MATS UNIVERSITY

SCHOOL OF ENGINEERING AND INFORMATION TECHNOLOGY

Department of Mechanical Engineering

Syllabus

For

(Four-Year Full-Time Degree Programme)

Bachelor of Technology (B .Tech.)

Mechanical Engineering

(2025-2029)

(Semester Based Course)

MATS University, Raipur C.G.				
School of Engineering and Information Technology, Raipur C.G.				
Model Curriculum of B.Tech. Program Aeronautical Engineering				
(BASED ON AICTE MODEL ALIGNED WITH NEP-2020)				
S. No.	**Subject Code**	**Semester - 1**	**LTP**	**Credits**
1	BTDSCBSC100	Matrices and Calculus	3:0:0	3
2	BTDSCBSC101	Engineering Physics	3:0:0	3
3	BTDSCESC102	Programming for Logic Building	3:1:0	4
4	BTDSCHSC103	Technical English	2:0:0	2
5	BTDSCMC104	Environmental Sciences	1:0:0	0
6	BTDSCBSC105	Engineering Physics Laboratory	0:0:2	1
7	BTDSCESC106	Manufacturing Practices – I Laboratory	0:0:2	1
8	BTDSCESC107	Engineering Graphics & Design Laboratory	0:0:4	2
9	BTSEC108	Programming and Soft Skill Laboratory (SEC)	0:0:2	1
10	BTAEC109	Communication Skills Laboratory (AEC)	0:0:4	2
11	BTVAC110	Universal Human Values	1:0:0	1
12	GEA	Multidisciplinary Elective Course - I (from bucket)	3:0:0	3
Total Credits				**23**
S. No.	**Subject Code**	**Semester - 2**	**LTP**	**Credits**
1	BTDSCBSC200	Analytical Mathematics	3:0:0	3
2	BTDSCBSC201	Engineering Chemistry	3:0:0	3
3	BTDSCESC202	Basic Electrical & Electronics Engineering	3:0:0	3
4	BTMC203	Constitution of India, Professional Ethics and Human Rights.	1:0:0	0
5	BTDSCESC204	Fundamental of Mechanical Engineering. (For Aero./Mech./Mining/Civil Engg.)	3:0:0	3
6	BTDSCESC205	Engineering Chemistry Laboratory	0:0:2	1
7	BTDSCESC206	Basic Electrical & Electronics Engineering Laboratory	0:0:2	1
8	BTDSCESC207	Fundamental of Mechanical Engineering Laboratory (For Aero./Mech./Mining/Civil Engg.)	0:0:2	1
9	BTDSCESC208	Manufacturing Practices - II Laboratory	0:0:2	1
10	BTSEC209	Problem Solving with Python Programming (SEC)	3:0:0	3
11	BTAEC210	Advanced Programming Laboratory (AEC)	0:0:2	1
12	GEA	Multidisciplinary Elective Course - II (from Basket)	3:0:0	3
Total Credits				**23**

S. No.	Subject Code	Semester - 3	LTP	Credits
1	BTDSCBSC300	Numerical Methods and Statistics	3:0:0	3
2	BTDSCME311	Engineering Thermodynamics	3:1:0	4
3	BTDSCME312	Mechanics of Solids I	3:1:0	4
4	BTDSCME313	Kinematics of Machine	3:1:0	4
5	BTDSCME314	Kinematics of MachineLaboratory	0:0:2	1
6	BTAEC315	Thermodynamics Laboratory	0:0:2	1
7	BTSEC316	Machine Drawing Laboratory	1:0:2	2
8	BTSEM317	Project / Seminar	0:0:2	1
9	GEA14	Multidisciplinary Elective Course – III (Renewable Energy Sources)	3:0:0	3
Total Credits				**23**
S. No.	**Subject Code**	**Semester - 4**	**LTP**	**Credits**
1	BTDSCME410	Fluid Mechanics & Machinery	3:1:0	4
2	BTDSCME411	Mechanics of Solids- II	3:0:0	3
3	BTDSCME412	Dynamics of Machines	3:0:0	3
4	BTDSCME413	Fluid Mechanics & Machinery Laboratory	0:0:2	1
5	BTAEC414	Dynamics of Machines Laboratory	0:0:2	1
6	BTSEC415	Material Testing Laboratory	0:0:2	1
7	BTSEM456	Project / Seminar	0:0:2	1
8	BTINT457	Internship – I	0:0:1	3
9	BTPDSE1XX	Professional Elective Course - I (from Basket)	3:0:0	3
10	GEAXX	Multidisciplinary Elective Course - IV (from Basket)	3:0:0	3
Total Credits				**23**
S. No.	**Subject Code**	**Semester – 5**	**LTP**	**Credits**
1	BTDSCME510	Manufacturing Technology	3:0:0	3
2	BTDSCME511	Machine Design – I	3:0:0	3
3	BTDSCME512	Energy Studies	3:0:0	3
4	BTDSCME513	Heat and Mass Transfer	3:0:0	3
5	BTDSCME514	Manufacturing Technology Laboratory	0:0:2	1
6	BTDSCME515	Machine Design - I Laboratory	0:0:2	1
7	BTSEC516	Heat and Mass Transfer Laboratory	0:0:2	1
8	BTPR557	Interdisciplinary Project	0:0:2	1
9	BTINT558	Internship – II	0:0:1	3
10	BTPDSE1XX	Professional Elective Course – II	3:0:0	3
Total Credits				**22**

S. No.	Subject Code	Semester – 6	LTP	Credits
1	BTDSCME610	Computer Aided Design & Manufacturing	3:0:0	3
2	BTDSCME611	Machine Design- II	3:0:0	3
3	BTAEC612	Internal Combustion Engine	3:1:0	4
4	BTDSCME613	Computer Aided Design & Manufacturing Lab	3:0:0	3
5	BTDSCME614	Machine Design – II Laboratory	0:0:2	1
6	BTDSCME615	Internal Combustion Engine Laboratory	0:0:2	1
7	BTINT616	Internship – III	0:0:1	3
8	BTPR617	Multidisciplinary Project / Case Study	0:0:2	1
9	BTPDSE1XX	Professional Elective Course - III	3:0:0	3
		Total Credits		**22**
S. No.	**Subject Code**	**Semester – 7**	**LTP**	**Credits**
1	BTDSCME710	Automobile Engineering	3:0:0	3
2	BTAEC711	Refrigeration & Air-conditioning	3:0:0	3
3	BTDSCME712	Robotics	3:0:0	3
4	BTDSCME713	Automobile Engineering Laboratory	3:0:0	3
5	BTDSCME714	Refrigeration & Air-conditioning Laboratory	0:0:2	1
6	BTPDSE1XX	Professional Elective IV (FEM)	0:0:2	1
7	BTINT716	Internship – IV	0:0:1	3
8	BTPR717	Project Work Phase - I (Domain Specific)	0:0:4	2
9	BTO1XX	Open Elective III (EMSD)	3:0:0	3
Total Credits				**22**
S. No.	**Subject Code**	**Semester – 8**	**LTP**	**Credits**
1	BTPR850	Project Work Phase - II (Domain Specific/live Project)	0:0:12	6
2	BTPDSE1XX	Professional Elective Course - V	3:0:0	3
3	BTPDSE1XX	Professional Elective Course - VI	3:0:0	3
4	BTPDSE1XX	Professional Elective Course - VII	3:0:0	3
		Total Credits		**15**
Grand Total Credits				**173**

Minors Courses listing:

S. No.	Subject Code	Semester – 5	LTP	Credits
1	xxxx	**Minors (01 Th + 01 Lab)**	3:0:4	3+2
		Total Credits		**5**
S. No.	**Subject Code**	**Semester – 6**	**LTP**	**Credits**
1	xxxx	**Minors (01 Th + 01 Lab)**	3:0:4	3+2
		Total Credits		**5**
S. No.	**Subject Code**	**Semester – 7**	**LTP**	**Credits**
1	xxxx	**Minors (01 Theory + 01 Research Project / Case Study)**	3:0:4	3+2
		Total Credits		**5**
S. No.	**Subject Code**	**Semester – 8**	**LTP**	**Credits**
1	xxxx	**Minors (01 Theory)**	3:0:0	3
Grand Total Credits				**191**

Scheme of Teaching and Evaluation
(As per NEP -2020)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

Semester - I

S. No.	Course Sub Category	Course Name	Course Code	Teaching Scheme				Evaluation Scheme		Total Marks
				Hours			Credits			
				Theory	Tutorial	Practical		CIA	ESE	
1	DSCC - BSC	Matrices and Calculus	BTDSCBSC100	3	0	-	3	30	70	100
2	DSCC - BSC	Engineering Physics	BTDSCBSC101	3	0	-	3	30	70	100
3	DSCC - ESC	Programming for Logic Building	BTDSCESC102	3	1	-	4	30	70	100
4	DSCC - HSC	Technical English	BTDSCHSC103	2	0	-	2	30	70	100
5	DSCC - MC	Environmental Sciences	BTDSCMC104	1	0	-	0	30	70	100
6	DSCC - BSC	Engineering Physics Laboratory	BTDSCBSC105	-	-	2	1	20	30	50
7	DSCC - ESC	Manufacturing Practices – I Laboratory	BTDSCESC106	-	-	2	1	20	30	50
8	DSCC - ESC	Engineering Graphics & Design Laboratory	BTDSCESC107	-	-	4	2	20	30	50
9	SEC	Programming and Soft Skill Laboratory	BTSEC108	-	-	2	1	20	30	50
10	AEC	Communication Skills Laboratory	BTAEC109	-	-	2	2	20	30	50
11	VAC	Universal Human Values	BTVAC110	1	-	-	1	30	70	100
12	GEC	Multidisciplinary Elective Course - I	GEA	3	0	0	3	30	70	100
			Total	16	1	12	23	310	640	950

L – Lecture, T – Tutorial, ESE – End Semester Examination, P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Note : Theory Internal Marks (CIA) = 30 (CT-I = 05, CT-II=05, Assignment=05, Mid Term=15) Practical Internal Marks (CIA) = 20 (Attendance = 05, Lab Viva-Voce = 05, Lab Record Work = 10)

Discipline Specific Core Courses (DSCC) Major				AEC (Ability Enhancement Course) (E)	SEC/Internship (Skill Enhancement Course) (F)	Value Added Course (VAC) (G)	GEC (Generic Elective Course) (H)
Basic Sciences Course (A)	Engineering Sciences Course (B)	Humanities Science (C)	Mandatory Course (D) (Zero Credit Course)				
Engineering Mathematics – I	Programming for Logic Building	Technical English	Environmental Sciences	Communication Skills Laboratory	Programming and Soft Skill Laboratory	Universal Human Values	Multidisciplinary Elective Course - I
Engineering Physics	Engineering Graphics & Design						
Engineering Physics Laboratory	Manufacturing Practices – I Laboratory						
	Engineering Graphics & DesignLaboratory						

Credit Definition:

- 1-hour lecture (L) per week per semester = 1Credit
- 1-hour tutorial (T) per week per semester = 1Credit
- 2-hour Practical/Drawing(P) per week per semester = 1 Credit
- Four credit courses are to be designed for 60 hours of Teaching-Learning process.
- Three credit courses are to be designed for 48 hours of Teaching-Learning process.
- Two credit courses are to be designed for 28 hours of Teaching-Learning process.
- One credit courses are to be designed for 15 hours of Teaching Learning process

Semester: I B. Tech **Branch: All Streams of Engineering**
Subject: Matrices and Calculus **Code: BTDSCBSC100**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT-I

MATRICES

Real vector space, Subspace, Linear span, Linear dependence and linear independence of vectors, Basis, Dimension, Linear transformation, Matrix associated with a linear transformation, Rank and inverse by elementary transformation (Gauss Jordan method), System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT- II

DIFFERENTIAL CALCULUS

Successive differentiation, Lebnitz theorem, Rolle's Theorem, Taylor's theorem with Lagrange's form of remainder, Expansions of functions in Taylor's and McLaurin's series

UNIT-III

PARTIAL DIFFERENTIATION

Functions of two variables: Limit, continuity and partial derivatives, derivatives of higher order, Euler's theorem on homogeneous functions, Total derivative, Change of variables, Jacobians, Maxima, minima and saddle points of functions of two variables

UNIT-IV

ORDINARY DIFFERENTIAL EQUATION

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation,Legendre polynomials and their properties

UNIT-V

MULTIPLE INTEGRAL

Beta and Gamma functions – elementary properties, Double and triple integrals, change of order of integration, Application to area and volume.

