Course Structure for Computer Science Engineering

Semester I : 30hrs

Sr. No.	Subject	L	T	P	Credits	Total Marks
1	Linear Algebra and Calculus	3	1	0	4	100
2	Programming for Problem Solving	2	0	4	4	150
3	Basics of Electrical and Electronics Engineering	3	0	2	4	150
4	Applied Sciences	4	0	2	5	150
5	English Communication for Engineers	2	0	2	3	100
6	Design Thinking Part I	1	0	2	2	50
7	SHD (Health Practice 1)	0	0	2	1	-
	Total	**15**	**1**	**14**	**23**	**700**

Semester II: 30hrs

Sr. No.	Subject	L	T	P	Credits	Total Marks
1	Ordinary Differential Equations and Advanced Calculus	3	1	0	4	100
2	Object Oriented Programming	2	0	2	3	100
3	Branch Specific*	3	0	2	4	150
4	Engineering Graphics	1	0	4	3	100
5	Engineering Workshop	0	0	4	2	50
6	Design Thinking Part II	1	0	2	2	50
7	SHD (Professional English Communication for Engineers)	1	0	2	2	-
8	SHD (Health Practice 2)	0	0	2	1	-
	Total	**11**	**1**	**18**	**21**	**550**

Course Structure for Electronics & Communication Engineering and Information Technology

Semester I : 29 hrs

Sr. No.	Subject	L	T	P	Credits	Total Marks
1	Linear Algebra and Calculus	3	1	0	4	100
2	Programming for Problem Solving	2	0	4	4	150
3	Basics of Electrical and Electronics Engineering	3	0	2	4	150
4	Engineering Graphics	1	0	4	3	100
5	English Communication for Engineers	2	0	2	3	100
6	Design Thinking Part I	1	0	2	2	50
7	SHD (Health Practice 1)	0	0	2	1	-
	Total	**12**	**1**	**16**	**21**	**650**

Semester II: 31 hrs

Sr. No.	Subject	L	T	P	Credits	Total Marks
1	Ordinary Differential Equations and Advanced Calculus	3	1	0	4	100
2	Object Oriented Programming	2	0	2	3	100
3	Branch Specific*	3	0	2	4	150
4	Applied Sciences	4	0	2	5	150
5	Engineering Workshop	0	0	4	2	50
6	Design Thinking Part II	1	0	2	2	50
7	SHD (Professional English Communication for Engineers)	1	0	2	2	-
8	SHD (Health Practice 2)	0	0	2	1	-
	Total	**14**	**1**	**16**	**23**	**600**

Course Structure for Mechanical Engineering and Civil Engineering

Semester I: 28 hrs

Sr. No.	Subject	L	T	P	Credits	Total Marks
1	Linear Algebra and Calculus	3	1	0	4	100
2	Programming in Problem Solving	2	0	4	4	150
3	Engineering Graphics	1	0	4	3	100
4	Engineering Workshop	0	0	4	2	50
5	English Communication for Engineers	2	0	2	3	100
6	Design Thinking Part I	1	0	2	2	50
7	SHD (Health Practice 1)	0	0	2	1	-
	Total	**9**	**1**	**18**	**19**	**550**

Semester II: 32 hrs

Sr. No.	Subject	L	T	P	Credit	Total Marks
1	Ordinary Differential Equations and Advanced Calculus	3	1	0	4	100
2	Object Oriented Programming	2	0	2	3	100
3	Basics of Electrical and Electronics Engineering	3	0	2	4	150
4	Applied Sciences	4	0	2	5	150
5	Branch Specific*	3	0	2	4	150
6	Design Thinking Part II	1	0	2	2	50
7	SHD (Professional English Communication for Engineers)	1	0	2	2	-
8	SHD (Health Practice 2)	0	0	2	1	-
	Total	**17**	**1**	**14**	**25**	**700**

Course Structure for Aerospace Engineering

Semester I: 31hrs

Sr. No.	Subject (Semester I)	L	T	P	Credits	Total Marks
1	Linear Algebra and Calculus	3	1	0	4	100
2	Applied Sciences	4	0	2	5	150
3	Programming for Problem Solving	2	0	4	4	150
4	Thermodynamics	2	0	0	2	50
5	English Communication for Engineers	2	0	2	3	100
6	Workshop Practice#	0	0	4	Au	-
7	Design Thinking Part I	1	0	2	2	50
8	SHD (Health Practice 1)	0	0	2	1	-
	Total	**14**	**1**	**16**	**21**	**600**

Semester II: 33hrs

Sr. No.	Subject (Semester II)	L	T	P	Credits	Total Marks
1	Ordinary Differential Equations and Advanced Calculus	3	1	0	4	100
2	Basics of Electrical and Electronics Engineering	3	0	2	4	150
3	Engineering Graphics	1	0	4	3	100
4	Branch Specific*	3	0	2	4	150
5	Object Oriented Programming	2	0	2	3	100
6	Material Engineering and Aerospace Materials#	2	0	0	Au	-
7	Design Thinking Part II	1	0	2	2	50
8	SHD (English Communication)	1	0	2	2	-
9	SHD (Health Practice 2)	0	0	2	1	-
	Total	**16**	**1**	**16**	**23**	**650**

Audit Course

First Year Course Code

(2021-22)

Sr. No.	Code	Courses	Marks
1	21BTAS001	Applied Sciences (T)	150
2	21BTAS102	Linear Algebra and Calculus (T)	100
3	21BTAS203	Ordinary Differential Equations and Advanced Calculus (T)	100
4	21BTAS104	English Communication for Engineers	100
5	21BTEC001	Basics of Electrical and Electronics Engineering (T)	150
6	21BTCS101	Programming for Problem Solving (T)	150
7	21BTCS202	Object Oriented Programing (T)	100
8	21BTME001	Engineering Graphics	100
9	21BTIC003	Engineering Workshop	50
10	21BTUC101	Design Thinking Part I	50
11	21BTUC201	Design Thinking Part II	50
12	21BT(branch code)202	Branch Specific*	150
13	21BTAE107	Thermodynamics	50
14	21BTAE151	Workshop Practice (Audit Course-Aero)	-
15	21BTAE251	Material Engineering and Aerospace Materials (Audit course-Aero)	-
16	18UCCS102	SHD (Health Practice 1)	-
17	18UCCS202	SHD (Health Practice 2)	-
18	18UCCS201	SHD (Professional English Communication for Engineers)	-

LIST of Branch Specific Courses in Semester II:

Sr. No.	Department Name	Branch Specific Course	Code
1	Computer Science and Engineering	Digital Electronics and Logic Design	21BTCS202
2	Electronics and Communication Engineering	Electronics Device and Circuits	21BTEC202
3	Information Technology	Digital Electronics and Microprocessor	21BTIT202
4	Mechanical Engineering	Basics of Mechanical Engineering	21BTME202
5	Civil Engineering	Applied Mechanics	21BTCE202
6	Aerospace Engineering	Engineering Mechanics	21BTAE202

SYLLABUS

Detailed First Year Curriculum Contents

Course Code				Course Title							Category
21BTAS102				Linear Algebra and Calculus							BSC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	1	0	4	60	40	100	0	0	0	100	24/60

Prerequisite: Matrix algebra, Basics of limit continuity and differentiability

Course Objectives:

The main purpose of this course is to:

- Understand linear algebra and its applicability in different engineering fields.
- Incorporate the knowledge of calculus to support to their concurrent and subsequent engineering studies.
- Expose the concept of integral calculus.
- Introduce the concepts of vector spaces and linear mapping.
- Express a periodic function by Fourier series and to learn their applications.

Syllabus points

1. Introduction to Matrices, rank and their applications to system of linear equations.
2. Eigen values and Eigen vectors of a matrix and Cayley - Hamilton theorem.
3. Vector spaces – Definitions and illustrations.
4. Dimension Theorem – Row Space, Column Space and Null Space.
5. Indeterminate forms and Mean Value Theorems.
6. Successive Differentiation, Leibnitz Theorem.
7. Introduction of Sequence and series, Convergence and Divergence of Series.
8. Expansion of Functions - Taylor's series, McLaurin's Series, Standard Expansions.
9. Integral Calculus - Reduction Formulae, Beta and Gamma Functions.
10. Fourier series and Harmonic Analysis.

Course Outcomes:

After learning this course, students shall be able to:

- Apply linear algebra to solve real life problems.
- Resolve the problems based on linear algebra.
- Understand applications of integral calculus.
- Express periodic function in terms of Fourier sine and Fourier cosine series.

