Scheme of Instruction & Syllabi
of
Bachelor of Technology
(Common to All Branches)

(With effect from academic session 2023-24)

(Dr. Ashish Kumar Singh)
HOD ME

(Prof. R.K. Shukla)
Dean Engineering & Technology

(Prof. Y D S Arya)
Vice- Chancellor

Department of Mechanical Engineering
INVERTIS UNIVERSITY

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243123 U. P.

INVERTIS UNIVERSITY BAREILLY

Established by Govt. of U.P. u/s 2F of UGC Act, 1956 vide U.P. Act 22 of 2010.

STUDY AND EVALUATION SCHEME
(With effect from academic session 2022-2023)
B.Tech. in Mechanical EngineeringYEAR I, SEMESTER I

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY										
1	Basic Science Course	BAS101	Physics	3	1	0	30	70	100	4
2	Engineering Science Course	BEE101 OR BEE-201	Basic Electrical Engineering OR Basic Civil & Mechanical Engineering	3	0	0	25	50	75	3
3	Engineering Science Course	BEC101	Emerging Domain in Electronics Engineering	3	0	0	25	50	75	3
4	Engineering Science Course	BCE101 OR BME101	Engineering Graphics and Design OR Workshop/Manufacturing Practices	1	0	0	10	15	25	1
5	Basic Science Course	BAS102	Mathematics-I	3	1	0	30	70	100	4
6	Engineering Science Course	BCS101	Introduction to Computers	3	0	0	25	50	75	3
7	Engineering Science Course	IIOT1	Introduction to IOT Foundation	4	0	0	30	70	100	4
PRACTICALS AND PROJECTS										
7	Basic Science Course	BAS151	Physics Lab	0	0	2	10	15	25	1
8	Engineering Science Course	BEE-151/ BEE 152	Basic Electrical Engineering lab	0	0	4	20	30	50	2
9	Engineering Science Course	BCE151 OR BME151	Engineering Graphics and Design Lab OR Workshop/Manufacturing Practices Lab	0	0	4	20	30	50	2

10	Engineering Science Course	BCS151	Introduction to computers Lab	0	0	4	20	30	50	2
			TOTAL	20	2	14	245	480	725	29
L-Lecture, **T**- Tutorial , **P**- Practical ,**CA**- Continuous Assessment, **EE**- End Semester Examination										

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STUDY AND EVALUATION SCHEME
(With effect from academic session 2022-2023)
B.Tech. in Mechanical Engineering
YEAR I, SEMESTER II

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY										
1	Engineering Science Course	BCS201	Programming For Problem Solving	3	0	0	25	50	75	3
2	Engineering Science Course	BCE201 OR BME201	Engineering Graphics and Design OR Workshop /Manufacturing Practices	1	0	0	10	15	25	1
3	Basic Science course	BAS201	Chemistry	3	1	0	30	70	100	4
4	Basic Science course	BAS202	Mathematics-II	3	1	0	30	70	100	4
5	Humanities & Social Sciences including Management	HAS201	English	2	0	0	15	35	50	2
6	Engineering Science Course	BEE201 OR BME 202	Basic Electrical Engineering OR Basic Civil & Mechanical Engineering	3	0	0	25	50	75	3
7	Engineering ScienceCourse	IIOT2	Communication and Standard Interfaces	4	0	0	30	70	100	4
PRACTICALS AND PROJECTS										
7	Engineering Science Course	BCS-251	Programming for problem Solving Lab	0	0	4	20	30	50	2
8	Engineering Science Course	BCE251 OR BME251	Engineering Graphics and Design OR Workshop/ Manufacturing Practice Lab	0	0	4	20	30	50	2
9	Engineering Science Course	BEE151 OR BME252	Basic Electrical Engineering Lab OR Basic Civil & Mechanical Engineering Lab	0	0	4	20	30	50	2