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

NAME OF TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (42th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

NAME OF REFERENCE BOOKS:

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

Semester: I B.Tech **Branch: All Streams of Engineering**
Subject: Engineering Physics **Code: BTDSCBSC101**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits : 03

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

Unit -I

THEORY OF RELATIVITY SPACE

Time and motion, frame of reference, Galilean Transformation Outline of relativity, Michelson-Morley experiment, Special theory of Relativity, transformation of space and time, Time dilation, Doppler effect ,length contraction, addition of velocities, Relativistic mass: variation of mass with velocity, kinetic energy, equivalence of mass and energy, Relation between energy and momentum.

Unit- II

(a) LASERS

Temporal and spatial coherence of light wave Principle of laser, Laser characteristics, components of laser, Principle of Ruby, He-Ne &Nd -YAG lasers, application, basic concepts of Holography (only introductory part, No detail derivation)

(b) FIBRES OPTICS:

Optical fibers: Introduction & advantages, structure & classification, Option of propagation in fiber, attenuation & distortion, acceptance angle and cone, numerical aperture (only introductory part, No detail derivation).

Unit -III

NUCLEAR PHYSICS

Controlled and uncontrolled chain reaction, criteria of critical mass, nuclear reactor and its site selection & numerical ,nuclear forces, Nuclear fusion in stars . Introduction of elementary particles. Electron ballistic: Motion of charged particles in electric and magnetic field. Aston and Bainbridge mass spectrograph.

Unit -IV

WAVE OPTICS

Wedge shaped films, Interferences by division of amplitude: Newton's rings and its applications Interference by division of wave front: Fresnel's bi prism, fringe width, diffraction grating, resolving power of grating,

Unit- V

SOLID STATE DEVICES:

Transistor: Input and Output characteristics in CE mode, Transistor as an amplifier, Hartley Oscillator. FET: Input and output characteristics of J-FETs & MOSFETs, Operational amplifiers (Op-Amp).

OUTCOMES:

The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

1. Gaur and Gupta “Engineering Physics”
2. Avadhanulu and Kshirsagar “Engineering Physics”.
3. Verma H.C.: Concepts of Physics, Part-1 & Part-2, BharatiBhawan (P&D)
4. A.K. Tayal: Engineering Mechanics (Statics and Dynamics)

REFERENCE BOOKS:

• Jenkins and White: “Optics”, MeGrew-Hill Book Company.

• Singh R.B.: “Physics of Oscillations and Waves”

• Ghatak A.K.: “Optics”

• Mani and Mehta: “Modern Physics”, Affiliated East-West Press Pvt. Ltd, 1998.

• Sanjeev Puri: Modern Physics, narosa Pub. Co.2004.

• Azroff: Solid State Physics, Tata McGraw-Hill, 2004.

• Theraja: B.L., Basic Electronics, S.Chand, 2002.

• Puri: Digital Electronics, Tata McGraw-Hill, 2002.

• Millman, J and Halkias: integrated Electronics, Tata MeGraw-Hill, 2004.

• Tyagrajan and Ghatak: Lasers, Macmillan, 2001.

Semester: I B.Tech **Branch: All Streams of Engineering**

Subject: Programming For Logic Building **Subject Code: BTDSCESC102**

Total Theory Periods: 48 **Total Tutorial Periods: 12**

Total Credits: 04

COURSE OBJECTIVE:

- To distinguish and recognize low-level and high-level programming languages
- To know fundamental concepts of structured programming
- To understand logic development
- To design pseudo logic for various programming problems.
- To understand the basic structure of a program including sequence, decisions and looping.
- To design solutions to real world problems using C language.
- To use C language for problem solving and numerical computations.
- To apply computer-programming concepts to new problems or situations.

UNIT – I

ELEMENTS OF C LANGUAGE

Tools for Problem Solving: Problem Analysis, Flowchart, Algorithm Development. Top-Down Program Design, Structured Design Approach, Origin of C, Features & Characteristic of C, C Compiler, Character Set, Keywords, Identifiers, Constants, Variables, Input/ Output Statements, Basic Data Types, Operators and Expressions, Basic structure of C programs, A simple C Program.

UNIT – II

CONTROL FLOW CONSTRUCTION

Decision making and branching: Simple if statement, if else statement, Nesting of if-else statement, else - if Ladder, Switch statement, Operator, goto statement, Decision making and looping, While statement, Do-While statement, For statement, Jumps in loops, Break and Continue statement.

UNIT – III

DEFINING AND MANIPULATING ARRAYS

One Dimensional Arrays: Declaration of Arrays, Initialization of Arrays, Reading and Writing of integer, real and Character arrays, sorting and Searching in Arrays, Multi-Dimensional Arrays, Handling of Character Strings.

UNIT – IV

USER DEFINED FUNCTIONS

Syntax of Function, Calling functions, Actual & Formal Arguments, Categories of Functions, Function prototype, Scope Rules: Local & Global variables, Recursion, Recursion vs. iteration, Passing Arguments: call by values & call by reference, passing array to function.

Structures: Declaration and initialization of Structure, Array of structures, Array within structure, structure within structure, Structures and functions, Introduction to unions.

UNIT – V

POINTER DATA TYPE AND ITS APPLICATION

Pointer Operator, Pointer Expression, Initialization of pointers, Pointer Arithmetic, Pointer and Function Arguments, Pointer to function, Pointer and Arrays, Pointers and String, Arrays of Pointers, Pointers to Pointers, Dynamic memory allocation.

Files in C: Defining and Opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, Random access to files.

COURSE OUTCOME:

After completion of the course study, students are going to be in a position to

1. Analyze issues and style algorithms in pseudo code.
2. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
3. Read, perceive and trace the execution of programs written in C language.
4. Develop confidence for self-education and ability for life-long learning needed for Computer language.
5. Write down C program for a given algorithm by means of modular approach.

TEXT BOOKS:

1. The C programming Language, Dennis M Ritchie and Kernighan, PHI.
2. Let us C, YashwantKanetkar, BPB Publication.
3. Programming in C, E. Balaguruswamy, TMH.

REFERENCE BOOKS:

1. Programming in C, Byron Gottfried, Schaum's series outline TMH.
2. Programming in C, Ghosh, PHI.
3. Computer Programming in C, V. Raja Raman, PHI.

Semester: I B. Tech **Branch: All Streams of Engineering**

Subject: Environmental Sciences **Code: BTDSCMC104**

Total Theory Periods: 15 **Total Tutorial Periods: 00**

Total Credits: 00

UNIT-I:

CONCEPTS OF ENVIRONMENTAL SCIENCES AND NATURAL RESOURCES

Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals. Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative).

UNIT-II:

BIODIVERSITY AND ITS CONSERVATION

Biodiversity at global, national and local levels: India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation.

UNIT-III:

ENVIRONMENTAL POLLUTION

Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

UNIT-IV:

ENVIRONMENTAL BIOTECHNOLOGY AND ENVIRONMENTAL MONITORING

Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phyto-remediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application. Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques.

UNIT-V:

SOCIAL ISSUES AND ENVIRONMENT

Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming,

ozone layer depletion, acid rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics

TEXTBOOKS:

1. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.

2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS:

1. A. K. Chatterji, "Introduction to Environmental Biotechnology", Prentice Hall of India, New Delhi, 2006.

2. R.K. Trivedi,"Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.

3. Nebel B. J., "Environmental Science", Prentice Hall of India, New Delhi, 1987.

Semester: I B.Tech **Branch: All Streams of Engineering**

Subject: Technical English **Code: BTDSCHSC103**

Total Theory Periods: 28 **Total Tutorial Periods: 00**

Total Credits : 02

OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT-I

Technical vocabulary-meaning in context, sequencing words, articles, prepositions, intensive reading and predicting content-reading and interpretation- process description.

UNIT-II

Phrases/structures indicating use/purpose- nonverbal communication- listening- corelating verbal and nonverbal communication-speaking in group discussion- formal letter writing-writing analytical paragraphs.

UNIT III

Cause and effect expressions- different grammatical forms of the same word- speaking stress and intonation- writing using connectives- report writing- types, structures, data collection, content form recommendation.

UNIT –IV

Numerical adjectives- oral instructions- descriptive writings, letter of application-content, format (c.v./biodata)-imperative forms –checklists, yes/no question forms- e mail communication.

UNIT-V

Speaking – discussion of problems and solutions- creative and critical thinking, writing a proposal.

OUTCOMES:

Learners should be able to

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.

Listen/view and comprehend different spoken discourses/excerpts in different accents.

BOOKS AND REFERENCES:

1. P.k. dutta, g. Rajeevan and c.l.n.prakash, ‘a course in communication skills,. Cambridge university press, india2007

2. Krishna mohan and meerabanerjee, ‘developing communication skills’ Macmillan india limited

3. Edger thrope, showickthrope, ‘objective english’ second edition,pearson education,2007

Semester: I B.Tech. **Branch: All Streams of Engineering**

Lab: Engineering Physics Lab **Code: BTDSCBSC105**

Total Practical Periods: 30 **Total Credit: 01**

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EXPERIMENTS (Any ten experiments can be performed)

1. To determine the surface tension by Capillary/Jager's method.
2. To determine the wave length of light by Newton's rings method.
3. To determine the wave length of light by Fresnel's Biprism.
4. To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
5. To determine specific resistance of a wire by Carry Foster's Bridge.
6. To determine the Hall coefficient of semiconductor.
7. To determine e/m by Thomson's method.
8. Study of Photo – Cell and determination of Planck's constant.
9. Determination of wavelength of a spectral line using diffraction grating.
10. Determination of divergence of LASER beam.
11. Determination of grating element of a diffraction grating using LASER beam.
12. To determine the coefficients of viscosity of a liquid by capillary flow/Stoke's method.
13. To determine the frequency of A.C. mains using sonometer.
14. To determine the moment of inertia of flywheel.
15 To determine the forbidden energy gap of semiconductor diode.
16. To determine the mechanical equivalent of heat (J) by Calender&Barne's method.
17. To determine the numerical aperture (NA) of the given fiber cables.
18. To study the characteristics of LDR.

