. Nagarath; Tata McGraw Hill
5. Electrical Technology, B. L. Thareja and A. K. Thareja; S. Chand.

BSM-102/BSM-152 **Ordinary and Partial Differential Equations**

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Two Minor tests and One Major Theory Examination
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To solve the ordinary differential equations.

2. To solve the partial differential equations using Lagrange and charpit's method.
3. To solve and understand the properties of Bessel`s and Legendre`s differential equation.
4. Application of partial differential equation in real life problems
5. To solve Wave, Heat and Laplace equation upto two dimensions.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Ordinary Differential Equations I: Linear differential equations with constant coefficients ($n^{th} order$), complementary function and particular integral. Simultaneous linear differential equations, solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications of differential equations to engineering problems

UNIT-II 9

Ordinary Differential Equations II: Series solution of second order differential equations with variable coefficient (Frobeneous method). Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

UNIT-III 9

Partial Differential equations I: Partial differential equations of the first order, Lagrange's solution, Charpit's general method of solution, Partial differential equations of the second order: Constant coefficient and reducible to constant coefficient, Classification of linear partial differential equations of second order.

UNIT-IV 9

Partial Differential Equations II: Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two dimensions, Heat conduction equations up to two dimensions

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.
3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.
4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd..
5. M.D. Raisinghania, Ordinary and Partial Differential Equations. S Chand Publications.

BEE- 107/ 157	**Basics of Measuring & Protective Equipments**
Course category	: Proficiency
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 0, Tutorial: 0, Practical: 4
Number of Credits	: 2
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Major Practical Examination.

Course **Objective** : **1.** To demonstrate and understand the basic principle of operation and construction of different types of electrical measuring instruments.

2. To demonstrate and understand the applications of different types of electrical measuring instruments.

Course Outcomes:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Understand the basic concepts of measurement.
2. Understand the basic concepts of calibration of instruments like voltmeter, ammeter, wattmeter, and energy meter.
3. Understand the use of CT and PT for extension of range.
4. Understand the construction, working principle of operation and performances of different kind of measuring instruments.
5. Student gains knowledge on different Protective Equipment's of Power Systems.
6. Understand the Single line diagram of Substation.

EXPERIMENTS

1. Verification of Kirchhoff's law.
2. Measurement of Power and Power factor of three phase inductive load by two wattmeter method.
3. Calibration of ac voltmeter and ac ammeter.
4. Calibration of single induction type energy meter with the help of wattmeter.
5. Extension of range instruments using CT & PT.
6. To study the IDMT over current relay and determine the time current characteristics.
7. To study percentage differential relay.
8. To study Impedance, MHO and Reactance type distance relays.
9. To understand the protection scheme of substation through visit to local high voltage substation and to sketch labelled schematic diagram/single line diagram of it.

Textbooks:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai& Sons India .
3. S. S. Rao, "Switchgear and Protection", Khanna Publishers.
4. B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.
5. B.Bhalja, R.P. Maheshwari& N. G. Chothani, Protection & Switch Gear, Oxford University Press.
6. B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc. Graw Hill

BCE 101 ENGINEERING GRAPHICS

Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 0, Tutorial : 0 , Practical: 4
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Major Practical Examination
Course Objectives	:	This course aims at the following educational objectives: Comprehend general projection theory, with emphasis on orthographic projection to represent three-dimensional objects in two-dimensional views (principal, auxiliary, sections). Dimension and annotate two-dimensional engineering drawings.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. How Engineering Drawing helps to sketch the imagination?
2. Able to effectively practice the different scales for drawings.
3. Effectively analyze the geometrical shapes and to be able to draw.
4. Know about out solids and discuss about their classification.
5. How to implement the different views for a solid placed in 3dspace.
6. Construction of the object from different perspective.
7. Comparison and contrast between frustum and truncated solid.
8. Sketching of different sections for any 3D regular object.
9. Discussing the principles of Isometric Projection.
10. Sketching isometric projections for different geometrical shapes and solids.

