MATS UNIVERSITY

SCHOOL OF ENGINEERING AND INFORMATION TECHNOLOGY

Department of Aeronautical Engineering

Syllabus

For

(Four-Year Full-Time Degree Programme)

Bachelor of Technology (B .Tech.)

Aeronautical 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	BTDSCAE351	Elements of Aeronautics	3:1:0	4
3	BTDSCAE352	Mechanics of Solids	3:1:0	4
4	BTDSCAE353	Fluid & Thermal Engineering	3:1:0	4
5	BTDSCAE354	Aero Engineering Thermodynamics Laboratory	0:0:2	1
6	BTAEC355	Fluid Mechanics & Machinery Laboratory (AEC)	0:0:2	1
7	BTSEC356	Material Testing Laboratory (SEC)	1:0:2	2
8	BTSEM357	Project / Seminar	0:0:2	1
9	GEA20	Multidisciplinary Elective Course - III (from Basket)	3:0:0	3
Total Credits				**23**
S. No.	**Subject Code**	**Semester - 4**	**LTP**	**Credits**
1	BTDSCAE450	Aircraft Structure-I	3:1:0	4
2	BTDSCAE451	Aerodynamics-I	3:0:0	3
3	BTDSCAE452	Aircraft System & Instrumentation (MOOC)	3:0:0	3
4	BTDSCAE453	Aerodynamics Laboratory	0:0:2	1
5	BTAEC454	Aircraft System & Instrumentation Laboratory(AEC)	0:0:2	1
6	BTSEC455	Design & Drafting Laboratory(SEC)	0:0:2	1
7	BTSEM456	Project / Seminar	0:0:2	1
8	BTINT457	Internship - I	0:0:1	3
9	BTPDSE5XX	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	BTDSCAE550	Air Breathing Propulsion (MOOC)	3:0:0	3
2	BTDSCAE551	Aerodynamics-II	3:0:0	3
3	BTDSCAE552	Aircraft Structure-II	3:0:0	3
4	BTDSCAE553	Flight Dynmaics	3:0:0	3
5	BTDSCAE554	Aircraft Structure Laboratory	0:0:2	1
6	BTDSCAE555	Aircraft Propulsion Laboratory	0:0:2	1
7	BTSEC556	Computer Aided Simulation Laboratory-I (SEC)	0:0:2	1
8	BTPR557	Interdisciplinary Project	0:0:2	1
9	BTINT558	Internship - II	0:0:1	3
10	BTPDSE5XX	Professional Elective Course - II	3:0:0	3
Total Credits				**22**

S. No.	Subject Code	Semester – 6	LTP	Credits
1	BTDSCAE650	Composite Materials & Structures(MOOC)	3:0:0	3
2	BTDSCAE651	Rocket Propulsion	3:0:0	3
3	BTAEC652	Aircraft Design (AEC)	3:1:0	4
4	BTDSCAE653	Additive Manufacturing	3:0:0	3
5	BTDSCAE654	Aircraft Structure Repair Laboratory	0:0:2	1
6	BTDSCAE655	Aero Engine Repair & Maintenance Laboratory	0:0:2	1
7	BTINT656	Internship - III	0:0:1	3
8	BTPR657	Multidisciplinary Project / Case Study	0:0:2	1
9	BTPDSE5XX	Professional Elective Course - III	3:0:0	3
		Total Credits		**22**
S. No.	**Subject Code**	**Semester – 7**	**LTP**	**Credits**
1	BTDSCAE750	Avionics	3:0:0	3
2	BTAEC751	Finite Elements Methods (AEC) (MOOC)	3:0:0	3
3	BTDSCAE752	Introduction to Space Technology	3:0:0	3
4	BTDSCAE753	Theory of Vibration	3:0:0	3
5	BTDSCAE754	Avionics Laboratory	0:0:2	1
6	BTSEC755	Computer Aided Simulation Laboratory-II (SEC)	0:0:2	1
7	BTINT756	Internship - IV	0:0:1	3
8	BTPR757	Project Work Phase - I (Domain Specific)	0:0:4	2
9	BTPDSE5XX	Professional Elective Course - IV	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	BTPDSE5XX	Professional Elective Course - V	3:0:0	3
3	BTPDSE5XX	Professional Elective Course - VI	3:0:0	3
4	BTPDSE5XX	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	Elements of Aeronautics	BTDSCAE351	3	1	-	4	30	70	100
3	DSCC - PCC	Mechanics of Solids	BTDSCAE352	3	1	-	4	30	70	100
4	DSCC - PCC	Fluid & Thermal Engineering	BTDSCAE353	3	1	-	4	30	70	100
5	DSCC - PCC	Aero Engineering Thermodynamics Laboratory	BTDSCAE354	-	-	2	1	20	30	50
6	AEC	Fluid Mechanics & Machinery Laboratory	BTAEC355	-	-	2	1	20	30	50
7	SEC	Material Testing Laboratory	BTSEC356	1	-	2	2	20	30	50
8	RP	Project / Seminar	BTSEM357	-	-	2	1	20	30	50
9	GEC	Multidisciplinary Elective Course - III (from Basket)	GEA20	3	-	0	3	30	70	100
			Total	16	03	08	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	Elements of Aeronautics	Multidisciplinary Elective Course - III	Fluid Mechanics & Machinery Laboratory	Material Testing Laboratory	Project / Seminar	-
	Mechanics of Solids					
	Fluid & Thermal Engineering					
	Aero Engineering Thermodynamics 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	:	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	:	Aeronautical Engineering
Subject	:	Element of Aeronautics
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCAE351