Semester: I B.Tech. **Branch: All Streams of Engineering**
Lab: Programming & soft skills laboratory **Code: BTSEC108**
Total Practical Periods: 30 **Total Credits: 01**

List of Programs:

1 Write a program to take the radius of a sphere as input and print the volume and surface area of that sphere.
2 Write a program to take a 5-digit number as input and calculate the sum of its digits.
3 Write a program to take three sides of a triangle as input and verify whether the triangle is an isosceles, scalene Oran equilateral triangle.
4 Write a program that will take 3 positive integers as input and verify whether or not they form a Pythagorean triplet or not.
5 Write a program to print all the Prime numbers between a given ranges.
6 Write a program to define a function that will take an integer as argument and return the sum of digits of that integer**.**
7 Write a program to define a macro that can calculate the greater of two of its arguments. Use this macro to calculate the greatest of 4 integers.
8 Write a program to define a recursive function that will print the reverse of its integer argument.
9 Write a program to print the sum of first N even numbers using recursive function.
10 Write a program to sort an array using Bubble sort technique.
11 Write a program that will take the elements of two integer arrays of 5 element each, and insert the common elements of both the array into a third array (Set intersection)
12 Write a program to take 5 names as input and print the longest name.
13 Write a program to check whether two given strings are palindrome or not using user defined function.
14 Write a program to find sum of all array elements by passing array as an argument using user define functions.
15 Write a program to convert decimal number to binary number using the function.
16 Write a program to get the largest and smallest element of an array using the function.
17 Write a program to define a structure Student that will contain the roll number, name and total marks of a student. The program will ask the user to input the details of 5 students and print the details of all the students whose total marks is greater than a given value.

18 Write a program to define a union Contact that will contain the members Mobile no and E-mail id. Now define structure Employee that will contain name, roll number, mode of contact (mob/e-mail) and a variable of type Contact as members. The program will ask the user to give the details of two Employees including mode of contact and the contact num/ E-mail. Print the details of both the Employees.

19 Write a program to count vowels and consonants in a string using pointer.

20 Write a program to swap two numbers using pointers.

21 Write a program to find sum of array elements using Dynamic Memory Allocation.

22 Write a program that will ask the user to input a file name and copy the contents of that file into another file.

23 Write a program that will take any number of integers from the command line as argument and print the sum of all those integers.

24 Write a program to process sequential file for payroll data.

25 Write a program to process random file of library data.

Smart Working with MS-Office

MS-Word

a) Creating, editing, saving and printing text documents
b) Font and paragraph formatting
c) Simple character formatting
d) Inserting tables, smart art, page breaks
e) Using lists and styles
f) Working with images
g) Using Spelling and Grammar check
h) Understanding document properties
i) Mail Merge

MS-Excel

a) Spreadsheet basics
b) Creating, editing, saving and printing spreadsheets
c) Working with functions & formulas
d) Modifying worksheets with color &auto formats
e) Graphically representing data : Charts & Graphs
f) Speeding data entry : Using Data Forms
g) Analyzing data : Data Menu, Subtotal, Filtering Data
h) Formatting worksheets
i) Securing & Protecting spreadsheets

MS-PowerPoint

a) Opening, viewing, creating, and printing slides
b) Applying auto layouts
c) Adding custom animation
d) Using slide transitions
e) Graphically representing data : Charts & Graphs
f) Creating Professional Slide for Presentation.

LIST OF EQUIPMENT'S / MACHINE REQUIRED:

PCs, C-Compiler, C Online Compiler, Microsoft Office (version 2007 or above)

REFERENCES:

1. Programming in ANSI C – E. Balaguruswamy Tata Mc-Gcraw Hill.
2. Let us C, YashwantKanetkar, BPB Publication
3. C: The Complete Reference, Herbert Schildt, McGraw Hill.
4. Office 2007 for Dummies, Wallace Wang, Wiley Publishing
5. MS-Office 2010 Training Guide, Satish Jain/M.Geeta/Kratika, BPB Publications

Semester: I B.Tech **Branch: All Streams of Engineering**

Lab: Engineering Graphics and Design Lab **Code: BTDSCESC107**

Total Practical Periods: 48 **Total Credits: 02**

LIST OF EXPERIMENTS

Component-1

Sheet-1: Projection of Solids (4 problems) + Section and Development of solid surfaces (4 problems) Sheet -2: Orthographic projection without section (4 problems).

Sheet -3: Orthographic projection with section (4 problems). Sheet- 4: Isometric Projections (6 problems).

Component -2

One A-3 size sketch book consisting of:-

1) 6 problems each from Projection of Curves, Lines, Planes and Solids.

2) 6 problems from Section and Development of Solids.

3) 4 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

Component - 3

1. An introduction of cad software and its utilities in the engineering software.
2. Study of the basic initial setting and viewing of drafting software interface.
3. Study of various tool bar options and exercises to familiarize all the drawing tools.
4. Use of various modify commands of drafting software.
5. Dimensioning in 2d and 3d entities.
6. Draw different types of 3d modeling entities using viewing commands, to view them (isometric projection).
7. Sectioning of solid primitives and rendering in 3d.
8. Intersection of solid primitives.

Semester: I B.Tech **Branch: All Streams of Engineering**
Lab: Communication Skill Lab **Code: BTAEC109**
Total Practical Periods: 30 **Total Credits: 02**

LIST OF TASKS:

1. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.

2. Vocabulary building, Creativity, using Advertisements, Case Studies etc.

3. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking

4. Cross-Cultural Communication: Role-Play/ Non-Verbal Communication.

5. Meetings- making meeting effective, chairing a meeting, decision making, seeking opinions , interrupting and handling interruptions, clarifications, closure- Agenda, Minute writing.

6. Group Discussion – dynamics of group discussion, Lateral thinking, Brainstorming and Negotiation skills

7. Resume writing – CV – structural differences, structure and presentation, planning, defining the career objective

8. Interview Skills – formal & informal interviews, concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing 9. Writing Skills - Business Communication, Essays for competitive examinations.

10. Technical Report Writing/ Project Proposals – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Feasibility, Progress and Project Reports.

Semester: I B.Tech **Branch: All Streams of Engineering**
Lab:Manufacturing Practices -I Laboratory **Code: BTDSCESC106**
Total Practical Periods: 45 (15 Instructional Periods) **Total Credits: 02**

INSTRUCTIONAL SYLLABUS

Carpentry:
Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards.
Foundry:
Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.
Welding:
Definitions of welding, brazing and soldering processes, and their applications, Oxyacetylene gas welding process, equipment and techniques, type of flames and their applications. Manual met an arc Welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating, Welding positions. Type of weld joint. Common welding defects such ascracks, undercutting slag inclusion, porosity.

LIST OF EXPERIMENTS

1. T-Lap joint and Bridle joint (Carpentry shop)

2. Mould of any pattern (foundry shop)

3. Casting of any simple pattern (foundry shop)

4. (a) Gas welding practice by students on mild steel flat

(b) Lap joint by Gas welding

5. (a) MMA Welding practice by students

(b) Square butt joint by MMA Welding

6. (a) Lap joint by MMA Welding

(b) Demonstration of brazing

Scheme of Teaching and Evaluation
(As per NEP -2020)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
Semester - II

S. No.	Course Sub Category	Course Name	Code	Teaching Scheme				Evaluation Scheme		Total Marks
				Hours			Credits			
				Theory	Tutorial	Practical		CIA	ESE	
1	DSCC	Analytical Mathematics	BTDSCBSC200	3	0	-	3	30	70	100
2	DSCC	Engineering Chemistry	BTDSCBSC201	3	-	-	3	30	70	100
3	DSCC	Basic Electrical & Electronics Engineering	BTDSCESC202	3	0	-	3	30	70	100
4	DSCC	Constitution of India, Professional Ethics and Human Rights.	BTMC203	1	-	-	0	30	70	100
5	DSCC	Fundamental of Mechanical Engineering.	BTDSCESC204	3	0	-	3	30	70	100
6	DSCC	Engineering Chemistry Laboratory	BTDSCESC205	-	-	2	1	20	30	50
7	DSCC	Basic Electrical & Electronics Engineering Laboratory	BTDSCESC206	-	-	2	1	20	30	50
8	DSCC	Fundamental of Mechanical Engineering Laboratory	BTDSCESC207	-	-	2	1	20	30	50
9	DSCC	Manufacturing Practices - II Laboratory	BTDSCESC208	-	-	2	1	20	30	50
10	SEC	Problem Solving with Python Programming	BTSEC209	3	-	0	3	30	70	100
11	AEC	Advanced Programming Laboratory	BTAEC210	-	-	2	1	20	30	50
12	GEC	Multidisciplinary Elective Course - II	GEA	3	0	-	3	30	70	100
			Total	15	0	13	23	310	640	950

Discipline Specific Core Courses (DSCC) Major			AEC (Ability Enhancement Course) (D)	SEC/Internship (Skill Enhancement Course) (E)	Generic Elective Course (GEC) (F)
Basic Sciences (A)	**Engineering Sciences (B)**	**Humanities Science (C)**			
Analytical Mathematics	Basic Electrical & Electronics Engineering	Constitution of India, Professional Ethics and Human Rights.	Advanced Programming Laboratory	Problem Solving with Python Programming	Multidisciplinary Elective Course - II
Engineering Chemistry	Fundamental of Mechanical Engineering.				
	Engineering Chemistry Laboratory				
	Basic Electrical & Electronics Engineering Laboratory				
	Fundamental of Mechanical EngineeringLaboratory				
	Manufacturing Practices - II Laboratory				

Note: 'French Language' is introduced in the even semester as an Add-on Certification Course (Non-credited).