- Evaluate complicated and improper integrals by using reduction formulae and Beta- Gamma functions respectively.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 10th edition.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus", Pearson Education, 12th edition.
3. Serge Lang, "Linear Algebra", Springer, 3rd edition.

References:

- Howard Anton and Chris Rorres, "Elementary Linear Algebra", John Wiley and Sons, 10th edition.
- C.R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publications, New Delhi, .
- Peter V. O' Neil, "Advanced Engineering Mathematics", Thomson Brooks/Cole, Singapore, 7th edition.
- Shanti Narayan, "Differential Calculus", S. Chand and Company, New Delhi.
- George Simmons, "Differential Equation with Applications", (2^{nd} edition) McGraw-Hill Education (India) Private Limited, New Delhi.
- B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication.

Course Code				Course Title							Category
21BTAS001				Applied Sciences							BSC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
4	0	2	5	60	40	100	0	50	50	150	24/60

Prerequisite: Physics and Chemistry at 10+2 level

Course Objectives:

- To understand the basic properties of nanostructures and their applications on the basis of quantum physics.
- To acquire fundamental understanding, develop scientific thinking and problem-solving skills in Acoustics and Ultrasonics to implement in various engineering fields.
- To understand, analyze and apply the concepts of Polarization, interference and diffraction for various engineering applications.
- To study the fundamentals, advantages and advances in Lasers, photonics and Fiber optic communication systems.
- To understand the concepts of renewable energy, efficiency of energy transformations and use of alternate energy to solve real world problems.
- To understand the basic and contemporary technology involved in purification and improving the quality of water to solve real world domestic and industrial problems.
- To understand the different chemical features of polymers for effective engineering applications and developing novel engineering materials.
- To study and explore the advantages of various fossil fuels and derived fuels with their properties for day to day real life applications.
- To study corrosion mechanism and electrochemical reactions causing corrosion and processes used for corrosion control involved in different industries and scientific applications.
- To acquire fundamental understanding of spectroscopic techniques to characterize novel structures, materials and explore the applicability.

PART-A

Syllabus points

1. Basic quantum physics and Schrodinger equation
2. Introduction to nanotechnology and its applications
3. Study of architectural acoustics
4. Introduction to ultrasonic waves and its applications
5. Study of phenomenon of interference of light waves and its applications
6. Study of phenomenon of diffraction of light waves and its applications
7. Study of phenomenon of polarization of light waves and its applications
8. Introduction to LASER and its applications
9. Introduction to optical fiber and optical fiber communication
10. Study of renewable sources of energy

List of experiments (any FIVE experiments)

1. Determination of velocity of ultrasonic waves in liquid using ultrasonic interferometer
2. (a)Measurement of sound pressure level
   (b)Determination of sound absorption coefficient of given materials
3. Determination of radius of curvature of a plano-convex lens using Newton's Rings method
4. Determination of wavelength of spectral lines by using a plane diffraction grating and spectrometer
5. Verification of Malus' law for polarization of light
6. Determination of wavelength of He-Ne laser beam
7. Study of V-I characteristics of Solar Cell
8. Determination of numerical aperture of optical fiber
   A. Demo Experiment: Synthesis of Silver Nanoparticles by wet chemical method
   B. Virtual Lab Experiment:
9. Determination of refractive index of liquid medium by Newton's rings experiment
10. Determination and verification of Brewster's law

Text Books:

1. Avadhanulu M N and Kshir Sagar P G, "A Text Book of Engineering Physics", 2010
2. Sulabha K. Kulkarni, "Nanotechnology: Principles and Practices", Springer, 2015.
3. Arther Beiser, "Concepts of Modern Physics", Tata Mcgraw Hill, 1994.

References:

1. Hecht E, “Optics”, Pearson Education, 2017.
2. John Buck, “Fundamentals of Optical Fibers”, 2004.
3. Godfrey Boyle, “A Renewable Energy: Power sustainable future”, Oxford University Press, UK, 2012.
4. David Halliday and Robert Resnic, “Fundamentals of Physics”, Wiley, 2018
5. Ruby Das , C. S. Robinson , Rajesh Kumar , Prashant Kumar Sahu, “Engineering Physics Practical”, University Science Press, 2015
6. https://nptel.ac.in/
7. https://swayam.gov.in/
8. Ruby Das, C. S. Robinson, Rajesh Kumar, Prashant Kumar Sahu, “Engineering Physics Practical”, University Science Press, 2015
9. Physics Lab manual of MIT ADT University
10. J.R. Taylor, “An Introduction to Error Analysis”, University Science Books, Mill Valley, California, 1982.
11. Virtual lab Experiment: https://www.vlab.co.in/broad-area-physical-sciences

PART- B

Syllabus points

1. Industrial water treatments and Principles of Green Chemistry
2. Classification, synthesis, properties, and applications of polymers and specialty polymers
3. Determination of calorific value of fuels, analysis of fuels and synthesis, properties, applications of nonconventional fuels.
4. Prevention, mechanism of Corrosion
5. Principle, instrumentation, and applications of advanced instrumental techniques like spectroscopy, chromatography

List of experiments (any FIVE experiments)

1. Determination of hardness of given water sample by EDTA method.
2. Determination of alkalinity of water sample by volumetric method.
3. Perform volumetric analysis using pH meter.
4. Synthesis and Characterization of polymer (i) Urea-Formaldehyde Resin, (ii) Polystyrene.
5. Determination of Viscosity Average Molecular Weight of a polymer
6. Perform Proximate analysis of given coal sample

7. Synthesis and characterization of biodiesel from vegetable oil and its characterization.
8. Electroplating of Zinc (Zn) over Copper (Cu)
9. Separation of components of an organic mixture by Thin Layer Chromatography
10. Quantitative determination of metals colorimetrically.

Textbooks

1. S. S. Dara, "A Textbook of Engineering Chemistry", S. Chand and Company Ltd.,15th edition, New Delhi.
2. O. P. Virmani and A. K. Narula, "Applied Chemistry Theory & Practical".
3. P. C. Jain, M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd.,17th edition, New Delhi.
4. R. Gopalan, D. Venkappayya, S. Nagarajan, "Textbook of Engineering Chemistry", 4th Edition, Vikas Publishing.
5. D. L. Pavia, G. M. Lapman and G. S. Kriz, "Introduction to spectroscopy", Stamford CT: Cengage Learning, 5th Edition, 2015.

References:

1. N. F. Gray, "Water Technology: An Introduction for Environmental Scientists and Engineers", 3rd Edition, Iwa Publishing, London UK.
2. V. Gowarikar, N.V. Vishwanathan and Jaydev Shreedhar, "Polymer Science", Wiley Publications.
3. H.H. Uhlig and R.W. Revie, "Corrosion and its Control", 4th Edition, Wiley Publications.
4. A. I. Vogel, "A Textbook of Quantitative Inorganic Analysis", 4th Edition, Longman Publication Ltd, 2000.
5. Shashi Chawla, "Essentials of Experimental Engineering Chemistry", Dhanpat Rai publishing Co. Delhi, 2001.
6. L. D. Field, S. Sternhell, and J. R. Kalman, "Organic structures from spectra", John Wiley & Sons, 5th Edition, 2012.
7. O. P. Agarwal, "Engineering Chemistry", 3rd Edition, KHANNA PUBLISHERS
8. For online content: https://nptel.ac.in, https://www.swayam.gov.in, https://www.youtube.com/user/nptelhrd
9. Practical Engineering Chemistry by K. Mukkanti, et al, B. S. Publications, Hyderabad.
10. Inorganic Qualitative Analysis, Vogel, latest edition.
11. A text book on experiments and calculation Engg. S. S. Dara.

12. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.
13. Laboratory manual on engineering Chemistry by S. K. Bhasin et al, Dhanpat Rai publishing Co.
14. Virtual labs: http://www.vlab.co.in/broad-area-chemical-sciences, http://icv-au.vlabs.ac.in/inorganic-chemistry/index.html

Course Outcomes:

After learning this course, students shall be able to,

- Explain the relation between nanotechnology and quantum physics in order to explore the properties of solids and their applications.
- Analyze the factors affecting the sound quality in a closed space using principles of Acoustics and use of Ultrasonic in various engineering applications.
- Explain and apply phenomena of interference, diffraction and Polarization in everyday activities.
- Explain the basic principles and applications of Lasers, photonics in engineering applications
- Describe the sources and systems of renewable energy: such as Solar energy, wind energy, ocean energy, Geo thermal energy, bio mass and bio fuels, Fuel cells
- Apply the knowledge of chemistry to solve problems related to water and its applications in diverse fields.
- Identify or develop suitable polymer based novel composite materials to explore synthetic processes for various engineering applications.
- Acquire knowledge related to various fossil fuels and their effective utilization to solve real world problems.
- Understand the kinematics of corrosion and related problems to explore the anti-corrosion process and alternate materials/solutions to increase the durability of various machinery and functional devices.
- Apply the knowledge of various advanced spectroscopic techniques and understand structure-property relationship to characterize novel materials for various engineering applications.