9	Humanities & Social Sciences including Management	HAS-251	English Lab	0	0	2	10	15	25	1
10	Basic Science course	BAS-251	Chemistry Lab	0	0	2	10	15	25	1
			TOTAL	19	2	14	245	480	725	29

L-Lecture, **T**- Tutorial , **P**- Practical ,**CA**- Continuous Assessment, **EE**- End Semester Examination

BAS-101- Physics

L T P C
3 1 0 4

MODULE -I

Frame of reference, Galilean transformation, Inertial and Non-inertial frames, Postulates of special theory of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, Length contraction, Time dilation, Addition of velocities, Variation of mass with velocity, Equivalence of mass and energy, Momentum-energy transformation equations

Interference

Theory of interference of light, Conditions for sustained interference, Classification of interference, Fresnel‟s Biprism experiment, displacement of fringes, Interference in thin films-wedge shaped film and Newton‟s rings.

MODULE- II

Diffraction

Single, Double & N- slit Diffraction, Diffraction grating, Grating spectra, Rayleigh‟s criterion and resolving power ofgrating

Polarization

Phenomena of double refraction, Doubly refracting crystals, Quarter wave plate & Half wave plate, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Optically active substance, Fresnel‟s theory of optical activity, Specific rotation and Polarimeters.

MODULE -III

Laser and Holography

Spontaneous and stimulated emission of radiation, Einstein‟s coefficients, construction and working of Ruby, He-Ne lasers and laser applications,
Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography

Fiber Optics

Fundamental ideas about optical fiber, Types of fibers, Acceptance angle and cone, Numerical aperture, Propagation mechanism and communication in optical fiber, Attenuation, Signal loss in optical fiber anddispersion.

Reference Books:

1. *Aurthur Beiser, "Concepts of Modern Physics" - (Mc-GrawHill)*
2. *Robert Resnick – "Introduction to Special theory of Relativity" -Wiely*
3. *Ajoy Ghatak ," Optics - (TMH)" Brijlal & Subramanian (S. Chand)*
4. *Anuradha De., "Optical Fibre & Laser "- (New Age)*

BEE-101/BEE-201- Basic Electrical Engineering

L T P C
3 0 0 3

Teaching Scheme: (Lectures - 3 hours/week; Tutorial - 1 hour/week; Laboratory – 2 hours/week)

Course Outcomes

- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines and Power Converters.
- To introduce components of Low Voltage Electrical Installations

MODULE-I

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin, Maximum Power Transfer and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

MODULE-II

Transformers: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor.
Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

MODULE-III

Power Converters: DC-DC bucks and boosts converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

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

Text Books:

1. *Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill*
2. *Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.*

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

Reference Books:

1. *S.N. Singh, "Basic Electrical Engineering" Prentice Hall International*
2. *I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill*
3. *Edward Hughes, " Electrical Technology" Longman*
4. *T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press.*
5. *H. Cotton, " Advanced Electrical Technology" Wheeler Publishing*
6. *W.H. Hayt & J.E. Kennely, "Engineering Circuit Analysis" Mc Graw Hill.*
7. *D.E. Fitzgerald & A. Grabel Higginbotham, " Basic Electrical Engineering Mc- Graw Hill*