Credit Definition:

- 1-hour lecture (L) per week per semester = 1Credit
- 1-hour tutorial (T) per week per semester = 1Credit
- 2-hour Practical/Drawing(P) per week per semester = 1 Credit
- Four credit courses are to be designed for 60 hours of Teaching-Learning process.
- Three credit courses are to be designed for 48 hours of Teaching-Learning process.
- Two credit courses are to be designed for 28 hours of Teaching-Learning process.
- One credit courses are to be designed for 15 hours of Teaching-Learning process

Semester: 2nd B.Tech **Branch: All Streams of Engineering**

Subject: Analytical Mathematics **Subject Code: BTDSCBSC200**

Total Theory Periods: 48 **Total Credits: 03**

OBJECTIVES:

- To make the scholars perceive the series analysis could be a powerful methodology wherever the formulas square measure integrals and to possess information of increasing periodic functions that explore sort of applications of Fourier series.
- To possess intensive information of PDE those arise in mathematical descriptions of things in engineering. To review a few amount which will take any of a given vary of values that will not be foreseen because it is however can be delineated in terms of their likelihood.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To produce a sound background of advanced analysis to perform an intensive investigation of major theorems of complex analysis and to use these ideas to a large vary of issues that features the analysis of each complex line integrals and real integrals.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I

FOURIER SERIES

Fourier series, Even odd function, Half range sine and cosine series, Parseval's theorem, practical harmonic analysis & Fourier Transform

UNIT II

PARTIAL DIFFERENTIAL EQUATION

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables & application of PDE

UNIT III

COMPLEX ANALYSIS

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue

UNIT IV

LAPLACE TRANSFORMATION

Definition, Transform of elementary functions, Properties of Laplace transform, of derivatives & integrals, Multiplication by tn, Division by t, Evaluation of integrals, Inverse Laplace function,

Convolution theorem, Unit step functions, Unit impulse function, periodic function. Application to solution of ordinary differential equations

UNIT V

VECTOR CALCULUS

Directional derivative, Gradient, Divergence and curl, Line, Surface and Volume integrals, Green's, Gauss's &Stoke's theorem (without proof) and applications

OUTCOMES:

The subject helps the students to develop the fundamentals and basic concepts in vector calculus, PDE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (40th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

REFERENCE BOOKS:

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune

Semester : II B. Tech **Branch: All Streams of Engineering**
Subject: Engineering Chemistry **Code: BTDSCBSC201**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

UNIT-I:

(a) ELECTROCHEMISTRY AND BATTERY TECHNOLOGY ELECTROCHEMISTRY: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

(b) BATTERY TECHNOLOGY:

Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency; cycle 10 hours life and shelf life. Construction, working and applications of Zinc Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

(c) **FUEL CELLS:**

Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte.

UNIT-II:

(a) CORROSION AND METAL FINISHING CORROSION:

Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of

medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

(b) **METAL FINISHING:**

Introduction, Technological importance. Electroplating: Introduction, principles governing- Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levelers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

UNIT-III:

(a) FUELS AND SOLAR ENERGY FUELS:

Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti-knocking agents, power alcohol & biodiesel.

(b) SOLAR ENERGY:

Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (N&P types).

UNIT-IV:

POLYMERS:

Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber. Adhesives: Introduction, synthesis, properties and applications of epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of Kevlar. Conducting polymers: Introduction, mechanism of conduction in Poly aniline and applications of conducting poly aniline.

UNIT-V:

WATER TECHNOLOGY AND NANOMATERIALS

(a)WATER TECHNOLOGY:

Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved O2, CO2 and MgCl2). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of seawater by reverse osmosis & electro dialysis (ion selective).

(b)NANO MATERIALS:

Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials- carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, &nano composites.

TEXTBOOKS:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah&PushpaIyengar., "Chemistry for Engineering Students", Subhash Publications, Bangalore.

2. R.V.Gadag&A.Nityananda Shetty., "Engineering Chemistry", I K International Publishing House Private Ltd. New Delhi.

3. P.C.Jain& Monica Jain., "Engineering Chemistry", Dhanpat Rai Publications, New Delhi.

REFERENCE BOOKS:

1. O.G.Palanna,"Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.

2. G.A.Ozin& A.C. Arsenault, "Nano chemistry A Chemical Approach to Nanomaterials", RSC publishing, 2005.

3. "Wiley Engineering Chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition.

4. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., "Polymer Science", Wiley-Eastern Ltd.

5. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi.

Semester: II B.Tech **Branch: All Streams of Engineering**
Subject: Basic Electrical & Electronics Engineering **Code: BTDSCESC202**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

Unit – I

D.C. Networks:

Elementary idea about power generation, transmission and distribution. Node voltage and mesh current method. Superposition, Thevenin's and Norton's theorems. Star- delta and Delta- star conversions.

Unit – II

Single Phase A.C. Circuits:

Single phase EMF generation, Effective & Average values of sinusoids and determination of form-factor, Analysis of simple series R-L, R-C and RLC circuits, power and power factor

Unit – III

(a) Three Phase AC circuits:

Introduction, Generation of Three-phase EMF, Phase sequence, Connection of Three-phase Windings - Delta and Star connection: Line and Phase quantities, phasor diagrams, Power equations in balanced conditions.

(b) Magnetic Circuits:

Introduction, Magneto motive force (MMF), Magnetic field strength, Reluctance, B-H curve, Comparison of the Electric and Magnetic Circuits, Series-Parallel Magnetic Circuit, Leakage flux and fringing, Magnetic Hysteresis, Eddy currents.

Unit – IV

(a) Single phase Transformers:

Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram on no load, Losses, Efficiency calculations.

(b) Direct current machines:

Basic concepts and elementary idea of AC and DC machines, construction and working principal of DC Generator, emf and torque equation dc machine and types of dc motor.

Unit – V

(a) Semiconductor Devices and Applications

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal Amplifier

(b) Digital Electronics

Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to sequential Circuits,

Flip-Flops - Registers and Counters – A/D and D/A Conversion.

TEXT BOOKS:

1. V.N. Mittle and Arvind Mittal, "Basic Electrical Engineering", Second Edition, Tata McGraw Hill.
2. 2 Del Torro, Vincent "Electrical Engineering Fundamentals", Second Edition Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Fitzrald and Higgonbothom, "Basic Electrical Engineering", Fifth Edition, McGraw Hill.
2. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI.
3. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill.
4. Ashfaq Hussain, "Fundamentals of Electrical Engineering", Third Edition, Dhanpat Rai and Co.
5. H. Cotton, "Advance Electrical Technology," ISSAC Pitman, London. 6. Parker Smith S. (Ed.Parker Smith N.N.), "Problems in Electrical Engineering", Tenth edition, Asia publication.

Semester: II B.Tech. **Branch: All Streams of Engineering**
Subject : Problem Solving with Python Programming **Code: BTSEC209**
Total Theory Periods: 45 **Total Tutorial Periods: 00**
Total Credits: 03

COURSE OBJECTIVE:

1. To learn the object-oriented programming concepts using C++.
2. To design and implement C++ programs with the concept of OOP.
3. To understand implementation issues related to object-oriented techniques.
4. To learn how to build good quality software using object-oriented programming technique.

UNIT-I

INTRODUCTION TO OOP AND C++

Concept of Object Oriented Programming, Procedural programming Vs. Object oriented programming (OOP), Features and Benefits of OOPs, Object Oriented Languages, Introduction to C++, C++ Compiler, C++ Standard library, Basics of a typical C++ environment and C++ program, Pre-processors directives, and illustrative simple C++ programs. Header files and namespaces, library files, Data Types, Keywords, Operators and Expressions, Control Structure, Loops, Arrays, Structures, Functions.

UNIT-II

CLASSES & OBJECT, CONSTRUCTORS&DESTRUCTORS

Introduction to class, class object creation, Access of class members, Scope of class and its member, Nested class, Data hiding & encapsulation, Friend function, Array within a class, Array of object as function argument, Function returning object, Static member. Constructor function, Parameterized multiple constructor, Default constructor, Dynamic memory allocation with new and delete, Copy constructor, Constant and class, Data conversion between objects of different classes, Destructor function.

UNIT- III

INHERITANCE, POINTER, VIRTUAL FUNCTIONS & POLYMORPHISM

Fundamentals of operator overloading, restrictions on operators overloading, operator functions as class members vs. as Friend functions, Overloading, <<, >> Overloading unary operators, overloading binary operators. Introduction to inheritance, Base classes and derived classes, protected members, Casting base class pointers to derived class pointers, Using member functions, Overriding base class members in a derived class, public, protected and private inheritance, Using constructors and destructors in derived classes, Implicit derived class object to base class object conversion, Composition Vs. Inheritance. Introduction to virtual functions, Abstract base classes and concrete classes, new classes and dynamic binding, virtual destructors, polymorphism, dynamic binding.

UNIT-IV

FILE I/O, TEMPLATES& EXCEPTION HANDLING

Files and streams, Creating a sequential access file, Reading data from a sequential access file, Updating sequential access files, Random access files, creating a random access file, Writing data randomly to a random access file, reading data sequentially from a random access file. Stream Input/output classes and objects, Stream output, Stream input, Unformatted I/O (with read and write),

Stream manipulators. Function templates, Overloading template functions, Class template, Class templates and non-type parameters, Templates and inheritance, Templates and friends, Templates and static members. Basics of C++ Exception handling: Try Throw, Catch, Throwing an exception, catching an exception, rethrowing an exception, Exception specifications, processing unexpected exceptions.

UNIT-V

OOPS CONCEPTS WITH PYTHON

Python Basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types. Creating classes and objects, inheritance in python.

COURSE OUTCOME:

After completion of the course study, students will be able to

1. Explain the basics of Object Oriented Programming concepts.
2. Design and develop a C++ program with concept of Object Oriented Programming.
3. Apply the object initialization and destroy concept using constructors and destructors.
4. Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
5. Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
6. Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
7. Use I/O operations and file streams in programs.
8. Make an application/project using C++.

TEXT BOOKS:

1. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Python 3 Object-Oriented Programming - Third Edition

REFERENCE BOOKS:

1. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
2. Let Us C++, YashavantKanetkar, BPB Publication.
3. Programming with C++, John R. Hubbard, Schaum's Outlines, McGraw Hill Education.
4. Programming with C++, D. Ravichandran, McGraw Hill Education.
5. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

Semester:II B.Tech **Branch: All Streams of Engineering**
Subject: Constitution of India, Professional Ethics and Human Rights **Code: BTMC203**
Total Theory Periods: 15 **Total Tutorial Periods: 00**
Total Credits: 00

UNIT-I: CONSTITUTION OF INDIA

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

UNIT-II: FUNDAMENTAL DUTIES AND UNION EXECUTIVES

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India

UNIT-III: STATE LEGISLATURE AND ELECTORAL PROCESS

State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.

UNIT-IV: HUMAN RIGHTS

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India ,Powers and functions of Municipalities, Panchyats and Co - Operative Societies..

UNIT-V: PROFESIONAL ETHICS

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

TEXTBOOKS:

1. Durga Das Basu: “Introduction to the Constitution on India”, (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001

2. Charles E. Haries, Michael S Pritchard and Michael J. Robins “Engineering Ethics” Thompson Asia, 2003-08-05.

REFERENCE BOOKS:

1. M.V.Pylee, “An Introduction to Constitution of India”, Vikas Publishing, 2002.

2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, “Engineering Ethics”, Prentice –Hall of India Pvt. Ltd. New Delhi, 2004

3. Brij Kishore Sharma,“Introduction to the Constitution of India”, PHI Learning Pvt. Ltd., New Delhi, 2011.

Semester : II B.Tech
Subject: Fundamental of Mechanical Engineering **Code: BTDSCESC204**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT – I :

RESULTANT AND EQUILIBRIUM ANALYSIS:

Basic concepts and laws of mechanics, system of forces, free body diagram, Resultant and equilibrium of concurrent, parallel and non-concurrent co-planar force system.
General numerical applications.