COURSE OBJECTIVE:

- To provide a foundational understanding of aircraft configurations, components, and the historical development of aviation.
- To explain the principles of flight, including the physical properties of the atmosphere and the generation of aerodynamic forces.
- To introduce the basic concepts of aerodynamics, such as aerofoil classification, aerodynamic forces, and performance parameters.
- To familiarize students with aircraft structures and materials, covering various construction methods and the use of metals and composites.
- To introduce different aircraft propulsion systems, including piston, turboprop, jet, and rocket engines, and their operating principles.

UNIT-I AIRCRAFT CONFIGURATIONS

Brief History of Aviation, Components of an airplane and their functions, Different types of flight vehicles- Classifications & Details, and Basic Flight instruments

UNIT-II INTRODUCTION TO PRINCIPLES OF FLIGHT

Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, Stability of Atmosphere, Evolution of lift, drag and moments. Different types of forces and moments.

UNIT-III INTRODUCTION TO AERODYNAMICS

Aerodynamic forces on aircraft – classification of NACA aerofoils, aspect ratio, wing loading, Mach number, centre of pressure and aerodynamic centre-aerofoil characteristics-lift, drag curves, pressure distribution curve and stall characteristics of low speed aerofoil.

UNIT-IV INTRODUCTION TO AIRPLANE STRUCTURES AND MATERIALS

General types of Aircraft construction- Monocoque, semi-monocoque. Typical wing and fuselage structure, Metallic & non-metallic materials, aluminum alloy, titanium, stainless steel and composite materials.

UNIT-V POWER PLANTS USED IN AIRPLANES

Introduction to piston, turboprop and jet engines, Principle of propeller and jets for thrust production, Principles of operation of rocket, types of rockets.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

1. Identify and describe the key components of an aircraft and their functions, along with the historical evolution of aviation technology.
2. Explain the fundamental principles of flight, including atmospheric properties and their effects on aircraft stability and control.
3. Analyze basic aerodynamic parameters such as lift, drag, aspect ratio, mach number, and interpret aerofoil characteristics.
4. Distinguish between different aircraft structural designs and materials used in aircraft manufacturing.
5. Demonstrate an understanding of aircraft propulsion systems, including the working principles of propeller-based and jet engines, as well as the basics of rocket propulsion.