BEC-101- Emerging Domain In Electronics Engineering

L T P C
3 0 0 3

Unit	Topics
I	**Introduction:** Semiconductors, Extrinsic & Intrinsic type, doping, p-n junction diode **Semiconductor Diode**: Depletion layer, V-I characteristics, ideal and practical Diodes, Diode Equivalent Circuits, Zener Diodes breakdown mechanism (Zener and avalanche) **Diode Application:** Diode Configuration, Half and Full Wave rectification, Clippers,Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits
II	**Bipolar Junction Transistor:** Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration **Field Effect Transistor:** Construction and Characteristic of JFETs. TransferCharacteristic. MOSFET (MOS) (Depletion and Enhancement) Type, Transfer Characteristic.
III	**Operational Amplifiers:** Introduction, Op-Amp Basic, Practical Op-Amp Circuits(Inverting Amplifier, Non-inverting Amplifier, Unit Follower, Summing Amplifier,Integrator, Differentiator). Differential and Common-Mode Operation, Comparators.
IV	**Digital Electronics:** Number system & representation. Introduction of Basic and Universal Gates, using Boolean algebra simplification of Boolean function. K Map.
V	**CRO as Measurement Instrument:** CRO (its working with block diagram), measurement of voltage, current, and frequency using CRO. **Introduction of IoT System,** Components of IoT system, Basic Introduction to Sensors

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", PearsonEducation.
2. H S Kalsi, "Electronic Instrumentation", McGraw Publication
3. George Kennedy, "Electronic Communication Systems", McGraw Publication
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
5. Jacob Millman, C.C. Halkias, Staya brataJit, "Electronic Devices and Circuits", McGraw Hill
6. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand the concept of PN Junction and devices.
2. Understand the concept of BJT, FET and MOFET.
3. Understand the concept of Operational amplifier
4. Understand the concept of measurement instrument.
5. Understand the working principle of different type of sensor and their uses.
6. Understand the concept of IoT system & understand the component of IoT system

BCE-101/BCE-201 Engineering Graphics and Design

L T P C
1 0 0 1

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

MODULE-I

Traditional Engineering Graphics: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.
Computer Graphics: Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

Text Books:

1. *Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House*
2. *Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education*
3. *" A Primer on Computer Aided Engineering Drawing"-2006, Published by VTU,Belgaum.*

Reference Books:

1. *Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication*
2. *Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers*
3. *(Corresponding set of) CAD Software Theory and User Manuals*
4. *S. Trymbaka Murthy, "Computer Aided Engineering Drawing" –I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revisededition-2006.*
5. *K.R. Gopalakrishna, "Engineering Graphics", 32nd edition, 2005 – Subash Publishers Bangalore.*

6. *Luzadder Warren J, duff John M.- "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., NewDelhi.*

BAS-102 – Mathematics –I

MODULE-I

Matrices

Elementary row and column transformation, Rank of matrix, Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Caley-Hamition theorem, Eigen values and eigen vectors, Diagonalisation, Complex and unitary matrices, Application of matrices to engineering problems.

MODULE-II

Differential Calculus-I

Leibnitz theorem, Partial differentiation, Eulers theorem, Curve tracing, Change of variables, Expansion of function of several variables.

Differential Calculus-II

Jacobian, approximation of errors, Extrema of functions of several variables, Lagranges method of multipliers (Simple applications).

MODULE-III

Fourier Series Periodic functions, Trignometric series, Fourier series of period 2 π, Eulers formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series.

Vector Calculus: Vector differentiation. Velocity, Acceleration of a particle moving on a space curve. Point function, Gradient, divergence and curl of a vector and their physical interpretations.

Text Books:-

1. H.K.Dass, Higher Engineering Mathmatics, S.ChandPublications.
2. B.S.Grewal, Engineering Mathematics, Khanna Publishers,2004.

Reference Books:-

1. R.K.Jain & S.R.K.Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers,2005.
3. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons,2005.
4. C.Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd.2003
5. Peter V. O"Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning,2007.
5. Peter V. O"Neil, "Advanced Engineering Mathematics", Thomson (Cengage) Learning, 2007.

BCS-101- Introduction to Computers

L T P C

3 0 0 3

Module 1:

Introduction to computers: Data, Information, Computer Definition, Features and Applications, Generations and Features of each Generations.

Basic Computer Organization: Basic Operations, Anatomy of Computers, I/O units and their functions, Storage Units their functions and types.

Hardware & Software: Definitions and their types, Relationship between hardware and software.

Classification of Computers: Types of Computers based on mode of use and their features.