UNIT – II :

(a) ANALYSIS OF PLANE TRUSSES Perfect truss, basic assumptions for perfect truss, analysis of axial forces in the members by method of joint and method of sections. General numerical applications.

(b) FRICTION Static, dynamic and limiting friction, Law of limiting friction, Angle of friction, Angle of Repose, Cone of Friction, Wedge friction. General numerical applications

UNIT –III :

PROPERTIES OF SURFACES Centre of Gravity, Second moment of area, determination of second moment of area by integration, polar moment of inertia, radius of gyration of area, Parallel axis theorem, Moment of inertia of composite areas, and determination of Product of inertia by integration.

UNIT –IV :

KINETICS OF PARTICLES

(a) D'Alembert's principle applied to bodies having rectilinear motion.

(b) Principle of work and Energy: General numerical applications

(c) Principle of Impulse and momentum: General numerical applications

UNIT – V :

LAWS OF THERMODYNAMICS

(a) Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application.

(b) First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

OUTCOMES:

(a) Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
(b) Ability to analyses the forces in any structures.
(c) Ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Engineering Mechanics (Statics and Dynamics) ; A. K. Tayal ,Umesh Pub., Delhi .

2. Engineering Mechanics : S. Timoshenko and D.H. Young,TMH

3. Engineering Thermodynamics: P.K.Nag, TMH

4. Engineering Thermodynamics: C.P.Arora, TMH

REFERENCE BOOKS:

1. Engineering Mechanics (Statics and Dynamics): R.C.Hibbeler, Pearson

2. Engineering Mechanics:Meriam and Kreige ,John Wiley and sons

3. Thermodynamics: Cengel and Boles, TMH

4. Essentials of Engg Mechanics: S.Rajasekharan&G.ShankaraSubramaniyam, Vikas Publications

5. Engineering Mechanics: BasudebBhatytacharya , Oxford

Semester: II B.Tech **Branch : All Streams of Engineering**
Subject : Engineering Chemistry Lab **Code: BTDSCESC205**
Total Theory Periods: 30 **Total Tutorial Periods: 00**
Total Credits: 01

COURSE OBJECTIVE:
1. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
1. Acid-base titration (estimation of commercial caustic soda)

2. Redox titration (estimation of iron using permanganometry)

3. Complexometric titration (estimation of hardness of water using EDTA titration).

4. Preparation and analysis of metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).

5. Chemical kinetics (determination of relative rates of reaction of iodide with H_2O_2 at room temperature (Clock reaction).

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).

7. Detection of functional groups in organic compounds.

8. Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds

9. Conduct metric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

10. Determine the amount of oxalic Acid and sulphuric Acid/Hydrochloric Acid in one liter of solution given standard Sodium Hydroxide and Potassium Permangate.

11. To determine the Carbonate, Bicarbonate and Chloride contents in irrigation water.

12. Determination of dissolved Oxygen in given sample of water.

13. Determination of calorific value of fuel by Bomb Calorimeter.

14. Determination of Flash Point and Fine Point of Lubricant by Abels and Pensky Martin apparatus.

COURSE OUTCOME:
1. The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

Semester: II B.Tech **Branch: All Streams of Engineering**
Subject: Basic Electrical & Electronics Engineering Lab **Code: BTDSCESC206**
Total Theory Periods: 30 **Total Tutorial Periods: 00**
Total Credits: 01

List of Experiments (To perform minimum 10 experiments)

1. To verify Thevenin's theorem and Norton's theorem.
2. To verify Superposition theorem.
3. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
4. To verify Maximum Power Transfer theorem
5. To determine V– I characteristics of Incandescent lamp.
6. To study B-H curve.
7. To measure current, power, voltage and power factor of series RLC circuit.
8. To measure current, power, voltage of parallel RLC circuit.
9. To measure current, power, voltage of series parallel RLC circuit.
10. To measure R and L of choke coil.
11. To study construction of transformer.
12. To perform ratio test and polarity test of single phase transformer.
13. To calculate efficiency of single phase transformer by direct loading.
14. To study construction of D.C. machine.
15. To study charging and discharging of a capacitor.
16. To study the Wattmeter and Energy meter.

Semester : II B.Tech **Branch: All Streams of Engineering**
Subject : Advance Programming Laboratory **Code: BT 208**
Total Theory Periods: 30 **Total Tutorial Periods: 00**
Total Credits: 01

1 Write a program to check whether a given number is Prime or not.

2 Write a program to read number and to display the largest value between two, three or four numbers by using switch-Case statements.

3 Write a program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using
a. for loop b. while loop c. do-while loop

4 Write a program to find sum of the following series using function:
Sum= $x-(x)^3/3!+(x)^5/5!$ ..... $(x)^n/n!$

5 Write a program to read the elements of two matrices & to perform the matrix multiplication.

6 Write a program to swap the contents of two variable by using
a. call by value b. Call by reference

7 Write a program to perform the following arithmetic operations on complex numbers using structure
a. Addition of the two complex numbers b. Subtraction of two complex numbers
c. Multiplication of two complex numbers d. Division of two complex numbers

8 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

9 Write an object-oriented program (OOP) using C++ to exchange the private data members of two different functions using friend functions.

10 Write an OOP using C++ to count how many times a particular member function of a class is called by:
a. A particular object b. Any objects

11 Write an OOP using C++ to define a constructor for a “Date” class that initializes the Date objects with initial values. In case initial values are not provided, it should initialize the objects with default values.

12 Write an OOP using C++ to overload:
a. + Operator b. = operator c. >> operator d. ++ operator

13 Write a C++ program to demonstrate how ambiguity is avoided using scope resolution operator in the following:
a. Single Inheritance b. Multiple Inheritance

14 Write a C++ Program to demonstrate function overloading for swapping of two variables of the various data types (integer, floating-point number and character type).

15 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

16 Write a C++ program to access the private data of a class by non-member function through friend function where the friend function is declared:

a. in the location of public category
b. in the location of private category
c. within the scope of a class definition itself
d. defined with inline code subtraction

17 Write a C++ program to demonstrate how a pure virtual function is defined, declared and invoked from the object of derived class through the pointer of the base class.

18 Write a C++ program to open a file and count the number of characters, number of vowels and number of newline characters present in the file.

19 Write a program to copy the contents of one text file to another and display both the files using a text Menu.

20 Create a database of 10 students. The database should contain the name, marks of 5 subjects, aggregate marks, aggregate percentage and division according to the following conditions:

a. Percentage greater or equal to 60 – First division
b. Percentage between 50 and less than 60 – Second division
c. Percentage between 40 and less than 50 – Third division
d. Percentage below 40 – Improvement required

Display the above database of every student in a tabulated form. Implement the above program using Structures, Text-Menu and File I/O operations.

21 Write an OOP using a class template to read any five parameterized data type such as float and integer, and print the average.

22 Write a program for sorting of numbers with Bubble Sort using template function.

23 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

24 Write a C++ program to read two numbers and find the division of these two numbers using exception handling.

25 Write a C++ program to create a function which take a parameter, if the value of parameter is > 0 then throw integer type, if parameter is = 0, then throw character type, if parameter is < 0 then throws float type exception but for all design use only one catch block.

26 Write a python program for finding biggest number among 3 numbers.

27 Implement Python Script to generate prime numbers series up to n

28 Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.

29 Write a python program to work with classes and objects.

30 Write a python program that makes use of function to display all such numbers, which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

LIST OF EQUIPMENT/ MACHINE REQUIRED

PCs, Turbo C++ compiler, Online C++ Compiler, Python 3/Python IDE, Online python compiler

REFERENCES:

1. Programming with C++, D. Ravichandran, McGraw Hill Education.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Mastering C++, K. R. Venugopal, Mcgraw Hill Education.
4. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
5. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
6. Let Us C++, YashavantKanetkar, BPB Publication.
7. Head-First Python: A Brain-Friendly Guide (2nd Edition), Paul Barry, Oreilly.
8. Python Programming: An Introduction to Computer Science (3rd Edition), John Zelle,

Semester : II B. Tech
Lab: Fundamental of Mechanical Engineering Lab **Code: BTDSCESC207**
Total Practical Periods: 30 **Total Credits: 01**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

LIST OF EXPERIMENTS

1. To verify law of triangle of forces.
2. To verify the Lami's theorem.
3. To verify the law of polygon of forces.
4. To verify the law of lever. 5. To determine the support reactions of a simply supported beam subjected to point loads.
6. To draw the variation of bending moment at a given section in a simply supported beam under a moving point load.
7. To find the coefficient of friction between surfaces of wooden plane and following blocks: i) Aluminum ii) Tin iii) Glass iv) Asbestos v) Teak ply vi) Sand paper vii) card board .
8. To determine the coefficient of friction between (i) Belt and pulley (ii) Rope and pulley.
9. To study simple jib crane and to determine the internal forces in members of jib crane.
10. To determine the stiffness of helical compression spring.
11. To study lifting machine.
12. To study the lifting machine "second order pulley system" and to draw the following characteristic diagram: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
13 To study the lifting machine "Wheel and Differential axle" and to draw the following characteristic diagram: (i). Load-effort diagram (ii) Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.
14. To study the lifting machine "Worm and worm wheel" and to draw the following characteristic diagram: (i). Load-effort diagram (ii). Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.
15. To study the lifting machine "Simple screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii). Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.
16. To study the lifting machine "Modified screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

17. To study the lifting machine “Geared Jib crane” and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

18. To study the lifting machine “Single Purchase Winch crab” and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram

(iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

19. To study the lifting machine “Double Purchase Winch crab” and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

Semester: II B . Tech **Branch: All Streams of Engineering**

Manufacturing Practices– II Lab **Code: BTDSCESC208**

Total Practical Periods: 45(15 Instructional Periods) **Total Credits: 01**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

Course Objective:

1. To make the student acquire practical skills in the machining, fitting and forging operations.

Instructional Syllabus

Machining:

Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning parting, chamfering and facing. Quick return mechanism of shaper. Difference between drilling and boring. Files-material and classification.

Fitting:

Need of fitting, different types of instruments used in fitting shop.

Forging:

Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.

List of Experiments

1. Job on lathe with one step turning and chamfering operations
2. Job on shaper for finishing two sides of a job
3. (a) Drilling two holes of size 5 and 12 mm diameter on job used/to be used for shaping.

(b) Grinding a corner of above job on bench grinder

4. Finishing of two sides of a square piece of filling
5. Tin smithy for making mechanical joint and soldering of joints
6. Perform step cutting on mild steel plate.