Topics Covered

UNIT-I

Conic Sections and Orthographic Projections Introduction

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Orthographic Projections: Orthographic Projections covering Principles of Orthographic Projections- Conventions Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Plane

UNIT-II

Projection of Regular Solids

Projections of Regular Solids covering those inclined to both the Planes- Auxiliary Views

UNIT-III

Sections and Sectional Views of Right Angular Solids

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

UNIT-IV

Isometric Projections

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. Overview of computer graphics, demonstrating knowledge of the theory of CAD software.

Textbooks

1. Engineering Drawing-Bhat, N.D.& M. Panchal, Charotar Publishing House, 2008

Reference Books

1. Engineering Drawing and Computer Graphics- Shah, M.B. & B.C. Rana, Pearson Education, 2008
2. A Text Book of Engineering Drawing-Dhawan, R.K., S. Chand Publications,2007
3. Text book on Engineering Drawing-Narayana, K.L. & P Kannaiah, Scitech Publishers, 2008

BME154		**Fundamentals Of Mechanical Engineering**
Course category	:	For Other Department
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial : 0 , Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Two Minor test and One Major Theory & Practical Examination
Course Objective	:	NA

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. The knowledge of basic laws of thermodynamics; steam generation and its properties; refrigeration cycles, properties and machines; and reciprocating engine such as two/four strokes IC engines.
2. The knowledge of measuring instruments, types of transducers for measurement of different geometrical parameters.
3. The ability to understand different types of stresses, Hooke's law and its applications, different mechanical properties of engineering materials.
4. The knowledge of different types of beams, shear force and bending moment diagrams for statically determinate beams, stresses in simple bending of beams and torsion in circular shafts.

Topics Covered

UNIT-I 9

Thermodynamics

First and second law of thermodynamics, statements of Second Law of Thermodynamics and their equivalence, Third law of thermodynamics, Steam properties, Steam processes at constant pressure, volume, enthalpy and entropy, Classification of steam boilers, boiler mounting and accessories, Refrigeration, Basics of Vapour compression and vapour absorption system, Coefficient of performance (COP), Refrigerants properties.

Reciprocating Machines

Carnot cycle, Otto and Diesel cycles, Working of two and four strokes petrol and diesel engines.

UNIT-II 9

Measurement & Metrology

Introduction to measurement and measuring instruments, Types of sensors and transducers and their characteristics, measuring error uncertainty analysis, Temperature, pressure, velocity, flow, strain, force and torque introduction of dial gauges, slip gauges and sine bar

Engineering Materials

Classification of materials, Ferrous and nonferrous metals, Composition of cast iron, carbon steel, alloy steel and their mechanical properties, Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. properties and its applications.

UNIT-III 9

Simple Stress and Strain

Introduction, Normal and shear stresses, Poisson's ratio, Elastic constants and their relationships, Hooke's law, Deflection of bars of uniform and varying cross-sections, Strain energy in due to static loading, Stress-strain diagrams for ductile and brittle materials

Mechanical Properties and Testing

Introduction to Toughness, Hardness, Fracture, Fatigue, Strength and deformation, Tensile, compression, Hardness, Impact, Fatigue, spring stiffness tests.

UNIT-IV 9

Beams

Introduction, Beams classification, types of loading, Free body diagram, Shear force and bending moment, Analysis of beams, Shear force and bending moment diagrams for statically determinate beams, Simple bending theory, Stress of beams of different cross sections

Torsion of Circular shafts

Introduction, Torsion of circular shafts, Shear stress due to torsion, Polar modulus, Power transmission

EXPERIMENTS

Note: Minimum Eight experiments are to be performed

1. Tensile strength test on universal testing machine.
2. Compressive strength test on universal testing machine.
3. Bend/rebend test on Izod.
4. Impact test on Impact testing machine.
5. Hardness testing on Vicker/Brinell hardness testing machine.

6. Torsion test of a rod on torsion testing machine.
7. Stiffness test on spring testing machine.
8. Study of two stroke and four stroke engine model.
9. Fatigue test on fatigue testing machine.
10. Deflection on bending of simple supported and cantilever beams.
11. Determination of COP of vapour absorption system.
12. Determination of COP of vapour compression refrigeration system.
13. Study of steam boilers model.