Module 2:

Number System: Introduction, Positional and Non-Positional types, Types of Positional Number System and Conversions.

Computer Codes: Introduction, BCD (Binary Coded Decimal), EBCDIC (Extended Binary Coded Decimal Interchange Code), ASCII (American Standard Code for Information Interchange).

Operating System: Definition and need for OS, Logical Architecture, Basic Functions, Multiprogramming, Multitasking, Multithreading.

Module 3:

Algorithms: Introduction and Definition, Criteria & Notation, Types.

Internet: Introduction, Evolution and Basic Services, WWW (World Wide Web), Browsers and Uses of the Internet.

MS-Office: Design Goals of MS-OFFICE, Components of MS-OFFICE: MS-Word, MS-Power Point, MS-Excel, and MS-Access.

Computer Languages: Introduction, Classification, Advantages & Limitations, Translators

Text Books:

-

1. Rajaraman V. - Fundamentals of Computers – PHI

Reference Books:-

1. Mrs. Chetna Shah & Mr. Kalpesh Patel - Open Office

BAS-151- Physics Lab

L T P C

0 0 2 0

List of Experiments

Any ten experiments, at least four from each group.

Group –A

1. To determine the wavelength of monochromatic light by Newton‟sring.
2. To determine the wavelength of monochromatic light with the help of Fresnel‟sbiprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection usinglaser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster‟sbridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of thecoil.
10. To verify Stefan‟s Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect setup.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of aliquid.
18. Measurement of fiber attenuation and aperture offiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

BEE-151/251- Basic Electrical Engineering Lab

L T PC
0 0 0 4

Laboratory Outcomes:

The students are expected to

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters

List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown alongwith a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super- synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switch gear.

Text Books:

1. *V. Del Toro, " Principles of Electrical Engineering" Prentice Hall International*
2. *S.N. Singh, "Basic Electrical Engineering" Prentice Hall International*
3. *I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill*

Reference Books:

1. *Edward Hughes, " Electrical Technology"Longman*
2. *T.K. Nagsarkar & M.S. Sukhija, " Basic Electrical Engineering" Oxford University Press.*
3. *H. Cotton, " Advanced Electrical Technology" WheelerPublishing*

4. W.H. Hayt & J.E. Kennely, " Engineering Circuit Analysis" Mc GrawHill.

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BCE-151/BCE-251- Engineering Graphics

L T P
C0 0 0 4

Laboratory Outcomes:
(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

Module I: 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;

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

Module III: Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module IV: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; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module V: 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;

Module VI: Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module VII: Customisation & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module VIII: Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen);

Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned

surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling; Module 9: Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

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BCS-151- Introduction to Computer Lab

L T P C
0 0 0 4

List of Experiments:

1. Identify the internal and external hardware/peripheral components

2. Familiarization with operating system along with file management commands like create, copy, move, delete and rename files and folders.

3. Prepare and print Bio-data with a covering letter using word processor.

4. Calculation of Total mark, grade based on boundary conditions for n number of students using Spread sheet.

5. Experiments for burning the contents in to optical disks.

6. Preparation of presentation (with transition and animations , insertion of scanned images and internet contents)

7. Email id creation, sending and receiving of email with attachments.

8. Programs to calculate average of 3 numbers, area of triangle, volume of cylinder, Temperature conversion.

9. Largest of 3 numbers, Check whether even or odd, Roots of quadratic equation, Character name of the day.

10. Print natural numbers, Factorial value, Multiplication table, Sum of digits, Sum of a set of numbers, calculation of grade based on boundary conditions

BCS-201- Programming For Problem Solving

L T P C

3 0 0 3

Course Outcomes:

The course will enable the students

- To formulate simple algorithms for arithmetic and logical problems
- To translate the algorithms to programs (in C language)
- To test and execute the programs and correct syntax and logical errors
- To implement conditional branching, iteration and recursion
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach
- To use arrays, pointers and structures to formulate algorithms and programs
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
- To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration

MODULE-1

Programming language and environment: Introduction, Types of Languages and their Advantages and Disadvantages, Comparison, language translators. Programming Environment, Format of C program, Compiling and linking, executing a C Program, Write and execute the first program.
Overview of 'C'- Introduction and history, characteristics, Application, Program development life cycle.
Data Types and Storage Classes: Introduction, Types of data type, Data type modifier, Size and ranges of data types, Tokens, Variables. Storage classes- introduction, types and features.