Course Outcome:

1. The students will be conversant with hands-on knowledge in the machining, fitting and forging operations.

Scheme of Teaching and Evaluation (As per NEP -2020)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
B. TECH. III Semester

S. No.	Course Sub Category	Course Name	Code	Teaching Scheme				Evaluation Scheme		Total Marks
				Hours			Credits			
				Theory	Tutorial	Practical		CIA	ESE	
1	DSCC - BSC	Numerical Methods and Statistics	BTDSCBSC300	3	0	-	3	30	70	100
2	DSCC - PCC	Engineering Thermodynamics	BTDSCME311	3	1	-	4	30	70	100
3	DSCC - PCC	Mechanics of Solids I	BTDSCME312	3	1	-	4	30	70	100
4	DSCC - PCC	Kinematics of Machine	BTDSCME313	3	1	-	4	30	70	100
5	DSCC - PCC	Kinematics of MachineLaboratory	BTDSCME314	-	-	2	1	20	30	50
6	AEC	Thermodynamics Laboratory	BTAEC315	-	-	2	1	20	30	50
7	SEC	Machine Drawing Laboratory	BTSEC316	-	-	4	2	20	30	50
8	RP	Project / Seminar	BTSEM317	-	-	2	1	20	30	50
9	GEC	Multidisciplinary Elective Course – III (Renewable Energy Sources)	GEA14	3	-	0	3	30	70	100
			Total	15	03	10	23	230	470	700

L – Lecture, T – Tutorial, ESE – End Semester Examination, P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Note : Theory Internal Marks (CIA) = 30 (CT-I = 05, CT-II=05, Assignment=05, Mid Term=15)
Practical Internal Marks (CIA) = 20 (Attendance = 05, Lab Viva-Voce = 05, Lab Record Work = 10)

Discipline Specific Core Courses (DSCC) Major		Generic Elective (C)	AEC (Ability Enhancement Course) (D)	SEC/Internship (Skill Enhancement Course) (E)	RP/SEMINAR	Value Added Course (VAC)/Indian Knowledge System (IKS)/IKS (Core) (F)
Basic Sciences (A)	Engineering Sciences (B)					
Numerical Methods and Statics	Engineering Thermodynamics	Multidisciplinary Elective Course – III (Renewable Energy Sources GEA14)	Thermodynamics Laboratory	Machine Drawing Laboratory	Project / Seminar	-
	Mechanics of Solids I					
	Kinematics Of Machine					
	Machine Drawing Laboratory					
	Kinematics Of MachineLaboratory					

Credit Definition:

- 1-hour lecture (L) per week per semester = 1Credit
- 1-hour tutorial (T) per week per semester = 1Credit
- 2-hour Practical/Drawing(P) per week per semester = 1 Credit
- One credit courses are to be designed for 15 hours of Teaching Learning process.
- Four credit courses are to be designed for 60 hours of Teaching-Learning process.
- Three credit courses are to be designed for 48 hours of Teaching-Learning process.
- Two credit courses are to be designed for 28 hours of Teaching-Learning process.

Semester	:	III B.Tech
Branch	:	Civil/Mech./Aero./Min./CSE
Subject	:	Numerical Methods and Statistics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTDSCBSC300

COURSE OBJECTIVE:

- To provide required skills to apply different statistical tools to analyze Engineering problems
- To provide the necessary basic concepts of a few numerical methods
- To provide procedures for solving numerically different kinds of problems occurring in the field of Engineering and Technology.

UNIT-I Statistics

Random variables, Discrete and continuous probability distributions, Expectation, Mean and Standard Deviation, Moments and moment generating function, Distributions binomial, Poissoin and normal distributions.

UNIT-II Numerical Solution of Algebraic, Transcendental & Simultaneous Linear Equation

Bisection method, Regula–Falsi Method, Secant Method, Newton Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan & Crout's Triangularisation method, Iterative methods: Jacobi, Gauss-Seidel & relaxation methods.

UNIT-III Interpolation

Interpolation with equal intervals, Finite differences, Forward, Backward & Central difference interpolation, Interpolation with unequal intervals, Lagrange's method and Newton's divided difference method.

UNIT-IV Numerical Differentiation & Integration

Derivatives using forward, Backward and central difference methods, Derivatives using unequally spaced values, Numerical integration using Newton-Cote's quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.

UNIT-V Numerical Solution of ODE

Numerical solution of ODE's by Taylor's series method, Picard's method, Euler's method, Euler's modified method, Runge–Kutta methods, Predictor corrector methods, Milne's method, Adams, Bash forth method.

COURSE OUTCOME:

On completion of course students will be able to:

- Solve statistics problems that arise during the study of Engineering
- Use various interpolation techniques for solving problems in Engineering.
- Use numerical methods to solve problems involving numerical differentiation and integration.
- Solve initial value problems numerically that arise in Science and Engineering.
- Solve boundary value problems that encounter in different fields of engineering study.

TEXT BOOK

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. B. V. Ramana, "Higher Engineering Mathematics" Tata McGraw Hill 2007.
3. N. P. Bali, and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

Semester	:	III B. Tech
Branch	:	Mechanical Engineering
Subject	:	Engineering Thermodynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCME311

COURSE OBJECTIVES:

- To provide a mature approach to the basic principle of classical thermodynamics and to apply it to system surroundings interactions; involving work and heat transfer with associated property changes.
- To Use classical thermodynamics principles to develop algebraic relationships among key physical parameters and variable based on analysis of a specified system
- Use references that provide tabulated physical data that are useful to mechanical engineers.
- Familiarity with construction and performance parameters of Boilers

UNIT – I First Lawof Thermodynamics:

Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application. First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

UNIT - II Second law of thermodynamics:

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, PMM of Second kind, reversibility and irreversibility, causes of irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale. Entropy: Clasius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes.

UNIT - III Properties of Pure substances:

Thermodynamic properties of pure substances in solid,liquid and vapour phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s, h-s diagrams, P-V-T surfaces,– Properties and processes in ideal vapour, use of steam tables and Mollier‟s diagram in determination of steam properties, energy interaction and entropy calculations.

UNIT - IV Availability and Irreversibility:

Available energy, availability of a closed system, availability function of a closed system availability of steady flow system, availability function of open system, Helmholtz function , Gibbs functions, Irreversibility for closed and open system, Second law efficiency.

UNIT V Thermodynamic Relationships:

Maxwell‟s equations, T-ds equations, difference in heat capacities, coefficient of Volume expansion and isothermal compressibility, adiabatic compressibility, ratio of specific heat, energy equations, Joule- Kelvin effect, Clausius-Clapeyron equation.

COURSE OUTCOMES:

- Apply knowledge of classical thermodynamics for formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems.

- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS:

1. Thermodynamics- An Engineering Approach – Cengal& Boles – McGraw Hill
2. Engineering Thermodynamics – P.K. Nag – TMH Publishers

REFERENCE BOOKS:

1. Fundamental of engineering thermodynamics- R.Yadav ,CPH, Allahabad
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria& Sons
3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag,Wiley,Delhi
4. An Introduction to Thermodynamics-Y.V.C.Rao University Prass, Hyderabad
5. Thermodynamics – C.P. Arora – TMH Publication

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Mechanics of Solids
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCME312

COURSE OBJECTIVES:

- To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- To study engineering properties of materials, force-deformation and stress-strain relationship
- To learn fundamental principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures
- To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces, bending moments, slopes and deflection.
- To determine stress, strain, and deformation of bars, beams and springs.
- To be able to perform structural analysis by hand computations and design axial and torsional members.

UNIT – I Introduction

Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke‟s law, stresses in the components subjected to multi-axial forces, temperature stresses, statically indeterminate systems.

UNIT – II Bending of Beams

Bending of Beams with symmetric section, boundary conditions, pure bending, bending equations, Transverse shear stress distribution in circular / hollow circular / I & T section.

UNIT – III Deflection of Beams

Relation between slope deflection & radius of curvature, solution of beam deflection, problems by Macaulay‟s Method, Direct integration method, Moment Area method, Method of Super position.

UNIT – IV Torsion

Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft.

Springs: Closed & Open Coil Helical Springs subjected to Axial Load, Springs in parallel & series.

UNIT – V Principal Stress & Strain

Transformation of plane stress, principal stresses, maximum shear stress, Mohr‟s Circle for Plane Stress, Plane Strain and its Mohr‟s circle representation, Principal Strains, Maximum Shear Strain. Combined Loading Components subjected to bending, torsion & axial load, Theories of failure.

COURSE OUTCOMES:

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS

1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
2. Elements of Strength of Material – Timo Shenko& Young – EWP Press
3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS

1. Strength of Material – Rider – ELBS
2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
3. Mechanics of Material – J.M. Gera & Time Shenko – CBS Publishers
4. Introduction to Solid Mechanics – I. H. Shames – PHI
5. Engineering Mechanics of Solids – E.P. Popov – PHI
6. Strength of Material – Shaums Outline Series – McGraw Hill

Semester	:	III B. Tech.
Branch	:	Mechanical Engineering
Subject	:	Kinematics of Machines
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCME313

COURSE OBJECTIVES:

- The knowledge of this subject is very essential for an engineer in designing the various parts of a machine
- To understand the dynamics of mechanism
- To develop the understanding of friction force, gear and cam mechanisms.

UNIT- I

Relative velocity: Elements, pairs, Mechanism, four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous center method.

UNIT-II

Relative Acceleration: Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.

UNIT- III

Cams: Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion,Synthesis of cam profile by graphical approach, Considerations of pressure angle. Cams with specified contours: Circular arc cam & tangent cam.

UNIT-IV

Gear: Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference.
Gear trains: Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.

UNIT-V

Friction: Applications of friction, Pivot and collar friction, Thrust bearing.
Belt-Drives: Ratio of tensions for flat belt & V-belt, Centrifugal tension, condition for maximum power transmission.
Brakes and dynamometer: Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake, Absorption dynamometer, Transmission dynamometer.

COURSE OUTCOMES:

- Understand the basic law of equilibrium and application of the on a mechanism
- Knew about the Design and working principles of gear and cam.

Text Books:

1. Theory of Machine – S. S. Ratan-Tata McGraw Hill.
2. The Theory of Machine – Thomas Beven – CBS Publishers.

Reference Books:

1. Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2. Theory of Machine – Shigley, JE
3. Theory of Machine Jagdish Lal
4. Theory of machine – J.E. Singh – McGraw Hill.

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Kinematics of Machine Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTDSCME314

COURSE OBJECTIVES:

- Analysis of mechanisms,
- Drawing displacement diagrams for followers with various types of motions,
- Cam profile drawing for various followers,
- Estimation of transmission of power by belts and application of various gears and gear trains.

LIST OF EXPERIMENTS

1. To determine the jump phenomena of cam follower apparatus.
2. To draw displacement, velocity and acceleration curve of cam motion.
3. To find out the load carrying capacity of bearing.
4. To find out the Coefficient of friction of bearing.
5. To find out the frictional horse power of bearing.
6. To find out the Pressure around the bearing by journal bearing apparatus.
7. To measure co-efficient of friction, power transmitted with varied belt tension by slip & creep apparatus.
8. To find out the percentage slip at fixed belt tension by varying load with slip & creep apparatus.
9. To find out belt slip and creep by slip and creep measurement apparatus.
10. To verify the coriolli‟s component of acceleration with theoretical and practical results.
11. To find the speed and torque of different gear in an epicyclic gear train.
12. To find the speed and torque of different gear in a simple, compound and reverted gear train.
13. To Study and analysis of Pantograph.
14. To study Four-bar mechanism and its inversions.
15. To study internal expanding and external contracting shoe brakes. 16. To study rope brake dynamometer and calculation of torque and power.