TEXT BOOKS

1. Anderson, J.D., “Introduction to Flight”, McGraw-Hill, 1995.

REFERENCE

1. Kermode, A.C., “Flight without Formulae”, McGraw-Hill, 1997.
2. Kermode, A.C., “Mechanics of Flight”, Pearson Education; 11th edition.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Mechanics of Solids
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCAE352

COURSE OBJECTIVES:

1. To introduce the fundamental concepts of stress and strain, including elastic behavior, stress-strain relationships, and thermal effects on materials.
2. To equip students with analytical tools to determine principal stresses and strains using graphical and analytical methods like mohr's circle.
3. To develop the ability to calculate deflections in beams using various analytical techniques such as double integration, moment area, and conjugate beam methods.
4. To impart knowledge of torsion, spring mechanics, and column stability, and analyze stresses in various types of beams under different loading conditions.

UNIT-I SIMPLE STRESSES AND STRAIN

Stresses and strains – Hooke's law – Stress and elongation due to self weight – Stress and strain diagrams – Elastic constants – Poisson's ratio – Relation between the elastic modulii – Numerical problems in tension & compression – Thermal stresses – Hoop stress.

UNIT-II PRINCIPAL STRESSES AND STRAINS

Pure tensile and shear stresses – Two mutually perpendicular direct stresses – Principal Planes and Principal Stresses – Two dimensional Stress System – Graphical methods of representation of Principal Stresses (Mohr's Circle).

UNIT-III DEFLECTION OF BEAMS

Introduction – Double integration method – Macaulay's method – moment area method – conjugate beam method –principle of superposition – Maxwell's theorem and their applications and related Numeric problems.

UNIT-IV TORSION – SPRINGS – COLUMNS

Torsion of solid and hollow circular shafts – shear stress variation – power transmission in shafts – open and closed coiled helical springs – classification of columns – Euler buckling – columns with different end conditions.

UNIT-V STRESSES IN BEAMS

Introduction – Classification of beams –Shear force & bending moment diagrams – Points of contraflexure – Bending equation – Neutral Axis, Section modulus – Combined direct and bending stresses – Shear stress variation in beams of symmetric sections.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

1. Analyze axial, thermal, and hoop stresses in structural members and determine strain using hooke's law and elastic constants.
2. Determine principal stresses and strains in a 2d stress system using analytical and graphical (mohr's circle) methods.
3. Compute beam deflections using methods such as double integration, macaulay's method, and moment area theorems.
4. Apply torsion and bending theories to analyze shafts, springs, and beams; and evaluate column stability under various end conditions.

TEXT BOOK

1. Gere & Timoshenko, 'Mechanics of Materials', McGraw Hill, 1993
2. William Nash, Strength of Materials, Tata McGraw Hill, 2004.

REFERENCES:

1. Dym, C. L., and Shames, I. H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
2. Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition.

Semester	:	III B. Tech.
Branch	:	Aeronautical Engineering
Subject	:	Fluid & Thermal Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BTDSCAE353

COURSE OBJECTIVES:

1. To introduce the basic concepts and properties of fluids, and analyze fluid statics including pressure measurement and buoyancy.
2. To develop an understanding of fluid motion using both kinematic and dynamic descriptions, and apply governing equations such as bernoulli's and momentum equations.
3. To study viscous fluid flow phenomena and introduce dimensional analysis techniques for solving fluid flow problems.
4. To establish a foundational understanding of thermodynamics, including laws of thermodynamics, entropy, and various air standard cycles used in engines and turbines.

UNIT I: INTRODUCTION AND FLUID STATICS

Definition of fluids, fluid properties, viscosity, capillarity, surface tension, compressibility, units and dimensions, Pascal's law-hydrostatics force, concept of buoyancy, measurement of pressure, use of manometers and gauges.

UNIT II: FLUID KINEMATICS AND DYNAMICS

Description of Fluid Motion : Lagrangian and Eulerain methods, description of properties in a moving fluid, Streamlines, path lines, streak lines, vorticity and circulation, translation, rotation and rate of deformation of fluid particle.

Equations of Fluid Motion: Euler's equation, Bernoulli's equation for inviscid and viscous flow fields, momentum equation and angular momentum equation.

UNIT III: VISCOUS FLOW AND DIMENSIONAL ANALYSIS

Introduction to Viscous Flows: Qualitative aspects of viscous flows, Plane poisuille flow, Couette flow, Hagen - Poisuelle flow, Transition from laminar to turbulent flow, Turbulent flow in circular pipe.