Study of domestic refrigerator

Books & References

1. Basic and Applied Thermodynamics-P. K. Nag (Tata McGraw Hill)
2. Basic Thermodynamics- Cengel(Tata McGraw Hill).
3. Applied Thermodynamics-Onkar Singh (New Age International)
4. Elements of Materials science and Engineering-Van Vlash (Jhon Wiley & Sons)
5. Material Science-V. Raghvan (Prentice Hall India Limited)
6. Mechanical Measurement-G. Beckwith Thomas (Narosa Publishing House)
7. Mechanical Measurement – Sirohi (New Age Publications)
8. Strength of Materials-S. Ramamurtham (Dhanpat rai Publishing Co.)
9. Strength of Materials-R. K. Rajput (S. Chand)
10. Strength of Materials–R. K. Bansal (Lakshmi Publications)

BHM-101/151 **PROFESSIONAL COMMUNICATION**

Course category	:	Humanities & Social Science (HSS)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 0
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Two Minor tests and One Major Theory & Practical Examination.
Course **Objective**	:	The course aims: 1) To sensitize the students to understand the role& importance of communication for personal & professional success. 2) To enable learners to exhibit knowledge, skills, and judgment in and around human communication that

facilitates their ability to work collaboratively with others in an interpersonal environment.

3) To develop awareness and understanding of applying appropriate communication strategies resulting into the enhancement of learners' employability skills.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1) Use of various facets of communication skills, such as, Reading, Writing, Listening and speaking skills.
2) To identify, formulate and solve the real life problems with positive attitude.
3) To inculcate the habit of learning and developing the communication and soft skills by practice.
4) To enhance effortless speaking and writing skills with the help of rich word power.
5) To develop personality by introducing and inculcating effective presentation strategies.
6) To focus on audio, visual aids for effective oral communication skills

Topic Covered

UNIT-I

VERBAL COMMUNICATION: **6**

Received Pronunciation; how to activate passive vocabulary; Technical/non-technical and Business Presentations; questioning and answer skills; soft skills for professionals; role of body postures, movements, gestures, facial expressions, dress in effective communication; Information/ Desk/ Front Office/ Telephone conversation; how to face an interview/press conference; Group discussions, debates, elocution.

UNIT-II

READING COMPREHENSION **6**

Skimming and Scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; use and interpretation of visuals and graphics in technical writing.

UNIT-III

WRITTEN COMMUNICATION: **6**

Note Making and Note Taking; summarizing; invitation, advertisement, agenda, notice and memos; official and commercial letters; job application; resume and curriculum vitae; utility, technical, project and enquiry reports; paragraph writing: General – Specific, Problem – Solution, Process – Description, Data – Comment.

UNIT-IV

SHORT ESSAYS: **6**

Description and Argument; comparison and contrast; illustration; using graphics in writing: tables and charts, diagrams and flow charts, maps and plans, graphs; how to write research paper; skills of editing and revising; skills of referencing; what is a bibliography and how to prepare it.

Textbooks:

1) Bansal, R.K. & Harrison J.B., (1972)*Spoken English*, Orient Longman, India.
2) Chauhan, Narender Kr. & Singh, Sudhir N., (2013) *Formal Letters*, Pankaj Publication International, New Delhi.
3) Chhabra T.N., (2019) *Business Communication*, Sun India Publication, New Delhi.

4) Dixon Robert J., (1986)*Complete Course in English,* Prentice Hall of India, New Delhi.
5) Jones, Daniel.(2012) *Cambridge English Pronouncing Dictionary*, 18th Edition, Paperback, CUP, India.
6) Lewis, Norman, (2015) *Word Power Made Easy*, Penguin India.
7) Sethi J. & Jindal, (1993)*Handbook of Pronunciation of English Words* - D.V.A, Prentice Hall of India, New Delhi.
8) Sharma R.C. & Mohan Krishna, (2017)*Business Correspondence and Report Writing*, Tata McGraw Hill.
9) Thomson, A. J. & and Martinet A. V., (1997)*A Practical English Grammar*,Paperback,Ed. IVth, Oxford.