COURSE OUTCOMES:

- Designing a suitable mechanism depending on application
- Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,
- Drawing velocity and acceleration diagrams for different mechanisms,

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Thermodynamics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTAEC315

COURSE OBJECTIVES:

- To provide a mature approach to the basic principle of classical thermodynamics and to apply it to system surroundings interactions; involving work and heat transfer with associated property changes.
- To Use classical thermodynamics principles to develop algebraic relationships among key physical parameters and variable based on analysis of a specified system
- Use references that provide tabulated physical data that are useful to mechanical engineers.
- Familiarity with construction and performance parameters of Boilers

LIST OF EXPERIMENTS

1. To study Mountings & Accessories of a Boiler.
2. To study the Cochran Boiler and its Accessories and Mountings.
3. To study the Lancashire and it‟s Accessories and Mountings.
4. To study the Babcock Wilcox and it‟s Accessories and Mountings.
5. To study a Simple Steam Engine.
6. To study a Simple Steam Engine With D-Slide Valve.
7. To study a Compound Steam Engine.
8. To study Meyer‟s Expansion Valve of Steam Engine.
9. To study Drop Valve of Steam Engine.
10. To study Two Stroke Petrol Engine.
11. To study Four Stroke Petrol Engine.
12. Determination of vacuum efficiency and condenser efficiency of a surface steam condenser.
13. Performance and testing of steam jet condenser.
14. Study of Steam Turbines
15. Study of Reciprocating Compressor

COURSE OUTCOMES:

- Apply knowledge of classical thermodynamics for formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems.
- To continue the study of the applied thermodynamics.

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Machin DrawingLaboratory
Total Practical Periods	:	28
Total Credits	:	02
Code	:	BTSEC316

COURSE OBJECTIVES:

- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.
- Apply auxiliary or sectional views to most practically represent engineered parts.
- Assemble important parts used in major mechanical engineering applications.

LIST OF EXPERIMENTS

1. General introduction of GUI
2. Setting up the drawing environment: Drawing aids, setting drawing units, setting grid, setting limits, function keys, object snap.
3. Using co-ordinate system-Cartesian coordinate, polar coordinate (Absolute and relative co- ordinate, direct distance entry methods).
4. Drawing Object-Use of various draw tools with illustrative exercise.
5. Modifying Objects- Use of various modify tools with illustrative exercise.
6. Creating texts and tables
7. Basic dimensioning, Geometric dimensioning and tolerancing
8. Adding constraints to sketches
9. Advance options for making complicated drawings –Layers, Blocks, View port.
10. Exercise problems on conversion of pictorial view to orthographic view
11. Exercise problems on conversion of pictorial view to orthographic sectional view
12. Assembly drawing of machine components.

COURSE OUTCOMES:

- Perform free hand sketching of basic geometrical constructions and multiple views of objects. Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces. Perspective sections of simple solids.
- Demonstrate computer aided drafting.

Semester	:	III B.Tech
Branch	:	Mechanical Engineering
Subject	:	Project/Seminar
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTSEM317

COURSE OBJECTIVE:

- To introduce students to independent technical exploration through seminar or project work in emerging Mechanical Engineering domains.
- To develop skills in literature survey, problem identification, data collection, and scientific interpretation of findings.
- To enhance technical communication abilities, enabling students to prepare well-structured reports and deliver effective presentations.
- To cultivate professionalism, teamwork, time management, and ethical practices in conducting and presenting technical work.

DESCRIPTION

This course provides students with an opportunity to explore emerging areas in Mechanical Engineering through guided project work or technical seminar presentations. Students identify a relevant topic, conduct a literature survey, analyze existing technologies, and present their findings through a structured report and seminar. The course strengthens technical understanding, research aptitude, documentation skills, and communication abilities essential for professional engineering practice. Students work individually or in small groups under faculty supervision to demonstrate clarity of thought, analytical skills, and effective presentation capabilities.

COURSE OUTCOME:

- Identify, select, and justify a relevant Mechanical Engineering topic for seminar or project work.
- Conduct a systematic literature review and analyze existing research or technologies in the chosen area.
- Apply engineering reasoning to interpret data, propose methodologies, or outline feasible technical solutions.
- Prepare a well-organized technical report following professional documentation standards.
- Deliver an effective oral presentation demonstrating clarity, confidence, and understanding of the subject matter.

Scheme of Teaching and Evaluation (As per NEP -2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

B. TECH. IV Semester

S. No.	Course Sub Category	Course Name	Code	Teaching Scheme				Evaluation Scheme		Total Marks
				Hours			Credits			
				Theory	Tutorial	Practical		CIA	ESE	
1	DSCC - PCC	Fluid Mechanics & Machinery	BTDSCME410	3	1	-	4	30	70	100
2	DSCC - PCC	Mechanics of Solids- II	BTDSCME411	3	0	-	3	30	70	100
3	DSCC - PCC	Dynamics of Machines	BTDSCME412	3	0	-	3	30	70	100
4	DSCC - PCC	Fluid Mechanics & Machinery Laboratory	BTDSCME413	-	-	2	1	20	30	50
5	AEC	Dynamics of Machines Laboratory	BTAEC414	-	-	2	1	20	30	50
6	SEC	Material Testing Laboratory	BTSEC415	-	-	2	1	20	30	50
7	RP	Project / Seminar	BTSEM416	-	-	1	1	20	30	50
8	INT	Internship – I	BTINT417	-	-	1	3	50	00	50
9	DSEC-PCC	Professional Elective Course - I (from Basket) Power Plant Engg.	BTPDSCME1XX	3	0	-	3	30	70	100
10	GEC	Multidisciplinary Elective Course - IV (from Basket)	GEAXX	3	0	-	3	30	70	100
			Total	15	01	08	23	280	470	750

L – Lecture, T – Tutorial, ESE – End Semester Examination, P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Note : Theory Internal Marks (CIA) = 30 (CT-I = 05, CT-II=05, Assignment=05, Mid Term=15)

Practical Internal Marks (CIA) = 20 (Attendance = 05, Lab Viva-Voce = 05, Lab Record Work = 10)

Discipline Specific Core Courses (DSCC) Major		Discipline Specific Core Courses (DSEC)	Generic Elective (C)	AEC (Ability Enhancement Course) (D)	SEC/Internship (Skill Enhancement Course) (E)	RP/SEMINAR	Internship/Vocational Training
Basic Sciences (A)	Engineering Sciences (B)						
	Fluid Mechanics & Machinery	Professional Elective Course - I (from Basket)	Multidisciplinary Elective Course - IV	Dynamics of Machines Laboratory	Material Testing Laboratory	Project / Seminar	Internship-I
	Mechanics of Solids- II						
	Dynamics of Machines						
	Fluid Mechanics & Machinery Laboratory						

Credit Definition:

- 1-hour lecture (L) per week per semester = 1Credit
- 1-hour tutorial (T) per week per semester = 1Credit
- 2-hour Practical/Drawing(P) per week per semester = 1 Credit
- One credit courses are to be designed for 15 hours of Teaching Learning process.
- Four credit courses are to be designed for 60 hours of Teaching-Learning process.
- Three credit courses are to be designed for 48 hours of Teaching-Learning process.
- Two credit courses are to be designed for 28 hours of Teaching-Learning process.

Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Fluid
Mechanics and		Machinery
Total Theory Periods	:	48
Total Tutorial Periods		
:		
01 Total Credits		
:		04
Code	:	BTDSCME410

COURSE OBJECTIVES:

- Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- The ability to formulate basic equations for Fluid Engineering problems
- The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
- The ability to perform dimensional analysis and identify important parameters

UNIT I Properties of fluid

Fluid,-ideal and real fluid, properties of fluid, mass density, weight density, specific volume, gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Newtonian and non-Newtonian fluids

Fluid Statics

Pressure, Pascal's law, hydrostatic law, pressure measurement, hydrostatic force on submerged plane and curved surface, Buoyancy.

UNIT – II

Fluid Kinematics

Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines- path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function.

Fluid Dynamics

Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle , Pitot tube. Impulse momentum equation, Momentum of Momentum equation. Vortex flow.

UNIT – III

Laminar Flow

Reynolds's experiment, shear stress and pressure gradient relationship, flow of viscous fluids in circular pipe and between two parallel plates.

Boundary Layer Theory

Boundary layer definition and characteristics, momentum equation, Laminar

and turbulent, boundary Layer, Total drag, separation and control.

UNIT – IV

Impulse Turbine

Classification of turbine, impulse turbine, Pelton wheel, Construction working, work done, head efficiency and Cavitations in turbines Design aspects, governing of impulse turbine.

Reaction Turbine

Radial flow reaction turbine, Francis turbine: construction, working, work done, efficiency, design aspect, advantages& disadvantages over pelton wheel.

UNIT-V

Axial flow reaction turbine

Propeller and Kaplan turbine, draft tube, specific speed, unit quantities, cavitations, degree of reaction, performance characteristics, surge tanks, governing of reaction turbine.

Centrifugal Pumps

Classification of Pumps-Centrifugal pump, Construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel, specific speed, characteristic, net positive suction head, cavitations.

COURSE OUTCOMES:

- Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application. As well as with multidisciplinary designs.
- Develop fundamentals to continue the study of the advance subject fluid machinery, Heat and mass transfer etc.

TEXT BOOKS

1. Mechanics of Fluids by Massey BS; Van Nostrand Reinhold Co
2. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som & G. Biswas – TMH
3. A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd.

REFERENCE BOOKS

1. Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Poitman
2. Fluid Mechanics by Streetes VL and Wylie EB; Mcgraw Hill Book Co

Semester	:	IV B.Tech			
Branch	:	Mechanical Engineering			
Subject	:	Mec			
hanics of Solids – II Total					
Theory Periods	:	48			
Total					
Tutorial					
Periods	:	00 Total Credits	:	03	
Code	:	BT DSCME411			

COURSE OBJECTIVES:

- To analyze solid mechanics problems using energy methods
- To analyze fixed beams and continuous beams.
- To solve for stresses and deflections of beams under unsymmetrical loading;
- To analyze column
- To analyze thin and thick pressure vessels

UNIT-I

Energy Methods:

Introduction, principles of superposition, strain energy, reciprocal relations, Maxwell Betti theorem, elastic strain energy relation in tension and compression, strain energy in beams subjected to bending and shaft to torsion. impact loading in tension and bending, first theorem of Castigliano and its applications

UNIT- II

Fixed Beams

Fixed beam subjected to different types of loads and couples, calculations of fixing moments and reactions at supports, deflection, effect of sinking of support.