MODULE-2

Operators and Expressions: Introduction, Types based on operands used, Precedence and Associativity, Arithmetic Expression, Evaluation of Expression, Type Conversions in Expressions, Mathematical Functions.

Decision Making and Branching: Introduction, Statement and Blocks**,** Conditional Statements **(**if statement**,** Switch statement**,** Ternary operator**,** goto statement), The break and continue statement.
Program Loops and Iteration: Introduction, Types, Uses of while, do and for loops, multiple loop variables, assignment operators.
Modular Programming: Introduction, advantages, Functions and their types, Declaration and Definition of a function, Scope rules and global variables, separate compilation, and linkage, building your own modules, Call by value and Call by reference.

MODULE-3

Arrays and Strings: Introduction, Array notation and representation, Declaring and initializing arrays, Manipulating array elements, using multidimensional arrays, String handling functions**.**
Structures: Purpose and usage of structures, declaring and defining structure, Assigning Values to variable, Initializing Structures, Arrays of Structures, Structures and Functions

Pointers to Objects: Introduction, Void and Null Pointers, Pointer and address arithmetic, pointer operations

and declarations, using pointers as function arguments, Pointer and Structure.

Basic Concepts of Dynamic Memory Allocation, Searching and Sorting, C Preprocessor directives and their types.

File Handling: Introduction, Types of Files, Defining, Opening and Closing a File, Input/output Operations on Files, Some Basic Functions

Text Books:

1. *Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill*
2. *E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill*

Reference Books:

1. *Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India*
2. *Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson Addison-Wesley,2006.*
3. *Behrouz A. Forouzan, Richard F. Gilberg,Computer Science- "A Structured Programming Approach Using C", Thomson, Third Edition [India Edition],2007.*
4. *Victor Alvarado, Mocygo San Jose,"M. S. Office For ME Word, Excel, Power Point, CA"*
5. *Yashwant Kanetker, "Let us C", BPB Publication,2008.*
6. *Detiel & Detiel, "„C" How to program, ISBN: 0132404168, 5th Edition,2007".*

BME-101/BME-201- Workshop/Manufacturing

L T PC
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Manufacturing is fundamental to the development of any engineering product. This course is intended to expose engineering students to different types of manufacturing/ fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included. The course intends to prepare students for:

- Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications
- The selection of a suitable technique for meeting a specific fabrication need

Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions

The chief goals of the course are:

- Introduction to different manufacturing methods in different fields of engineering
- Practical exposure to different fabrication techniques
- Creation of simple components using different materials
- Exposure to some of the advanced and latest manufacturing techniques being employed in the industry

MODULE- 1

Lectures & videos:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

[More hours can be given to Welding for Civil Engineering students as they may have to deal with Steel structures fabrication and erection; 3D Printing is an evolving manufacturing technology and merits some lectures and hands-on training.]