Course Code				Course Title							Category
21BTAS104				English Communication for Engineers							HSM
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
2	0	2	3	0	50	50	0	50	50	100	Nil

Prerequisite: Basic Proficiency in English at the Higher Secondary School Level

Course Objectives:

- To acquire social understanding and develop social skills and be able to greet and talk about likes and dislikes in formal as well as informal situations.
- To enrich the vocabulary of the students with the help of various word games and dictionary.
- To teach basic English grammar
- To familiarize the students with various sounds and sound patterns in English.
- To help students develop various strategies of reading, such as, skimming, scanning, analyzing, criticizing and to help them write effective texts.

Syllabus points

1. Introduction of Communication Skills
2. Importance of Listening Skills
3. Enriching Phonetics Skills
4. Basics of Conversational Skills
5. Vocabulary Building
6. Functional Grammar
7. Common Errors
8. Developing Speaking Skills
9. Introduction to Reading Skills
10. Introduction to Writing Skills

Course Outcomes:

- Students should be able to communicate fluently within and off campus. They should be able to implement the social skills, learnt in the classroom, in outside world.
- Students should be able to choose and employ suitable words of English language in day to day communication effectively.
- Students should be able to apply English Grammar rules correctly and effectively for error less communication.
- Students should be able to recognize and reproduce sounds of English and master the sound patterns in English to maintain the rhythm of the language.
- Students should be able to use the strategies of reading in their respective academic reading as well as writing.

Text Books:

1. Nitin Bhatnagar and Mamta Bhatnagar: Communicative English for Engineers and Professionals, Uttar Pradesh: Pearson.

References:

1. Dutt et.al. : A Course in Communication Skills, Foundation, 1st Edition
2. Lynch: Listening, Cambridge, 1st edition, ISBN- 0521707757
3. S. Aggarwal: Essential Communication Skills, Ane Books pvt. Ltd, ISBN- 8180522806
4. Jennings: Communication Basics, Cengage Learning, 1st edition, ISBN- 8131515206

Laboratory Objectives:

- To help students master the various techniques of communicating in professional world and enhance their listening skills.
- To help students use the knowledge of grammar and vocabulary of different varieties of English to communicate in their day to day life.
- To introduce students to the phonemic transcription of English sounds.
- To help students apply various techniques of reading to read comprehensions, reports, news articles, scientific texts, etc and write effective texts.

Practical 1: Role Plays

A task of handling social interactions, acting out scenarios to problem solve, story making through dramatic play and practice team building and group dynamics, decision making, leadership, analytical and creative thinking, group presentation while coping with real life situations.

Practical 2: Grammar/Common Errors

To provide opportunities to students to familiarize them with the grammar of English and help them in understanding grammatically correct sentences, phrases, words, etc.

Practical 3: Listening

Active Listening to Various Audio-Video clips with the use of Language software

Practical 4: Extempore

To test the knowledge of the students as well as their ability to express themselves in good words in a framed manner within a limited time.

Practical 5: Reading Comprehension

Reading Texts from GRE, TOFEL, IELTS texts by using skimming, scanning, intensive, extensive, analytical, critical reading techniques.

Practical 6: Writing Skills

Writing Paragraphs, Essays and Letters

Practical 7: Pronunciation and Phonemic Transcription

Identification of correct pronunciation of words by decoding phonemic scripts; writing phonemic transcriptions of the given words

Practical 8: Public Speaking

To provide students a platform to develop their confidence and communication skills for public speaking.

Practical 9: Film Review

Reviewing short Films shown in the language lab.

Practical 10: Tele -Video Conferencing

Tele-Video conferencing will help students to conduct meetings, presentations, etc. at their workplace.

Practical 11: Vocabulary Enrichment

Enriching their vocabulary for special purposes.

Practical 12: Riddles and Games

Laboratory Outcomes:

- Students should be able to take part in various discussions and put forth their knowledge by communicating effectively.
- Students should be able to choose and apply suitable words from different varieties of English language and apply grammar rules for effective communication.
- Students should be able to pronounce all words correctly with the help of phonetic transcriptions.
- Students should be able to read, interpret and reproduce texts effectively.

Text Books:

1. Raymund Murphy: Essential Grammar in Use, Cambridge, 3rd Edition

References:

1. Michael Swan: Practical English Usage, Oxford, 3rd Edition, ISBN-13: 978-0194420983

Course Code				Course Title							Category
21BTEC001				Basics of Electrical and Electronics Engineering							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	0	50	50	150	24/60

Prerequisite:
The Students should have knowledge of Mathematics, Physics and fundamentals of semiconductor physics.

Course Objectives:

- To understand fundamental operational concepts of DC and AC circuits along with various laws and theorems.
- To study electrical motor, generator and transformer.
- To study the characteristics and working of diode and transistor circuit.
- To study logic gates and their applications in combinational and sequential logic circuits.
- To understand working of transducers and their applications.

Syllabus points

1. To analyses circuit parameters using basics principles of D.C. Circuits and A.C. Circuits
2. Understanding fundamental operational concepts of DC and AC circuits along with various laws and theorems during different practical's session.
3. To discuss application of electrical machines like transformer and Motor
4. To understand the concepts using hands on Practical on single phase transformer.
5. To understand different basics building block elements of electronic circuits.
6. Design and describe basics electronic circuits with their applications like Rectifier, Regulated power supply (Battery Charger) etc.
7. To discuss different basics elements of digital electronics circuits.
8. Understand the basics digital electronics circuits during hands on practical session, like Adder subtractor etc.
9. Discuss working principle and construction of transducer.
10. To understand applications of various types of transducer like LVDT, RTD etc.

Course Outcomes:

- Understand and apply knowledge of circuit laws and network theorems to solve electrical networks.
- Understand fundamental concepts of electromechanical energy conversion for operation of electrical machines.
- Identify and describe electronic components and circuits with their applications (Diodes, BJT, and Rectifier).
- Design logic circuits and its implementation using logic gates.
- Understand working principle and applications of various types of transducer.

Text Books:

1. V. N. Mittle and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Second Edition)
2. Edward Hughes "Electrical and Electrical Technology", Pearson Education (Tenth edition)
3. S. K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Publication (Second Edition)

References:

1. V.K.Mehta and Rohit Mehta, "Principles of Electronics", S.Chand Publication
2. R.P.Jain, "Modern Digital Electronics" Tata McGraw Hill (Second edition).
3. A.P. Malvino, D.P. leach, G. Saha, "Digital principles and Applications", Tata McGraw Hill, (Seventh edition).
4. H. S. Kalsi, "Electronics Instrumentation" Tata McGraw Hill.
5. B.L.Theraja "Fundamentals of Electrical Engineering and Electronics", S.Chand (Reprint 2015)

List of Experiments (Minimum 8)

1. Verification of KCL and KVL in DC circuit.
2. Verification of Thevenin's theorem in DC circuit.
3. To study different types of transformer.
4. To find efficiency and regulation of single phase transformer using O.C. & S.C. test.
5. To study behavior of RLC series circuit.
6. Study of Regulated power supply.
7. Study of characteristics of BJT Common Emitter configuration.
8. Design & implementation of half adder and full adder circuit using logic gates.
9. Design & test simple application circuit using logic gates ICs.
10. Study of RTD sensor.
11. Measurement of strain using strain gauge.

Course Code				Course Title							Category
21BTCS101				Programming for Problem Solving							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria* w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
2	0	4	4	60	40	100	0	50	50	150	24/60
Prerequisite: Computer Fundamentals											

Course Objectives:

- To develop abilities to understand computer system and algorithmic requirements.
- To learn the fundamental programming concepts and methodologies which are essential to build good programs.
- To implement decision making, conditional branching & iteration problems.
- To develop an ability to write a computer program by using user defined data types and reusable modules for solving specified problems.
- To learn the good practices to build a robust program.

Syllabus points

1. Introduction to Components of Computer Systems.
2. Algorithm, flowchart & Pseudocode for program representation.
3. Program Development Phases.
4. Programming basic building blocks.
5. Implementation & execution of a Program.
6. Decision Making & Looping.
7. Array & Structures.
8. Functions.
9. Pointers.
10. File Handling.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition.