UNIT IV: FUNDAMENTAL LAWS OF THERMODYNAMICS

Fundamental Concepts and Definitions, Thermodynamic system, state, property, change of state, type of thermodynamics process and functions, Zeroth law of thermodynamics, work and heat definition and units of work and heat, Statement of the first law, Steady Flow Energy Equation (SFEE). Limitations of the first law, Kelvin-Planck's and Clausius statements of the second law, reversible and irreversible processes, Carnot Cycle

UNIT V: ENTROPY CONCEPT & AIR STANDARD CYCLES

Entropy: The property, entropy, principle of increase of entropy, calculation of entropy changes, T-s and h-s diagrams.

Air Standard Cycles: Carnot cycle, Otto cycle, Diesel cycle, dual cycle, gas turbine cycles, gas turbine jet propulsion.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

1. Describe fluid properties and apply hydrostatic principles to analyze pressure forces, buoyancy, and pressure measurement using manometers and gauges.
2. Apply kinematic and dynamic equations of fluid motion such as bernoulli's and momentum equations to ideal and real fluid flows.
3. Analyze laminar and turbulent viscous flow in pipes and apply dimensional analysis to fluid mechanics problems.
4. Apply the first and second laws of thermodynamics, analyze entropy changes, and evaluate air standard cycles like otto, diesel, and carnot for idealized engine performance.

TEXT BOOKS

1. Shames I H, 'Mechanics of Fluids', Kogakusha, Tokyo, 1998
2. Nag P. K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2007.
3. Rathakrishnan E., "Fundamentals of Engineering Thermodynamics", Prentice-Hall India, 2005.
4. Bansal, R K, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2005.

REFERENCE BOOKS

1. Yuan S W, 'Foundations of fluid Mechanics', Prentice-Hall, 1987.
2. Milne Thompson L M, 'Theoretical Hydrodynamics', MacMillan, 1985.
3. Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006
4. Holman J. P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2007.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aero Engineering Thermodynamics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTDSCAE354

COURSE OBJECTIVE:

- Can clearly understand the performance of a IC engine
- Clearly understand the port timing mechanism and valve timing mechanism of stroke engine
- To calculate the heating values, specific heats and thermal conductivity

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of heating value of a fuel
6. COP test on a vapor compression refrigeration test rig
7. COP test on a vapor compression air-conditioning test rig
8. Determination of specific heat of solid
9. Determination of Thermal Conductivity of solid.
10. Determination of Thermal Resistance of a Composite wall.

COURSE OUTCOME:

At the end of the course, the student will be able to:

- Get a clear idea about effectiveness of a parallel flow heat exchanger.
- Get a clear idea about effectiveness of a counter flow heat exchanger
- Investigate about the heating value of a fuel
- Find the specific heat and Thermal Conductivity of solid

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Fluid Mechanics & Machinery Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTAEC355

COURSE OBJECTIVE:

- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.

LIST OF EXPERIMENTS

1. Calibration of Venturimeter
2. Pressure measurement with Pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Flow visualization by Heleshaw apparatus
6. Performance test on centrifugal pumps
7. Performance test on reciprocating pumps
8. Performance test on piston wheel turbine
9. Performance test on Francis turbine
10. Determination of Viscosity of a Fluid

COURSE OUTCOME:

- Determination of fluid properties
- Ability to use the measurement equipment's for flow measurement.
- Ability to do performance trust on different fluid machinery

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Material Testing Laboratory
Total Practical Periods	:	28
Total Credits	:	02
Code	:	BTSEC356

COURSE OBJECTIVE:

- To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.
- This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS

1. Brinell Hardness test
2. Rockwell Hardness test
3. Tension test
4. Torsion test
5. Izod Impact test
6. Charpy Impact test
7. Testing of springs
8. Block Compression Test

COURSE OUTCOME:

- Ability to perform different material testing.
- Ability to characteristic of materials.
- To know about behavior under various loading

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Project/Seminar
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTSEM357

COURSE OBJECTIVE:

- To introduce students to independent technical exploration through seminar or project work in emerging aeronautical 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 Aeronautical 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 aeronautical 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	Aircraft Structure-I	BTDSCAE450	3	1	-	4	30	70	100
2	DSCC - PCC	Aerodynamics-I	BTDSCAE451	3	0	-	3	30	70	100
3	DSCC - PCC	Aircraft System & Instrumentation (MOOC)	BTDSCAE452	3	0	-	3	30	70	100
4	DSCC - PCC	Aerodynamics Laboratory	BTDSCAE453	-	-	2	1	20	30	50
5	AEC	Aircraft System & Instrumentation Laboratory (AEC)	BTAEC454	-	-	2	1	20	30	50
6	SEC	Design & Drafting Laboratory (SEC)	BTSEC455	-	-	2	1	20	30	50
7	RP	Project / Seminar	BTSEM456	-	-	1	1	20	30	50
8	INT	Internship - I	BTINT457	-	-	1	3	50	00	50
9	DSEC-PCC	Professional Elective Course - I (from Basket)	BTPDSCAE5XX	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)						
	Aircraft Structure-I	Professional Elective Course - I (from Basket)	Multidisciplinary Elective Course - IV	Aircraft System & Instrumentation Laboratory	Design & Drafting Laboratory	Project / Seminar	Internship-I
	Aerodynamics-I						
	Aircraft System & Instrumentation (MOOC)						
	Aerodynamics 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	:	Aeronautical Engineering
Subject	:	Aircraft Structure-I
Total Theory Periods	:	48
Total Tutorial Periods	:	01
Total Credits	:	04
Code	:	BTDSCAE450

COURSE OBJECTIVE:

- To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To make the students understand the various energy methods to compute the strain energy in axial, bending, torsion and shear loadings.
- To impart the knowledge on column structural member
- To interpret the failure behavior of materials using failure theories.
- To make the students understand the various induced stresses.

UNIT I STATICALLY DETERMINATE STRUCTURES

Statically determinate frames – plane truss analysis – method of joints – method of sections – 3-D trusses – the landing gear tripod – beams of two materials.

UNIT II STATICALLY INDETERMINATE STRUCTURES

Propped cantilevers – fixed-fixed beams– Clapeyron's 3 moment equation –moment distribution method.

UNIT III ENERGY METHODS

Strain energy evaluation in structural members – energy theorems – dummy load &unit load methods – Maxwell's reciprocal theorem – energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.

UNIT IV COLUMNS

Euler's column curve – inelastic buckling – effect of initial curvature – the Southwell plot – columns with eccentricity – use of energy methods – theory of beam columns –beam columns with different end conditions – stresses in beam columns.

UNIT V FAILURE THEORIES

Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - distortion energy theory – octahedral shear stress theory.

COURSE OUTCOMES:

- Analyze the statically determinate and indeterminate using the principle of iterative methods and theorem of three moments.
- Make use of classical methods determine the deflections of beams, frames and arches
- Understand the stability, Euler buckling load and problems in column design.
- Analyze the failure of the brittle and ductile materials in comparison with simple mechanical tests.
- Interpret and Predict material failure for the induced stresses caused due to the dynamic and other environmental effects

TEXT BOOKS

1. Timoshenko and Gere, `Mechanics of Materials', Tata McGraw Hill, 1993.
2. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985

REFERENCES

1. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction', McGraw Hill, 1993.
2. Megson T M G, `Aircraft Structures for engineering students' Edward Arnold Publishers.
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aerodynamics-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTDSCAE451

COURSE OBJECTIVES:

- To introduce fundamental aerodynamic theories and aerodynamic characteristics of airfoils and wings
- To familiarize students with viscous flows

UNIT I REVIEW OF BASIC FLUID MECHANICS

System and Control volume approach, substantial, local and convective derivative, Continuity, momentum and energy equations, inviscid flow, Euler equation, incompressible Bernoulli's Equation. Circulation and Vorticity, Green's Lemma and Stoke's Theorem, Barotropic Flow, Kelvin's theorem, Streamline, Stream Function, Irrotational flow, Potential Function, Equi-Potential Lines, Elementary Flows and their combinations.