Continuous beams

Continuous beams subjected to different type of loads and couples, beams with overhang, beams with one end fixed, Clapeyron's theorem, effect of sinking of supports

UNIT-III

Bending of curved bars

Bending of curved bars in plane of loading, Winkler Bech theory, crane hooks, chain links,bending of curved beams built in its initial plane, bending of circular bars subjected to symmetric loading, bending of circular rings, stresses in circular rings

UNIT-IV

Unsymmetrical Bending

Introduction to unsymmetrical bending, stresses due to unsymmetrical bending, deflection of beam due to unsymmetrical bending, shear center for angle, channel, and I-sections

Columns

Short Column (Strut), Eccentric loading on Strut, Stability of columns, Euler's formula for different end conditions, equivalent load, eccentric loading, Rankine's formula.

UNIT – V

Pressure Vessels

Thin Pressure Vessels circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure, Stresses in thick and compound cylinders.

COURSE OUTCOMES:

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

TEXT BOOKS

1. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
2. Elements of Strength of Material – Timo Shenko & Young – EWP Press
3. Strength of Material – R.K. Rajput – Dhanpat Rai & Sons

REFERENCE BOOKS

1. Strength of Material – Rider – ELBS
2. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
3. Mechanics of Material – J.M. Gera & Time Shenko – CBS Publishers
4. Introduction to Solid Mechanics – I. H. Shames – PHI
5. Engineering Mechanics of Solids – E.P. Popov – PHI
6. Strength of Material – Shaums Outline Series – McGraw Hill

Semester	:	IV B.Tech			
Branch	:	Mechanical Engineering			
Subject	:	Dynamics of Machines	Total Theory Periods:		48
Total Tutorial Periods	:	00	Total Credits	:	03
Code	:	BTDSCME 412			

COURSE OBJECTIVES:

- To synthesis, both graphically and analytically, multilink mechanisms.
- To perform mechanism analyses to find the position, velocity, acceleration, and dynamics and equilibrium of multi-bar mechanisms.
- To synthesis mechanism to perform certain prescribed task/motion
- To analyze mechanical systems.

UNIT- I

Static & Dynamic Force Analysis

Static equilibrium of two/three force members, Static equilibrium of member with twoforces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalentoffset inertia force, Dynamic force analysis of four link mechanism and slider crankmechanism, Engine force analysis-Piston and crank effort

Turning Moment & Flywheel

Turning moment on crankshaft, Turning moment diagrams-single cylinder double actingsteam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation ofenergy, Flywheel

UNIT- II

Balancing of Machines

Static and dynamic balancing, Balancing of several masses in the same plane anddifferent planes, Balancing of reciprocating masses, Balancing of primary force inreciprocatingengine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple,hammer blow

UNIT- III

Governors

Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter &Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, Stability,Hunting, Isochronism, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors

UNIT- IV

Gyroscopic Motion

Principles, Gyroscopic torque, Effect of gyroscopic couple on the stability of aero planes & automobiles **Mechanical Vibrations:** Types of vibrations, Degrees of freedom, Single degree free & damped vibrations,Forced vibration of single degree system under harmonic excitation, Critical seeds of shaft.

UNIT-V

Inertia force analysis

Effective force and inertia force of a link, Inertia forces in the reciprocating engine, Inertia forces in four bar chain.

Turning moment diagram for single and multi cylinder internal combustion engine, coefficient fluctuation of speed, coefficient of fluctuation of energy, flywheel.

COURSE OUTCOMES:

- Apply knowledge of Dynamics of machines for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts dynamics of machine in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering
- Identify, analysis, and solve mechanical engineering problems useful to the society.

TEXT BOOKS:

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines - S.S. Rattan

REFERENCES BOOKS AND:

1. Theory of Machines – R.K. Bansal
2. Mechanics of Machines – V. Ramamurti
3. Theory of Machines – Khurmi & Gupta
4. Theory of Machines – P.L. Ballaney
5. Theory of Machines – V. P. Singh

Semester	:	IV B.Tech			
Branch	:	Mechanical Engineering			
Subject	:	Fluid Mechanics and Machinery Lab	Total Theory Periods	:	28
Total Tutorial Periods	:	00	Total Credits	:	01
Code	:	BT 413			

COURSE OBJECTIVES:

- Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- The ability to formulate basic equations for Fluid Engineering problems
- The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
- The ability to perform dimensional analysis and identify important parameters

LIST OF EXPERIMENTS

1. To determine the meta-centric height of a ship model.
2. To verify Bernoulli's Theorem.
3. To verify Impulse Momentum Principle.
4. To calibrate a Venturimeter and study the variation of coefficient of discharge.
5. To calibrate an orifice-meter.
6. Performance characteristics of Pelton wheel turbine.
7. Performance characteristics of Francis turbine.
8. Performance characteristics of Kaplan turbine.
9. Performance characteristics of variable speed centrifugal pump.
10. Performance characteristics of rated speed centrifugal pump.
11. Performance characteristics of multistage centrifugal pump.

COURSE OUTCOMES:

- Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- Acquire knowledge of fluid mechanics for the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

Semester	:	IV B.Tech			
Branch	:	Mechanical Engineering			
Subject	:	Dynamics of Machines Lab	Total Theory Periods	:	28
Total Tutorial Periods	:	00	Total Credits	:	01
Code	:	BTAEC 414			

COURSE OBJECTIVES:

- To synthesis, both graphically and analytically, multilink mechanisms.
- To perform mechanism analyses to find the position, velocity, acceleration, and dynamics and equilibrium of multi-bar mechanisms.
- To synthesis mechanism to perform certain prescribed task/motion
- To analyze mechanical systems.

LIST OF EXPERIMENTS

1. To find out the oscillations of simple pendulum with universal vibration apparatus.
2. To find out the oscillations of Compound pendulum with universal vibration apparatus.
3. To find out the radius of gyration of bi-filler suspension with universal vibration apparatus.
4. To find out undamped torsional vibrations of single rotor system with universal vibration apparatus.
5. To find out the frequency of damped torsional vibration of single rotor system with universal vibration vibration apparatus.
6. To measure the frequency of torsional vibrations of single rotor system with universal vibration apparatus.
7. To measure the frequency of torsional vibrations of double rotor system with universal vibration apparatus.
8. To find out free vibration of helical coiled spring with universal vibration apparatus.
9. To study forced damped vibration of a spring mass system and simple supported beam with universal vibration apparatus.
10. To find out the Gyroscopic couple and prove the Gyroscopic law with Gyroscope apparatus.
11. To find out the Power and effort of Proel, Porter & Hartnell Governor with Governor Apparatus.
12. To find out the critical speed for different diameters of shaft by whirling of shaft apparatus.
13. To verify the static and dynamic balancing for different planes and masses by balancing apparatus.

COURSE OUTCOMES:

- Apply knowledge of Dynamics of machines for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts dynamics of machine in the design and development of mechanical systems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	
Material Testing Laboratory		
Total Theory Periods	:	28
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BTSEC 415

COURSE OBJECTIVES:

- To analyze solid mechanics problems using energy methods
- To analyze fixed beams and continuous beams.
- To solve for stresses and deflections of beams under unsymmetrical loading;
- To analyze column
- To analyze thin and thick pressure vessels

LIST OF EXPERIMENTS

1. To study the Universal Testing Machine.
2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.
3. To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain.
4. To determine shear strength of Mild Steel on U.T.M.
5. To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M.
6. To study the Impact Testing Machine and test specimen of Izod and Charpy.
7. To determine Izod and Charpy Value of the given mild steel specimen.
8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.
9. To study the Spring Testing Machine.
10. 10.To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine.
11. To study the Torsion Testing Machine
12. To determine ultimate shear stress and modulus of rigidity under Torsion.
13. To study the Cupping Test Machine and to determine Erichsen value of Mild Steel sheet.
14. To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material.
15. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
16. To study the Vickers Hardness Machine and to conduct a test on the machine.
17. Buckling of column

COURSE OUTCOMES:

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

Semester : IV B.Tech
Branch : Mechanical Engineering
Subject : Project/Seminar
Total Practical Periods

:

28 Total Credits

: 01
Code : BTSEM416

COURSE OBJECTIVE:

- To introduce students to independent technical exploration through seminar or project work in emerging Mechanical Engineering domains.
- To develop skills in literature survey, problem identification, data collection, and scientific interpretation of findings.
- To enhance technical communication abilities, enabling students to prepare well- structured reports and deliver effective presentations.
- To cultivate professionalism, teamwork, time management, and ethical practices in conducting and presenting technical work.

DESCRIPTION

This course provides students with an opportunity to explore emerging areas in Mechanical Engineering through guided project work or technical seminar presentations. Students identify a relevant topic, conduct a literature survey, analyze existing technologies, and present their findings through a structured report and seminar. The course strengthens technical understanding, research aptitude, documentation skills, and communication abilities essential for professional engineering practice. Students work individually or in small groups under faculty supervision to demonstrate clarity of thought, analytical skills, and effective presentation capabilities.

COURSE OUTCOME:

- Identify, select, and justify a relevant Mechanical Engineering topic for seminar or project work.
- Conduct a systematic literature review and analyze existing research or technologies in the chosen area.
- Apply engineering reasoning to interpret data, propose methodologies, or outline feasible technical solutions.
- Prepare a well-organized technical report following professional documentation standards.
- Deliver an effective oral presentation demonstrating clarity, confidence, and understanding of the subject matter.

Semester	:	IV B.Tech
Branch	:	Mechanical Engineering
Subject	:	Internship - I
Total Practical Periods	:	
28		
Total Credits	:	01
Code	:	BTINT417

Course Description :

The internship/vocational training course is designed to provide students with real-time exposure to industrial practices, professional work environments, and hands-on experience relevant to aeronautical engineering. Through supervised industrial training, students gain practical understanding of aircraft systems, manufacturing processes, maintenance operations, design methodologies, quality control standards, and emerging technologies used in the Mechanical industry.

During the internship, students observe and participate in organizational workflows, safety procedures, engineering decision-making, and problem-solving activities. The program strengthens the connection between theoretical knowledge and practical application, allowing students to apply classroom-based concepts in real-world engineering settings. Students also develop essential professional competencies such as teamwork, discipline, communication skills, documentation practice, and engineering ethics.

The course culminates in the submission of a well-structured internship report and a presentation summarizing tasks performed, skills acquired, technologies observed, and the knowledge gained during training. Evaluation is based on industrial feedback, quality of documentation, and effectiveness of presentation.

Course Outcomes :

- Demonstrate an understanding of industrial practices, safety procedures, and organizational workflows in Mechanical and related engineering sectors.
- Apply classroom concepts to real-world engineering problems and interpret practical processes such as design, manufacturing, testing, or maintenance of Mechanical systems.
- Analyze engineering challenges encountered during the internship and propose realistic, industry-oriented solutions or improvements.
- Prepare a professionally structured internship report documenting tasks performed, observations made, technologies used, and learning outcomes.