2. E. Balguruswamy, “Programming in ANSI C”, Tata Mc-Graw Hill

References:

1. Joyce Farell, “Programming Logic and Design- Comprehensive”, Sixth Edition, Cengage Learning.
2. Tony Gaddis, “Programming Logic & Design”, Third Edition, Pearson Education.
3. Herbert Schildt, “C – The Complete Reference”, Tata McGraw Hill Publishing Company,Fourth Edition,New Delhi, 2010.

Course Outcomes:

- Students will be able to understand the programming tasks using concepts learned and write pseudo-code.
- Students will be able to use pseudo-code and visual modeling to prepare clear and accurate program documentation and models.
- Students will be able to implement decision making, conditional branching, iteration, user defined data types and reusable modules for solving specified problems.
- Students will be able to identify concepts applicability and apply them to write optimized programs, and hence use computers effectively to solve the task.
- Students will be able to use common developer tools effectively and implement best practices to write professional-quality code.

Laboratory

Concept: Problem solving using computer

Lab 1: A: Execution of basic commands of Linux.

B: Familiarization with programming environment.

Concept: Variable, data types & operators

Lab 2: Write a C program to accept electricity bill details from the user such as name, address, customer ID, pin code, bill amount and month of bill and display the same.

Lab 3: Riya wants to learn basic calculation, help her for following operations by program:

Addition of 2 numbers

1. Subtraction of 2 numbers
2. Division operation of 2 numbers
3. Multiplication of 2 numbers
4. Find the remainder
5. Calculation of percentage

Concept: Branching and logical expressions

Lab 4: Time Calculator: Design a program that asks the user to enter a number of seconds, and works as follows:

1. There are 60 seconds in a minute. If the number of seconds entered by the user is greater than or equal to 60, the program should display the number of minutes in that many seconds.

2. There are 3,600 seconds in an hour. If the number of seconds entered by the user is greater than or equal to 3,600, the program should display the number of hours in that many seconds.

3. There are 86,400 seconds in a day. If the number of seconds entered by the user is greater than or equal to 86,400, the program should display the number of days in that many seconds.

Concept: Loops: While, do-while & for loops:

Lab 5: Calculating the factorial of a number in mathematics, the notation $n!$ represents the factorial of the non-negative integer n. The factorial of n is the product of all the non-negative integers from 1 up through n. For example:

$$7! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 = 5{,}040 \text{ and}$$

$$4! = 1 \times 2 \times 3 \times 4 = 24$$

Design a program that asks the user to enter a non-negative integer and then displays the factorial of that number.

Lab 6: Average Rainfall

Design a program that uses nested loops to collect data and calculate the average rainfall over a period of years. The program should first ask for the number of years. The outer loop will iterate once for each year. The inner loop will iterate twelve times, once for each month. Each iteration of the inner loop will ask the user for the inches of rainfall for that month. After all iterations, the program should display the number of months, the total inches of rainfall, and the average rainfall per month for the entire period.

Concept: 1D Array

Lab 7: Watson Elementary School contains 10 classrooms numbered 1 through 10. Each classroom can contain any number of students up to 12. Each student takes an achievement test at the end of the school year and receives a score from 0 through 100. Write a program that accepts data for each student in the school—student ID, classroom number, and score on the achievement test. Design a program that lists the total points scored for each of the 10 classrooms.

Concept: String Operation

Lab 8: Color Mixer

The colors red, blue, and yellow are known as the primary colors because they cannot be made by mixing other colors. When you mix two primary colors, you get a secondary color, as shown here:

▪ When you mix red and blue, you get purple.

▪ When you mix red and yellow, you get orange.

▪ When you mix blue and yellow, you get green.

Design a program that prompts the user to enter the names of two primary colors to mix. If the user enters anything other than "red," "blue," or "yellow," the program should display an error message. Otherwise, the program should display the name of the secondary color that results.

Concept: Structure

Lab 9: An automobile company has serial numbers for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.

1. Specify a structure to store information corresponding to a part.
2. Write a program to retrieve information on parts with serial numbers between BB1 and CC6.

Concept: Function

Lab 10: Create a program that calls a method that computes the final price for a sales transaction. The program contains variables that hold the price of an item, the salesperson's commission expressed as a percentage, and the customer discount expressed as a percentage. Create a calculatePrice() method that determines the final price and returns the value to the calling method. The calculatePrice() method requires three arguments: product price, salesperson commission rate, and customer discount rate. A product's final price is the original price plus the commission amount minus the discount amount. The customer discount is taken as a percentage of the total price after the salesperson commission has been added to the original price.

Concept: Pointer

Lab 11: Take two numbers from the user in two variables and interchange their addresses by means of an external module. Display the result from the main function.

Concept: File Handling

Lab 12: Write a program to read a file and display contents with its line numbers.

Apart from these assignments, topic specific additional programs can be given to students for practice.

References

1. https://ubuntu.com/tutorials/command-line-for-beginners
2. E. Balguruswamy, “Programming in ANSI C”, Tata Mc-Graw Hill

Laboratory Outcomes:

- To be able to formulate the algorithms for simple problems.
- To be able to identify & correct different types of errors in a program.
- To be able to write conditional statements, iterative as well as recursive programs
- To be able to use arrays, strings, structures, functions & pointers to implement any real world application.
- To be able to create, read & write operations to & from simple text files.

Course Code				Course Title						Category
21BTAS203				Ordinary Differential Equations and Advanced Calculus						BSC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	1	0	4	60	40	100	0	0	0	100	24/60

Prerequisite: Basics of limit, differentiability and integrability, tangent and normal. Simple curves.

Course Objectives:

The main purpose of this course is to:

- Understand solution of differential equations and its applications.
- Study partial differentiation and its applications.
- Trace the curve of any function and use it for different applications.
- Evaluate multiple integrals and applying them to compute area and volume.
- Incorporate the knowledge of Differential equations and calculus to study engineering applications.

Syllabus points

1. Formation of differential equations and Solution of First order differential equations.
2. Orthogonal Trajectories.
3. Applications of first order differential equations – Newton's law of cooling, rectilinear motion.
4. Applications of first order differential equations – Electric circuits, Heat flow and others.
5. Introduction to partial differentiation and Euler's Theorem.
6. Applications of partial differentiation - Jacobians, Maxima Minima of a function.
7. Integral calculus - DUIS and Error function.
8. Curve Tracing and rectification of curves.
9. Multiple integrals – Double and Triple integrals.
10. Applications of Multiple integrals – Area, Volume, Centre of Gravity, Moment of Inertia and others.

Course Outcomes:

After learning this course, students shall be able to:

- Apply concept of differential equations in daily life.
- Understand partial differentiation and apply to technical applications.
- Trace curve of any equation and also find its arc length.
- Evaluate multiple integrals and apply these concepts to find area, volume, moment of inertia and centre of gravity.

- Embrace the concepts of differential equations and calculus in different fields.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 10th edition.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus", Pearson Education, 12th edition.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication.

Reference Books

1. K.D Joshi, "Calculus for Scientists and Engineers", CRC Press.
2. Sudhir Ghorpade and Balmohan Limaye, "A Course in Calculus and Real Analysis" (1st edition) Springer-Verlag, New York.
3. C.R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publications, New Delhi.
4. Peter V. O' Neil, "Advanced Engineering Mathematics (7th edition)", Thomson Brooks / Cole, Singapore.
5. Shanti Narayan, "Differential Calculus", S. Chand and company, New Delhi
6. George Simmons, "Differential Equation with Applications", (2^{nd} edition) McGraw-Hill Education (India) Private Limited, New Delhi.

Course Code				Course Title							Category
21BTCS202				Digital Electronics & Logic Design							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)

Prerequisite: Basic Electrical & Electronics Engineering (BEEE).

Course Objectives:

- To make the students to build basic foundation about number system and Boolean algebra
- To understand the functionality of the combinational logic circuits.
- To study and understand the functionality of the Sequential logic design.
- To understand various memory design of a digital computer.
- To understand and compare the functionalities, properties of digital logic families.

Syllabus points

1. Fundamentals of Digital Electronics
2. Number systems & Boolean Algebra
3. Combinational Logic Design
4. Logical Functions(SOP/POS)
5. Design of Combinational Circuits
6. Sequential Logic Design
7. Design of Flip-Flop, counter, registers, etc
8. Memory & Programmable logic Devices
9. Digital Logic Families

Text Book:

1. Morris Mano. M, “Digital Design ", Prentice-Hall of India, New Delhi, 2006.
2. R. P. Jain, “Modern Digital Electronics”, 4th edition, Tata McGraw Hill Publication, 2010.

References:

1. Tokheim R L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill Publishing Company, New Delhi, 2001.
2. William I Fletcher, “An Engineering Approach to Digital Design ", Prentice-Hall of India, New Delhi, 1996.
3. Floyd. T. L, “Digital Fundamentals ", Pearson Education, Eighth Edition, New Delhi, 2009.