TextBooks

1. *Hajra & Bose, "Workshop Technology, Vol 1 & 2", Roy Media Promoters*
2. *Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.*
3. *Kalpakjian S. And Steven S. Schmid, " Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.*
4. *Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.*
5. *Roy A. Lindberg, " Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.*
6. *Rao P.N., " Manufacturing Technology" , Vol. I and Vol. II, Tata McGrawHill House, 2017.*
7. *"*

Reference Books

1. *Raghuvanshi, B.S., "Workshop Technology, Vol 1 & 2", Dhanpat Rai &Sons*
2. *Laxmi Narayan & Vaish W, "A Text Book of Practical Geometrical" Drawin*
3. *Chapmann , "A book of Workshop technology, Vol.1,II, andIII"*
4. *Ghosh & Malik, "A textbook of Manufacturing Process".*
5. *J. K. Lal & N. V. Reddy, "Machining Senses".*
6. *Digarmo, "A textbook of Machining Process*

BAS-201- Chemistry

LT PC
1 0 0 1

MODULE-I

Chemical bonding
Molecular Orbital Theory and its applications to Homo and Hetero diatomic molecules, Hydrogen bonding and its consequences, Band theory of metals and its applications.
Liquid crystalline state: Classification and its application. **Solid state**
Solid state:Limiting radius ratio (cubic). Braggs equation.l Distinctive allotropes of carbon such as graphite and fullerenes (two dimensional); properties and applications.
Gaseous state: Gas laws: Boyle‟s law, Charles law, Gay lussac law and kinetic theory of gases.
Reaction kinetics: Order and molecularity of reaction, integrated rate equation for zero first and second order. Theories of reaction rate.
Phase rule: Phase rule and its application to one component system (water)
Electrochemistry
Electrode potential, electrochemical and concentration cell, electrochemical theory of corrosion and itsPrevention.

MODULE-II

Concepts of organics
Electronic displacement in covalent bonded compound, Stability of reaction intermediates; carbocation,carbonation, free radical.E-Z nomenclature and R-S configuration, Conformation of n butane, Nucleophilic substitution reactions Structural and mechanistics
Reaction mechanism of
(i) Aldol Condensation
(ii) CannizarroReaction
(iii) HoffmannRearrangement
(iv) Beckmannrearrangement
(v) Diels Alder reaction.
Polymers
Polymerization techniques; addition, condensation and co – ordination polymerization. Structure preparation, properties and application of Elastomers, plastomers, polyamides and polyesters Conducting Polymers

MODULE-III

Spectroscopy
Elementary idea and simple application of U.V, IR and NMR spectral techniques.
Water: Water processing: boiler feed water (Calgon process), process water (Zeolite process) potable water, (ion exchange method)
Fuel: Analysis of coal (proximate and Ultimate) and their implications, calorific value and its determination (Bomb Calorimeter).

Titrimetric analysis: Types of titrimetric analysis: Acid Base, Redox, Precipitation and Complexometric titrations

Text Books:-

1. *Cotton F.A., Wilkinson G.,Murillo,C.A. and Bochmann" Advanced inorganic chemistry", Wiley,chiester,1992*
2. *Smith,Michael B./March Jerry, March,s "Advanced organic chemistry Reaction , mechanism and structure".,Wilelly and Sons,2007*
3. *Glaston,Samuel B., "Elements of physical chemistry",ELBS,2005Finar,I.L, "Organic Chemistry(vol I&II)" , Addision-Wesley LongmanLtd.*

Reference Book:-

1. *F.W. Billmeyer, "Text Book of Polymer Science", Jonhon Wielly & sons*
2. *G.W. Gray and P.A. Winsor, Ellis "Harwood series in Physical Chemistry, Liquid crystals and plastic crystals (vol I"), ,New York*
3. *M.G. Fontana, "Corrosion Engineering", Mc.Graw Hill Publications.*

BAS-202- Mathematics-II

L T P C
3 1 0 4

MODULE-I

Numerical Techniques – I

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton‟s forward and backward interpolation , Lagrange‟s and Newton‟s divided difference formula for unequal intervals.

Numerical Techniques –II

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson‟s one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler‟s, Picard‟s and forth-order Runge-Kutta mehthods.

MODULE-II

Statistical Techniques - I

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear and multiple regression analysis, Probability theory.

Statistical Techniques - II

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations, Chi-square test, t-test.

MODULE-III

Multiple Integrals

Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Application to area, volume, Dirichlet integral and applications.