UNIT II TWO-DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW

Ideal Flow over a circular cylinder, D'Alembert's Paradox, Magnus effect, Kutta Joukowski's Theorem, Starting Vortex, Kutta condition, Real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY

Cauchy-Riemann relations, Complex Potential, Methodology of Conformal Transformation, Kutta-Joukowski transformation and its applications, Karman Trefftz Profiles, Thin Airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY

Vortex Filament, Biot and Savart Law, Bound Vortex and trailing Vortex, Horse Shoe Vortex, Lifting Line Theory and its limitations.

UNIT V INTRODUCTION TO LAMINAR AND TURBULENT FLOW

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, Energy thickness, Shape parameter, Boundary layer equations for a steady, two dimensional incompressible flow,

Boundary Layer growth over a Flatplate, Critical Reynolds Number, Clasius solution, Basics of Turbulent flow, Prandtl's mixing length hypothesis, Free shear layers.

COURSE OUTCOMES:

On completion of the course students will be able to

- Classify airfoils and label their nomenclature; apply governing equations to formulate necessary
- Subsidiary equation in order to determine the aerodynamic force
- Explain potential flow theories and solve their combinations.
- Estimate the aerodynamic characteristics of airfoils
- Estimate the aerodynamic characteristics of wings
- Formulate and solve boundary layer problems

TEXT BOOKS

1. Houghton, E.L., and Caruthers, N.B., Aerodynamics for Engineering students, Edward Arnold Publishers Ltd., London, 1989.
2. Anderson, J.D., Fundamentals of Aerodynamics, McGraw Hill Book Co., 1999.

REFERENCES

1. Milne Thomson, L.H., Theoretical Aerodynamics, Macmillan, 1985.
2. John J Bertin., Aerodynamics for Engineers, Pearson Education Inc, 2002.
3. Clancey, L J., Aerodynamics, Pitman, 1986.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft System and Instrumentation
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTDSCAE452

COURSE OBJECTIVES:

- To impart knowledge of the aircraft control systems
- To gain knowledge on hydraulic and pneumatic systems of aircraft
- Basic knowledge of piston and jet engine fuel and lubrication systems
- To impart knowledge on aircraft environment systems
- To gain knowledge on flight and engine instruments.

UNIT I AIRCRAFT SYSTEMS

Hydraulic systems – Study of typical workable systems – components – Hydraulic systems controllers – Modes of operation – Pneumatic systems – Working principles– Typical Pneumatic Power system – Brake system – Components, Landing Gear Systems – Classification – Shock absorbers – Retractive mechanism.

UNIT II AIRPLANE CONTROL SYSTEMS

Conventional Systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system – operating principles – Modern control systems – Digital fly by wire systems – Auto pilot system, Active Control Technology.

UNIT III ENGINE SYSTEMS

Fuel systems – Piston and Jet Engines – Components - Multi-engine fuel systems, lubricating systems - Piston and jet engines – Starting and Ignition systems – Piston and Jet engines.

UNIT IV AIRCONDITIONING AND PRESSURIZING SYSTEM

Basic Air Cycle systems – Vapour Cycle Systems, Boot-strap air cycle system –Evaporative vapour cycle systems – Evaporation air cycle systems –Oxygen systems – Fire protection systems, De-icing and anti-icing system.

UNIT V AIRCRAFT INSTRUMENTS

Flight Instruments and Navigation Instruments – Accelerometers, Air speed Indicators – Mach Meters – Altimeters - Gyroscopic Instruments– Principles and operation – Study of various types of engine instruments – Tachometers –Temperature gauges – Pressure gauge – Operation and principles.

COURSE OUTCOMES:

On completion of the course students will be able to:

- Understands the aircraft control systems
- Acquires knowledge on hydraulic and pneumatic systems of aircraft
- Understands piston and jet engine fuel and lubrication systems
- Understands the aircraft environment systems
- Identify flight and engine instruments

TEXT BOOKS

1. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill 1993.
2. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co 1993.