List of Experiments: (Perform at least any 8)

1. Design and testing of code converters for BCD to Gray conversion.
2. Design and testing of BCD to Excess- 3 code converters.
3. Implementation of the Given Boolean Function using Logic Gates in Both SOP and POS Forms.
4. Design and testing of magnitude comparator.
5. Design and testing of Multiplexers/ Demultiplexers.
6. Design and testing of shift registers using D flip flops.
7. Design and testing of ring counter and Johnson counter.
8. Design and testing of Asynchronous counter.
9. Design and testing of Synchronous counter.
10. To conduct an experiment to store a set of data in a RAM using IC2114.
11. Verify four voltage and current parameters for TTL and CMOS.

Laboratory outcomes:

After successful completion of the course student will be able to

- Develop a digital logic and apply it to solve real life problems.
- Analyze, design and implement combinational & sequential logic circuits.
- Classify different semiconductor memories as per requirement for different applications.
- Analyze digital system design using PLD.
- Design Digital systems using different Integrated circuit technologies.

Text Book:

1. Morris Mano. M, “Digital Design ", Prentice-Hall of India, New Delhi, 2006.
2. R. P. Jain, “Modern Digital Electronics”, 4th edition, Tata McGraw Hill Publication, 2010.

References:

1. Tokheim R L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill Publishing Company, New Delhi, 2001.
2 William I Fletcher, “An Engineering Approach to Digital Design ", Prentice-Hall of India, New Delhi, 1996.
3. Floyd. T. L, “Digital Fundamentals ", Pearson Education, Eighth Edition, New Delhi, 2009.

Course Code				Course Title							Category
21BTEC202				Electronic Devices & Circuits							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)

Prerequisite: Basic Electronics

Course Objectives:

- To study the behavior of BJT and small signal analysis.
- To study JFET with its characteristics and various biasing schemes as a foundation of JFET amplifier and DC analysis.
- To study MOSFET device and its various configurations and fundamentals of MOSFET amplifier.
- To study operational amplifier and its linear, non-linear applications.
- To study different operational modes of multivibrators and their applications.

Syllabus points

1. Comprehensive understanding of transistor basics and small signal parameters.
2. Understanding of difference between BJT and JFET with their applications.
3. Construction, working, and device parameters of JFET.
4. Understanding the effects of various biasing arrangements on device parameters
5. Insight of construction, working, device parameters and merits of MOSFET
6. Understanding the equivalent circuit and different configurations of MOSFET
7. Understanding OPAMP construction, differential mode operations in linear and nonlinear areas.
8. Acquaintance with timer IC's operational modes and its various applications.

Course Outcomes:

Successful completion of the course leads to:

- Comprehensive understanding of transistor basics and small signal parameters.
- Understanding of difference between BJT and JFET, effects of various biasing arrangements on device parameters.
- Insight of construction, working, device parameters and merits of MOSFET with its equivalent circuit and configurations.
- Understanding OPAMP construction, differential mode operations in linear and non-linear areas. Acquaintance with timer IC's operational modes and applications.

Text Books:

1. R. L. Boylestad, L. Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Prentice Hall of India, 2006.
2. Thomas Floyd, "Electronic Devices", Prentice Hall, 9th Edition 2012
3. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education 2000

References:

1. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford press.
2. Albert Paul Malvino, "Electronic Principles", 8th Edition, McGraw Hill Publication.
3. Anil K. Maini and Varsha Agarwal "Electronic Devices and Circuits", Wiley India
4. Millman, Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGrawHill, 2000.

Laboratory Objectives:

- To study construction, operation, and characteristics of semiconductor devices.
- To study DC analysis and its requirements.
- To study linear integrated circuit and its applications.
- To introduce operating parameters of basic semiconductor device circuits.

List of Experiments (Minimum 8)

1. To plot transistor I/O characteristics in CE, CB, and CC configurations.
2. To study and comparison of transistor biasing circuit.
3. To plot V-I characteristics of JFET.
4. To calculate A_V, R_i, R_{out} of CE amplifier with and without C_E.
5. To study Transistor as a Switch.
6. To compare biasing circuits of JFET.
7. To plot V-I characteristics and DC load line of MOSFET.
8. To study inverting and non-inverting amplifier using OPAMP.
9. To study summing and difference amplifier using OPAMP.
10. To study Astable multi-vibrator using IC 555 and calculate duty cycle and frequency of output.
11. To study instrumentation amplifier.

Laboratory Outcomes:

Successful completion of the course leads to:

- The understanding of operation, and relationship between input and output signals.
- Insight of biasing requirements and its types of semiconductor devices for various applications.
- Learning the need and working of operational amplifier circuit in various applications. They will also get an insight of working, construction of timer IC.
- Understanding basic analysis in terms of various circuit parameters of semiconductor devices.

Course Code				Course Title							Category
21BTCE202				Applied Mechanics							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)

Prerequisite: Basic Physics and Mathematics

Course Objectives:

- To study force and its characteristics.
- To study applications of statics in trusses and friction.
- To study applications of mechanics in surfaces and volumes properties such as Centroid, CG, MI etc.
- To study dynamics of particles and rigid bodies.

Syllabus points

1. Resultant of Coplanar Force System
2. Equilibrium of Force System
3. Analysis of Friction force
4. Centre of Gravity
5. Moment of Inertia
6. Analysis of Truss Structure
7. Kinematics of particle
8. Kinetics of Particle

Course Outcomes:

- Students will be able to understand characteristics of forces and moments and some fundamental theorems of mechanics.
- Students will be able to draw free body diagrams of the system.
- Students will get insight of trusses and friction and their analysis.
- Students will get understanding of properties of surface and volume.
- Student will understand dynamics of particles and rigid bodies.

Text Books:

1. Timoshenko, and Young, Engineering Mechanics, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988
2. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, Vector Mechanics for Engineers: Statics and Dynamics , McGraw - Hill, New Delhi, Tenth Edition 2013

3. Palanichamy, M. S., and Nagan, S., Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill, New Delhi Eighth reprint 2011(Third edition)
4. R. C. Hibbeler, Engineering Mechanics: Statics, Pearson, 2013 - Technology & Engineering.

References:

1. Mclean, and Nelson, Theory and problems of Engineering Mechanics (Statics and Dynamics), 3rd Edition Schaum Series, 1980
2. Rajasekaran, S., &Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Pvt Ltd, 2011
3. Shames, I.H., and Krishna Mohana Rao, G., Engineering Mechanics (Statics and Dynamics), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006

It is a representative list of practical with minimum seven experiments. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Determination of resultant of coplanar concurrent force system by law of polygon of forces.
2. Determination of reactions at the supports of simple supported beam.
3. Determination of forces in the members of Jib crane.
4. Determination of coefficient of friction between inclined glass planes and different blocks.
5. Determination of coefficient of friction between belt and fixed drum.
6. Determination of ‘g’ by compound pendulum.
7. Determination of moment of inertia of flywheel.
8. Demonstration of direct central impact
9. Verification of Virtual Work Principle
10. Determination of Beam Reactions of a compound beam
11. Study of curvilinear motion
12. Determination of coefficient of restitution

Course Code				Course Title							Category
21BTIT202				Digital Electronics and Microprocessors							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)
Prerequisite: Basics of Electrical and Electronics Engineering											
Course Objectives: ➢ To learn and understand basic digital design techniques. ➢ To develop design and implementation skills of combinational and sequential logic circuits ➢ To understand the basic functioning of microprocessor and to learn assembly language programming.											

Syllabus points

1. Fundamentals of Digital Electronics
2. Number systems & Boolean Algebra
3. Combinational Logic Design
4. Logical Functions(SOP/POS)
5. Design of Combinational Circuits
6. Sequential Logic Design
7. Design of Flip-Flop, counter, registers, etc
8. Memory & Programmable logic Devices
9. Digital Logic Families

Course Outcomes:

- Spectacle an awareness and apply knowledge of TTL and number systems.
- Understand codes and the functioning of Mux and Demux.
- Analyze as well as design Combinational and sequential logic circuits.
- To demonstrate the use various system programs such as an assembler, linker and loader.
- Ability to program the microprocessor using an assembly language

Text Books:

1. R.P. Jain, “Modern Digital Electronics”, Tata McGraw-Hill, 3rd Edition, ISBN: 0–07–049492–4.
2. Douglas V Hall, “Microprocessors and Interfacing”.