Vector Calculus

Line, surface and volume integrals, Statement and problems of Green‟s, Stoke‟s and Gauss divergence theorems (without proof).

Text Books:-

1. H.K.Dass, Higher Engineering Mathmatics, S.Chand Publications.
2. B.S.Grewal, Engineering Mathematics, Khanna Publishers,2004.

Reference Books:-

1. R.K.Jain & S.R.K.Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers,2005.
3. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons,2005.
4. C.Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd.2003
5. Peter V. O‟Neil, Advanced Engineering Mathematics, Thomson (Cengage)Learning,2007.

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HAS-201- English

L T P C

20 0 2

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

Detailed contents

1. Vocabulary Building
1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills
2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

4. Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. Writing Practices
5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

6. Oral Communication

- (This unit involves interactive practice sessions in Language Lab)
- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and DialoguesCommunication at Workplace
- Interviews
- Formal Presentations

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

BME-102/BME-202 – Basic Civil &Mechanical Engineering

L T P C
3 0 0 3

Course Objectives:
The objectives of this Course is to provide-

1. An introductory treatment of *Basic Mechanical Engineering* to all the students of engineering.
2. A working knowledge of statics with emphasis on force equilibrium.
3. To provide an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems
4. To introduce the students the various manufacturing processes carried out in various industries and properties on materials used.
5. To understand the basics of energy interactions.
6. A working knowledge of IC Engines, refrigerator, air conditioner etc.

MODULE -1

Introduction to Mechanics of Solid:
Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems,
Force, force system, conditions of equilibrium, calculations of the reactions, moment, Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Basic Numerical problems,

MODULE- 2

Introduction to Thermal Engineering:
Thermodynamics: Thermodynamic systems, State & properties, Thermodynamic equilibrium & processes, Heat & work, Work done for different polytrophic processes, Zeroth law of thermodynamics and its applications, First law of thermodynamics, Steady flow energy equation, Application of first law to various thermodynamic systems and its limitations, concept of heat engine, refrigerator and heat pump, Carnot cycle, Second law of thermodynamics and its statements, Concept of entropy.
IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to hybrid vehicles.
Refrigeration and Air-Conditioning: Meaning, working of a simple refrigerator, meaning and application, humidity, dry bulb, wet bulb, and dew point temperatures, construction and working of window air conditioner.

MODULE -3

Introduction to Manufacturing Processes:
Engineering Materials and their properties: Metal, non-metal, ferrous, non-ferrous materials, strength, ductility, malleability etc.
Manufacturing Processes: Positive, negative and zero process, casting, joining processes, machining, forming.

After the successful completion of the course the students will be able (Course Outcomes)-

CO1	To define force, stress-strain, factor of safety, beams and various laws of thermodynamics.
CO2	Understand the basic laws of thermodynamics and their applications in
CO3	Apply laws of thermodynamics on different SFEE devices, concepts of refrigeration for calculation of COP, conditions of equilibrium compute load and reactions on different types of beams.
CO4	To differentiate various beams and thermodynamics systems.
CO5	To judge the feasibility of a thermodynamic process and Carnot cycle.
CO6	Develop basic knowledge and awareness of various manufacturing processes.

TEXT BOOKS

1. Engineering Mechanics: Ramamrutham S., 17th edition New Delhi : Dhanpat Rai Publications , 2002

2. Engineering Mechanics: S. S. Bhavikatti & Rajshekhrappa, 2nd edition: New Age International Publishers, 2012

3. Engineering Mechanics : Meriam J. L., 5th ed. Singapore : John Wiley & Sons (ASIA) Pte. Ltd., 2003

4. Engineering Mechanics: Statics & Dynamics: Shames Irving H.- 4th ed. New Delhi : Prentice Hall of India , 1998 to 2006