REFERENCES

1. Teager, S. Gas Turbine technology, McGraw Hill 1997.
2. Mckinley, J.L. and Bent R.D. Aircraft Maintenance & Repair, McGraw Hill, 1993.
3. Handbooks of Airframe and Powerplant Mechanics, US Dept. of Transportation, Federal, Aviation Administration, The English Book Store, New Delhi, 1995.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aerodynamics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTDSCAE453

COURSE OBJECTIVES:

- To visualize and understand the low-speed flows
- To practice techniques which predict/measure aerodynamics forces
- To understand the interactions of flow fields

LIST OF EXPERIMENTS

1. Generation of lift and tip vortices.
2. Flow visualization in water flow channel
3. Flow visualization in smoke tunnel
4. Plot of RPM Vs test section velocity in a subsonic wind tunnel.
5. Pressure distribution over circular cylinder.
6. Pressure distribution over airfoil and estimation of C_L and C_D.
7. Force measurement using wind tunnel balance.
8. Mach number distribution in nozzle of supersonic wind tunnel.
9. Use of Schlieren system to visualize shock.
10. Use of Shadow graph system to visualize shock.

COURSE OUTCOME:

- Ability to use the fundamental aerodynamic principles for aircraft testing applications
- Deep understanding of flow visualization
- Understanding about instruments and their function

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft system and Instrumentation Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTAEC454

COURSE OBJECTIVES:

- To impart knowledge of the aircraft system and instruments
- To Examination and testing of element of flight director and various systems
- Basic knowledge of Wiring and cabling demonstration
- To know about Safety precaution associated with radio equipment
- To gain knowledge on flight instruments

LIST OF EXPERIMENTS

1. Familiarization of computer, accessories.
2. Autopilots (electrical or electronics) dismantling, examination of components, reassembly, and installation in A/C or on simulator by following the manufacturer's test programme: practice with portable test kit.
3. Examination and testing of element of flight director systems, automatic flare, automatic landing systems.
4. Safety precaution associated with radio equipment hazards: high voltage, RF emission and microwave emissions, Electrostatic discharge etc.
5. Wiring and cabling demonstration and practice in wiring and soldering radio circuits.
6. Multimeter, Megger and bonding testers: demonstration and practice.
7. Identification and inspection of antenna: external wire aerials, blade, rod and rail aerials:
8. D/F loops and suppressed aerials viewing on A/C and inspection for physical condition. Aerial masts, static dischargers' etc. inspection and servicing.
9. To demonstrate the measurements and experiments with circuit demonstration units simulating the following system elements
   TRF receiver, Intermediate frequency amplifier, Frequency convertor, Super heterodyne alignment, Buffer-doubler amplifier, RF amplifier, Modulation and demodulation, Transmission lines, Reactance tube modulators, Interference (filtering and shielding).
10. Troubleshooting Practices.

COURSE OUTCOME:

On completion of the lab students will be able to:

- Know about of the aircraft system and instruments
- Examine and testing of element of flight director and various systems
- Implement basic knowledge of Wiring and cabling
- Understand Safety precaution associated with radio equipment
- Understand the working of flight instruments

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Design and Drafting Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTSEC455

COURSE OBJECTIVES:

- Ability to gain practical experience in handling 2D drafting and 3D drafting
- Ability to perform surface modelling on a/c and its parts
- To develop in students' graphic skills for communication of concepts, ideas of engineering products
- To familiarize with technical drawings

LIST OF EXPERIMENTS

1. Design and Drafting of riveted joints.
2. Design and Drafting of welded joints.
3. Design and Drafting Control Components Cam.
4. Design and Drafting Control Components Gear.
5. Design and Drafting Control Components Push-pull rod.
6. Three view diagram of a typical aircraft.
7. Layout of typical wing structure.
8. Layout of typical fuselage structure.

COURSE OUTCOMES:

- Explain graphic skills for communication of concepts, ideas of engineering products.
- Design surface modelling using modeling software.
- Create surface modelling in a/c and its parts
- Create drafting on 3D models
- Get job opportunities on design-based industries

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Project/Seminar
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTSEM456

COURSE OBJECTIVE:

- To introduce students to independent technical exploration through seminar or project work in emerging aeronautical 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 Aeronautical 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 aeronautical 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	:	Aeronautical Engineering
Subject	:	Internship - I
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BTINT457

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 aerospace 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 aerospace or related engineering sectors.
- Apply classroom concepts to real-world engineering problems and interpret practical processes such as design, manufacturing, testing, or maintenance of aeronautical 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.