3. A. Ray, K. Bhurchandi, ”Advanced Microprocessors and peripherals: Arch, Programming & Interfacing”, Tata McGraw Hill,2004 ISBN 0-07-463841-6

Reference Books:

1. Flyod, “Digital Principles”, Pearson Education, ISBN: 978-81- 7758-643-6.

2. M Morris Mano, “Digital Design”, Prentice Hall, 3rd Edition, ISBN: 0130621218.

3. A.P. Malvino, D.P. leach, G. Saha, “Digital principles and Applications”, Tata McGraw Hill, (Seventh edition).

4. Walter A .Tribel, Avtar Singh, “The 8088 And 8086 Microprocessors Programming. Interfacing, Software, Hardware Applications”, PHI Pulication, 4th Edition.

5. Barry B Brey, The Intel Microprocessors .Pearson, Eight Ed. 2009

Assignment List

1. Study of BCD and Excess-3 codes and their conversion.

2. Study of IC 7474 and 7476

3. Design & Implement MOD –N counter and draw Timing diagram.

4. Design & Implement 4 bit Shift register.

5. Write an Assembly Language Program (ALP) to add ten numbers stored in memory at consecutive locations.

6. Write an Assembly Language Program (ALP) to compare and concatenation strings

7. Write an Assembly Language Program (ALP) for reversing the strings/numbers

8. Study of 8086 interfacing with 8255

Course Code				Course Title							Category
21BTME202				Basic Mechanical Engineering							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)

Prerequisite: Engineering Mathematics, Engineering Science

Course Objectives:

The student will able to

- Conversant with engineering knowledge of various mechanical elements, mechanism and different power transmission systems
- Study and understanding of various manufacturing processes.
- Study and understanding of various machine tools operations.
- Develop fundamental concepts of thermodynamics and its applications.
- Extend analytical competency in various material testing methods.

Syllabus points

1. Conversant with engineering knowledge of various mechanical elements and their applications
2. Conversant with basics of mechanisms, its types and applications.
3. Understand different power transmission systems and their applications.
4. Study and understand various manufacturing processes and their applications.
5. Study and understand of various machine tools, their types and operations performed.
6. Develop fundamental concepts of thermodynamics and its applications in the field of engineering.
7. Develop fundamental concepts of power producing and power absorbing devices.
8. Study Mechanical behavior and different properties of materials
9. Extend analytical competency in various material testing methods.

Course Outcomes:

The student will be

- Conversant with engineering knowledge of various mechanical elements, mechanism and different power transmission systems
- Study and understanding of various manufacturing processes.

- Study and understanding of various machine tools operations.
- Develop fundamental concepts of thermodynamics and its applications.
- Extend analytical competency in various material testing methods.

Text Books:

1. Elements of Mechanical Engineering, D.S Kumar, S.K Kataria and Sons.
2. Basics of Mechanical Engineering, R.K Rajput Laxmi Publications, Delhi.
3. Basic Mechanical Engineering, Shanmugam, Ravindran, Tata-McGraw Hill Publications.
4. Elements of Workshop Technology, Vol. I & II, Hajra & Chaudhari, Media Promoters & Publishers Pvt. Ltd.
5. Design of Machine Elements, V.B. Bhandari, Tata-McGraw Hill Publications.
6. Material Science and Metallurgy for Engineers, V.D. Kodgire, Everest Publishing House.
7. A Course in Thermal Engineering, Domkundwar, Kothandaraman, Dhanpat Rai& Co.

Reference Books:

1. Engineering Thermodynamics, P. K. Nag, Tata-McGraw Hill Publications
2. Mechanical Engineering Design, Joseph E Shigley, Charles R Mischke, Tata-McGraw Hill Publications
3. Workshop Technology Vol. I, II & III, Chapman A.J.
4. Manufacturing Engineering & Technology, Kalpakjian & Schmid, Pearson
5. Theory of Machines, S S Ratan, Tata-McGraw Hill Publications
6. Material Science and Engineering, William D Callister, John Wiley and sons.

List of Experiments:

1. Study of four bar mechanism/slider crank mechanism through lab demonstration.

2. Study of the practical application of specific machine element/power transmission drive (Visit Report).

3. Dismantling and Assembly of specific mechanical device.

4. Study of any one machining operation through workshop demonstration.

5. Prepare and present any one machining operation through PPT.

6. Study of I.C. Engine (SI and CI Engine) through lab demonstration.

7. Determine Hardness of given material using Brinell and Poldi hardness test.

8. Determine Toughness of given material using impact test.

Course Code				Course Title							Category
21BTAE202				Engineering Mechanics							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
3	0	2	4	60	40	100	30	20	50	150	24/60 (Th) & 12/30 (Pr)

Prerequisite: Basic Physics and Mathematics

Course Objectives:

- To study force and its characteristics.
- To study applications of statics in trusses and friction.
- To study applications of mechanics in surfaces and volumes properties such as Centroid, CG, MI etc.
- To study dynamics of particles and rigid bodies.

Syllabus points

1. Resultant and Equilibrium of various system of Forces
2. Moment, Couple and their applications
3. Method of Joints for Truss Analysis
4. Method of sections for truss Analysis
5. Single body static friction
6. Multibody static Friction
7. 2D Area Properties - Centroid
8. 2D Area Properties - Area Moment of Inertia
9. D'Alembetrz's Principle
10. Impulse Momentum Principle

Course Outcomes:

- Students will be able to understand characteristics of forces and moments and some fundamental theorems of mechanics.
- Students will be able to draw free body diagrams of the system.
- Students will get insight of trusses and friction and their analysis.
- Students will get understanding of properties of surface and volume.
- Student will understand dynamics of particles and rigid bodies.

Text Books:

1. Timoshenko, and Young, Engineering Mechanics, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988

2. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, Vector Mechanics for Engineers: Statics and Dynamics , McGraw - Hill, New Delhi, Tenth Edition 2013
3. Palanichamy, M. S., and Nagan, S., Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill, New Delhi Eighth reprint 2011(Third edition)
4. R. C. Hibbeler, Engineering Mechanics: Statics, Pearson, 2013 - Technology & Engineering

References:

1. Mclean, and Nelson, Theory and problems of Engineering Mechanics (Statics and Dynamics), 3rd Edition Schaum Series, 1980
2. Rajasekaran, S., &Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Pvt Ltd, 2011
3. Shames, I.H., and Krishna Mohana Rao, G., Engineering Mechanics (Statics and Dynamics), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.

Any eight experiments

1. Verification of triangle law and parallelogram law of forces
2. Verification of law of polygon of forces
3. Support reactions of simple / compound beam
4. Determination of coefficient of friction of inclined plane / belt
5. Study of curvilinear motion
6. Determination of coefficient of restitution
7. To verify principle of moments using bell crank lever apparatus
8. To estimate the value of gravitational acceleration using compound pendulum
9. To determine moment of inertia of fly wheel
10. Verification of Centroid of Different Laminae
11. Verification of Conditions of Equilibrium for A System Of Forces
12. Verification of Axial Forces In The Members of a Truss
13. Verification of Newton’s Law of Motion
14. Verification of Angular Acceleration of A Rolling Disc on an Inclined Plane

Course Code				Course Title							Category
21BTAE107				Thermodynamics							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
2	0	0	2	30	20	50	0	0	0	50	12/30

Prerequisite: Basic Physics

Course Objectives:

- To study the basic laws of thermodynamics.
- To study heat and work interaction.
- To study applications of laws of thermodynamics in air standard cycles.
- To study the applications of thermodynamics in refrigeration and air condition.
- To study thermodynamics of fuels and combustion.

Syllabus points

1. Laws of thermodynamics
2. Entropy, Clausius equality and inequality
3. Air Standard Cycles - efficiency and mean effective pressure
4. Comparison of Otto, Diesel and Dual cycle
5. Properties of steam and steam processes
6. Vapour processes and power cycles
7. Refrigerants, vapour compression and absorption cycles
8. Air-conditioning, psychrometry
9. Fuels and combustion - stoichiometry
10. Fuel calorific value and flue gas analysis

Course Outcomes:

- Students will get comprehensive understanding laws of thermodynamics.
- Students will understand difference between heat and work and its interaction.
- Students will get insight about thermodynamics law by means of its applications.
- Students will understand refrigeration and air condition concepts. They will also be acquainted with knowledge of fuels and combustion.

Text Books:

1. R. K. Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications
2. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications
3. R.S. Khurmi, J. K. Gupta, A textbook of Thermal Engineering, S. Chand & Company Publication
4. R.S. Khurmi, A textbook of Refrigeration and Air conditioning, S. Chand & Company Publication

References:

1. Y. Cengel & Boles: Thermodynamics – An Engineering Approach,
2. P. L Ballany: Thermal Engineering, Khanna Publishers
3. C.P. Arora: Engineering Thermodynamics, Tata McGraw Hill.
4. S. Domkundwar, C. P. Kothandaraman, Anand Domkundwar, Thermal Engineering, Dhanpat Rai Publishers.