5. Engineering with Experiments : Dr. D. S. Kumar, S. K. Kataria & Sons., 2015, 12, 08

6. A Text Book of Engineering Mechanics: R. S. Khurmi, S. Chand Publication, 2004, 2011

7. A Text Book of Engineering Mechanics: R. K. Rajput, Dhanpat Rai Publication, 2004

8. Engineering Mechanics: With Hints To All Tutorial Problems: Kumar, K. L, 3rd .Rev. Ed. New Delhi : Tata McGraw Hill, 2005

9. Engineering Thermodynamics: P. K. Nag, TMH Publication.

10. A Textbook of Manufacturing Processes: Workshop Technology, R.S. Khurmi, S.Chand Publication, 2008

11. Basic Mechanical Engineering: Dr. D. S. Kumar, S K Kataria & Sons-New Delhi.

12. Thermodynamics “An Engineering Approach”: Y. A. Cengel and Boles, McGraw Hills Publication, 8th Edition, 2016.

BCS-251 – Programming for problem Solving Lab

L T P C
0 0 0 4

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self referential structures.
- To be able to create, read and write to and from simple text files.

Assignments for lab classes are as follows:

1: Problem solving using computers: Familiarization with programming environment

2: Variable types and type conversions: Simple computational problems using arithmetic expressions

3: Branching and logical expressions: Problems involving if-then-else structures

4: Loops, while and for loops: Iterative problems e.g., sum of series

5: 1D Arrays: searching, sorting: 1D Array manipulation

6: 2D arrays and Strings, memory structure: Matrix problems, String operations

7: Functions, call by value: Simple functions

8: Numerical methods (Root finding, numerical differentiation, numerical integration): Numerical methods problems

9: Recursion, structure of recursive calls: Recursive functions

10: Pointers, structures and dynamic memory allocation: Pointers and structures

11: File handling: File operations

BME-251- Workshop Using Practice Lab

L T P C
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Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

Workshop Practice:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding + gas welding)
6. Casting
7. Smithy
8. Plastic moulding & Glass Cutting

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

HAS-251- English Lab

L T P C
0 0 0 2

Oral Communication

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

7. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
8. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
9. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/Kinesics.
10. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
11. Official/Public Speaking based on suitable Rhythmic Patterns.
12. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
13. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
14. Argumentative Skills/Role Play Presentation with Stress and Intonation.
15. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

2. *Bansal R.K. & Harrison:" Phonetics in English", Orient Longman, New Delhi.*
3. *Sethi & Dhamija: "A Course in Phonetics and Spoken English", Prentice Hall, New Delhi.*
4. *L.U.B.Pandey & R.P.Singh, "A Manual of Practical Communication", A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.*
5. *Joans Daniel," English Pronouncing Dictionary", Cambridge Univ. Press.*

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Established by Govt. of U.P. u/s 2F of UGC Act, 1956 vide U.P. Act 22 of 2010.

BAS-251- Chemistry Lab

L T P C
0 0 0 2

Volumetric Analysis (Any five)

1. Determination of constituents and amount of alkalinity of water sample.
2. Determination of temporary and permanent hardness (Complexo metrictitration).
3 Determination of available chlorine in bleaching powder.
4 Determination of chloride content in water (Mohr,s Method).
5 Determination of iron content in the ore sample using external indicator.
6. Analysis of river water: suspended matter, TDS, heavy metals and pH.
7. Determination of BOD and COD of river water sample.
8 . Determination of equivalent wt. of iron by chemical displacement method

Instrumental Analysis (Any two)

9. Determination of strength of a unknown acid solution by pH metrictitration.
10. Determination of iron concentration in water by calorimetric method.
11 Determination of viscosity of addition polymer by viscometer.(Polystyrene)

Miscellaneous [Prep (1) and Elemental & Functional (2)]

12. Preparation of Bakelite resin.
13 Synthesis of Aspirin
14 Elemental analysis of organic compounds
15 Determination of functional groups in organic compounds