Course Code				Course Title							Category
21BTAE251				Material Engineering and Aerospace Materials (Audit course-Aero)							Audit
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
2	0	0	0	0	0	0	0	0	0	0	0

Prerequisite: Chemistry and Physics

Course Objectives:

- To understand the knowledge of phase diagram of metals.
- Evaluate and classify iron carbon alloy system and its applications.
- Identify the suitable heat treatment processes for different steels.
- Identify the suitable destructive test to select proper material for specific application.
- To understand the basic knowledge of magnetic material.
- To study modern materials used in aerospace sector and their properties.

Syllabus points

- Study of metals and alloys formed and how the properties change due to microstructure
- Phase diagrams and their uses, Applications of Hume Ruther's rules, Gibbs phase rule.
- Concepts in Engineering Metallurgy to modify microstructures and properties of materials
- Materials for design and construction depending on properties of various materials.
- Concepts of heat treatments to solve engineering problems
- Tensile Test and plastic deformations & Various Hardness Tests
- Techniques necessary for modern materials engineering practice
- Ferrous and non-ferrous metals for high temperature and aerospace applications
- Proper material for aerospace applications depending on their properties.

Course Outcomes:

- Students will be able to get insight of phase diagram of metals.
- Student will be able to get understanding of iron carbon alloy system and various heat treatment methods.
- Students will be able to select proper materials for different applications by means of various test.
- Students will get understanding of magnetic materials.
- Students will understand the material requirement in aerospace field and properties of various

modern materials.

Text Books:

1. Raghavan, V. “Physical Metallurgy: Principles and Practice”, Phi Learning (2009).
2. Balasubramaniam, R. “Callister's Materials Science and Engineering”, Wiley India Pvt. Ltd.(2014).
3. Palanisamy P.K., “Materials Science”, Scitech (2013).
4. Polmear, I. J., Light Alloys: From Traditional Alloys to Nanocrystals, 4th ed., Elsevier (2005).

References:

1. Raghavan, V. “Materials Science and Engineering”, Printice Hall of India (2007).
2. Shackelford, J.F. “Introduction to Materials Science for Engineers”. Pearson India (2006).
3. Donald Askeland. “Materials Science and Engineering”, Brooks/Cole (2010).
4. Smith, W.F., Hashemi, J. and R.Prakash. “Materials Science and Engineering”,TataMcgrawHill Education Private Limited (2014).
5. Cantor, B., Assender, H., and Grant, P. (Eds.), Aerospace Materials, CRC Press (2001).
6. ASM Speciality Handbook: Heat Resistant Materials, ASM International (1997).

Course Code				Course Title							Category
21BTME001				Engineering Graphics							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
1	0	4	3	0	0	0	50	50	100	100	20/50

Prerequisite: Geometry, Mathematics, Elementary Drawing

Course Objectives:

- Develop imagination of Physical Objects to be represented on Paper for Engineering Communication.
- Develop the drawing Skills, drawing interpretation Skills by using Modern Engineering tools required for industrial practice.
- Develop the physical realization of the dimensions of the objects

Syllabus points

1. Develop imagination of physical objects to be represented on paper for engineering communication.
2. Develop the drawing Skills, drawing interpretation Skills by using Modern Engineering tools like AutoCAD required for industrial practice.
3. Develop the physical realization of the dimensions of the objects
4. Imagine and Solve Problems on Projections of lines & planes inclined to both reference planes
5. Develop the physical realization of basic solid types and its orientation w.r.to reference planes.
6. Imagine and draw development of lateral surfaces of Solids.
7. Understand the 3D object and can draw orthographic projections of the same.
8. Visualize the 3D object from given orthographic projection and draw the isometric projections.
9. Draw various engineering curves and understand its importance in the field of engineering.

Practical Content

Practical assignments should be sketched on computer by using any one drafting package and printouts on A3 size paper should be submitted at the end of semester as a part of Continuous Assessment.

Assignment No. – 1 Projection of lines and planes (2 problems of each)
Assignment No. – 2 Projections of solids and development of solids (2 problems of each)
Assignment No. – 3 Orthographic projections (2 Problems)
Assignment No. – 4 Isometric projections (2 Problems)
Assignment No. – 5 Engineering Curves (any 4 curve problems)

Important Note: The problems solved by students of each batch should be preserved batch wise in soft form.

Course Outcomes:

After learning this course, students will be able to:

- Imagine physical objects represented on paper.
- Apply knowledge of drawing Skill, drawing interpretation Skill for engineering communication.
- Use modern engineering tools required for engineering practices.
- Represent the physical objects by its shape, size and position.

Text Books

1. N. D. Bhatt, "Elementary Engineering Drawing", Chartor Publishing house, Anand, India.
2. D. N. Johle, "Engineering Drawing", Tata McGraw-Hill Publishing Co. Ltd.
3. K. L. Narayana and P. Kannaiah,"Textbook on Engineering Drawing", Scitech Pub, 2010.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

Reference Books

1. P. S. Gill, "Engineering Graphics", S K Kataria and Sons, Reprint 2013 edition (2013)
2. N. D. Bhatt, "Machine Drawing", Chartor Publishing House, Anand, India.
3. Warren J. Luzzader, "Fundamentals of Engineering Drawing", Prentice Hall of India, New Delhi.
4. (Corresponding set of) CAD Software Theory and User Manuals

Course Code				Course Title							Category
21BTIC003				Engineering Workshop							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
0	0	4	2	0	0	0	0	50	50	50	Nil
Prerequisite: Electrical & Electronics Engineering											

Course Objectives:

- Create awareness of all Engineering Branches.
- Students could do troubleshooting and maintenance of Electronics and Computer hardware on their own.
- Create inclination of students in project development.

COURSE CONTENT ECE, CSE and IT Branches

PART A) COMPUTER

Activity I: Introduction to PC Hardware Components (2)

1. Student or group of students have to study and identify different types of Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, Fiber Cable, Hard Disk, RAM, CMOs Battery, SMPS, Cache, ROM, BIOS.
2. Assemble a Desktop PC from its components.

Activity II: Introduction to Softwares (6)

1. Student or group of students have to study Various Operating Systems, Various Text Editors, Various Internet Browsers, Linux Commands, Photoshop.
2. Install above mentioned softwares in Windows and Ubuntu.
3. Install any two latest version of the operating system on a PC and make it dual boot.

Activity III: Proper typing with all fingers for good speed (2)

Introduction to keys on keyboard, position and fingers used to press keys. Students have to practice typing to achieve speed up to 30 words/min.

Activity IV: Introduction to Networking (4)

1. Study of types of Networks, LAN, DNS, Server-Client, Router, Hub, Switch, Website, Web Server.
2. Study and check the output of various Network Commands, Application of ssh, telnet, ftp, winscp, ping, http, https, Various Search Engines.
3. Prepare patch Cable using a crimping tool.
4. Prepare a Small Network of 4-5 PCs using switch, LAN cable and crimping tool.

Activity V: Use of Development Platform for Project **(4)**

1. Setup working desktop system using any development board.
2. Download the OS image from the web. Install operating system on board.

PART B) ELECTRONICS

A group of students have to select one activity from the list given below. Every activity consists of 4 Assignments. Students have to perform each assignment in the lab session. At the end of semester group of students have to submit a prototype of Project as a part of the final submission.

Project I: Water Level Indicator

1. To build and test 9v DC regulated power supply on beard board. **(4)**
2. To build and test water level indicators using BJT on beard board. **(4)**
3. To build printed circuit board for RPS and water level indicator. **(4)**
4. Assemble of complete circuit of water level indicator. **(6)**

Project II: Soil condition monitoring (Temperature) sensors for agriculture.

1. To build and test 5V DC regulated power supply on beard board. **(4)**
2. To build printed circuit board for RPS. **(4)**
3. Write and test code in Ardino for temperature sensor. **(4)**
4. Interface LCD with Ardino and assemble of complete circuit of temperature sensor for agriculture. **(6)**

Project III: Moisture condition monitoring for agriculture.

1. To build and test 5V DC regulated power supply on beard board. **(4)**
2. To build printed circuit board for RPS. **(4)**
3. Write and test code in Ardino for moisture sensor. **(4)**
4. Interface LCD with Ardino and Assemble of complete circuit of moisture condition monitoring for agriculture on plywood. **(6)**

Project IV: Intruder alarm system

1. To build and test 9v DC regulated power supply on beard board. **(4)**
2. To build and test alarm circuit using LDR & IC555 on beard board. **(4)**
3. To build printed circuit board for RPS and Alarm circuit. **(4)**
4. Assemble of complete circuit of intruder alarm system. **(6)**

Project V: Student can select any day to day life problem statement with the proper knowledge of that scenario and prior approval of instructor/ Course coordinator. Instructor/ course coordinator will approve problem statement after checking feasibility of problem statement, technology support, applicability and students approach. Instructor/ Course coordinator have to distribute problem

statement into 4 clear assignments as mentioned in Project I to IV. **(18)**

PART C) Workshop

Activity I: Plastic Machine **(4)**

Student or group of students have to prepare plastic wheels, gears, assembly platforms, etc.

Activity II: Carpentry and Electrical **(6)**

Students or group of students have to prepare an electrical switch board. This activity includes:

1. Cutting and pasting wooden sheet to prepare a board.
2. Cutting squares and making holes.
3. Fitting electric switches, sockets, dimmer, voltage indicator, fuse, etc.
4. Connecting wires to make working electric switch board.

Activity III: Tin Smithy **(6)**

Students or group of students have to prepare tin base platform for assembling electrical, electronics and computer components to make working project prototype.

Hardware and Software Resource:

Computer Workshop:

PC Hardware Components: Motherboard, Processor, SMPS, RAM, DVD-RW drive, Hard Disk, Power Cables, Data Cables, VGA/HDMI connectors, keyboard, Mouse(PS2/USB), Cabinet, LED Display.

IoT Kit: Raspberry Pi, Micros SD card, Plastic case, Power Adapter, HDMI Cable, RCA Video/Audio Cable, Cat5 Cable

Network Tools: Hub (4/8 ports), CAT 5/6 cable, Crimper, Cable Tester, Wire Stripper.

List of Major Equipment/ Instrument

i. Function Generator
ii. Multimeter, Transformer, fuses, Auto transformer
iii. Cathode Ray Oscilloscope
iv. D.C. Power supplies
v. Digital trainer Kits
vi. DSO
vii. Consumable materials (Bread board Wire, resister, capacitor, inductor, ICs etc.)

Course Outcomes:

Students will demonstrate the ability to

- Identify, handle and use various electronic components, devices and instruments with “What it is” and “How it works” insight, towards skill development.

- Build and test a hobby class electronic circuit, with flavor of small real life application, on printed circuit board.
- Get introduced to various computer system hardware components, peripherals and terminologies frequently used in software and software world and acquire proficiency in handling them.
- Build a dual boot machine by installing different operating systems on it and install software on various operating systems including GNU/Linux and Microsoft Windows.
- Create basic networking steps using 2-4 PCs and networking hardware.
- Troubleshoot day to day life problems on personal computers, including issues related to: Network connection, display, Power-on, Software configuration, Software Network setup, etc.

Text Books

1. Other Learning Resources Practical Semiconductor Data manuals: BPB Publications; New Delhi

2. Some electronics engineering magazines.

COURSE CONTENT Civil, Mechanical Branches

Workshop

Practicals: (10 hours)

Detailed contents

1. Fitting operations & power tools (10 lecture)

2. Carpentry (10 lecture)

3. Tin Smithy (10 lecture)

Course Outcomes:

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

1. Fitting shop (10 hours)

2. Carpentry Shop (10 hours)

3. Tin Smithy Shop (10 hours)

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

Laboratory Outcomes:

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

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.

(iii) Gowri P. Hariharan and A. Suresh Babu,”Manufacturing Technology – I” Pearson Education, 2008.

(iv) Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.

(v) Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Code				Course Title							Category
21BTAE151				Workshop Practice (Audit Course-Aero)							Audit
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
0	0	4	0	0	0	0	0	0	0	0	0

Prerequisite:

Course Objectives:

1. To learn the basics of workshop practices being used in Aerospace Industry.
2. To make simple models of aerofoils, wings and other aerodynamic shapes using workshop practices
3. To make lap and butt joints for sheet metal wings
4. To make simple models of aerospace domain using workshop practices

COURSE CONTENT

Aerospace Branch

1. Making of a NACA 0012 or 0015 aerofoils (Symmetric)
2. Making of a NACA 2412 or 2415 aerofoils (Cambered)
3. Making of a wing using sheet metal
4. Making of Lap joints using sheet metal and rivets
5. Making of Butt joints using sheet metal and rivets
6. Making of winglets of different shapes
7. Making of helicopter rotor blades
8. Making of propeller
9. Making of pitot tube
10. Making of a chart / board of civil aircrafts
11. Making of a chart / board of military aircrafts
12. Making of a chart / board of Indian Launch Vehicles
13. Aircraft Wood Gluing practice

Course Code				Course Title							Category
21BTCS202				Object Oriented Programming							ESC
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w. r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
2	0	2	3	60	00	60	0	40	40	100	24/60

Prerequisite: Computer Fundamentals

Course Objectives:

The main objectives of the course are to:

- To explore the principles of Object Oriented Programming (OOP).
- To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism.
- To use the object-oriented paradigm in program design.
- To lay a foundation for advanced programming.

Syllabus points

1. Procedure oriented Programming overview
2. Introduction of object-oriented programming
3. Class and Constructors
4. Overloading and inheritance
5. Polymorphism and virtual functions
6. Templates and exception handling

Course Outcomes:

After completion of the course students are expected to be able to:

- Analyze the strengths of object oriented programming
- Design and apply OOP principles for effective programming
- Develop programming application using object oriented programming language C++
- Percept the utility and applicability of OOP

Text Books

1. Robert Lafore, “Object Oriented Programming in C++”, SAMS Techmedia
2. Bjarne Stroustrup, The C++ Programming language, Third edition, Pearson Education. ISBN 9780201889543.

References

1. Herbert Schildt, C++ The complete reference‖, Eighth Edition, McGraw Hill Professional, 2011, ISBN:978-00-72226805
2. E. Balaguruswamy, “Object-oriented Programming with C++”, Tata McGraw Hill, 5th edition

Assignments List

1. Write a CPP program to generate Hotel bill. Create a class with the following members: Table no., customer name, Customer contact, details of order. Compute the bill amount and offer possible discounts.

2. Create a class to represent a bank account, include the following members:

    1. Data members:

        i. Name of the depositor
        ii. Account number

    2. Member functions

        i. Deposit an amount
        ii. Withdraw an amount
        iii. Display name and balance

3. Write a CPP program with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Engineer, Business Analyst and Manager from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Implement a class Complex which represents the Complex Number data type. Implement the following operations: 1. Constructor (including a default constructor which creates the complex number 0+0i)

5. Implement a class Complex which represents the Complex Number data type. Implement the following operations: 1. Overloaded operator+ to add two complex numbers. 2 Overloaded operator* to multiply two complex numbers. 3. Overloaded << and >> to print and read Complex Numbers.

6. Create a class template to represent a generic vector. Include following member functions: · To create the vector. · To modify the value of a given element · To multiply by a scalar value

7. Write a program to implement polymorphism having draw function to display different shapes.

8. Imagine a publishing company which does marketing for book and audiocassette versions. Create a class publication that stores the title (a string) and price (type float) of a publication. From this class derive two classes: book, which adds a page count (type int), and tape, which adds a playing time in minutes (type float). Write a program that instantiates the book and tape classes, allows user to enter data and displays the data members. Catch an exception and replace all the data member values with zero values.

9. Write a simple oop program in multiples oop languages to differentiate syntax. (in cpp, python and java.)

Course Code				Course Title							Category
21BTUC101 and 21BTUC201				Design thinking – I and II							
Contact Hours per Week				Theory			Practical			Total	Passing Criteria * w.r.t FE
L	T	P	Credits	FE	CA	Total	FE	CA	Total		
1	0	2	2	0	50	50	0	0	0	50	NIL
Prerequisite: 10+2											
Course Objectives: ➢ Introduce Design Thinking as a tool to trigger innovation sensibilities ➢ Inculcate Design Thinking as a way of life / an attitude to co-create ➢ Learn to be sensitive to the other human being – Empathy											

- **Introduction**
- **Identify**
- **Introspect**
- **Ideate**
- **Prototype**
- **Test**

Course Outcomes:

- To understand the concept of Design Thinking
- To learn the importance of 'Empathy' and user centric Design

Learning Methodology:

· Triggering Insights

· Immersion sessions

· Role play

· Creating prototype of ideas

· Presentations

· Case study

· Group tasks/ assignments

The Course will be an immersion experience for the participants to imbibe the sensibilities required for triggering innovation through Design Thinking