NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology
Biotechnology

First Year

(Effective from the Session: 2023-24)

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology
Biotechnology
Evaluation Scheme
SEMESTER-I

Sl. No.	Subject Codes	Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	BBT0101 / BBT0102	Elementary Mathematics/Remedial Biology	3	1	0	30	20	50		100		150	4
2	BEC0101	Basic Electrical and Electronics Engineering	3	1	0	30	20	50		100		150	4
3	BASL0101	Acquiring Business Communication (ABC)	2	0	0	30	20	50		50		100	2
4		Foreign Language	2	0	0	30	20	50		50		100	2
5	BCSE0151	Problem-Solving using Python	0	0	6				50		100	150	3
6	BEC0151	Basic Electrical and Electronics Engineering Lab	0	0	2				25		25	50	1
7	BASL0151	Acquiring Business Communication (ABC) Lab	0	0	4				50		50	100	2
8		MOOCs (For B.Tech. Hons. Degree)											
		TOTAL										**800**	**18**

***Foreign Language:**
1. BASL0102 French
2. BASL0103 German
3. BASL0104 Japanese

*** List of MOOCs Based Recommended Courses for first year (Semester-I) B. Tech Students**

S.No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0002	Next Gen Technologies	Infosys Springboard	10h 14m	**0.5**
2	BMC0003	Programming Fundamentals using Python - Part 1	Infosys Springboard	43h 25m	**3.5**

Abbreviation Used:-
L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam.

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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Bachelor of Technology
Biotechnology
Evaluation Scheme
SEMESTER-II

Sl. No.	Subject Codes	Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BBT0201	Introduction to Biotechnology	3	1	0	30	20	50		100		150	4
2	BAS0201B	Engineering Physics	3	1	0	30	20	50		100		150	4
3	BCSE0203	Design Thinking-I	2	1	0	30	20	50		50		100	3
4	BCSE0252	Advanced Python	0	0	6				50		100	150	3
5	BAS0251B	Engineering Physics Lab	0	0	2				25		25	50	1
6	BASL0251	Communication for career Enhancement	0	0	4				50		50	100	2
7	BCSE0251	C Programming	0	0	6				50		100	150	3
8	BME0251	CAD and Digital Manufacturing	0	0	6				50		100	150	3
9		MOOCs (For B.Tech. Hons. Degree)											
		TOTAL										**1000**	**23**

*** List of MOOCs Based Recommended Courses for first year (Semester-II) B. Tech Students**

S. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0001	Design Thinking for innovation	Infosys Springboard	6 hrs	0.5
2	BMC0004	Programming In C	Infosys Springboard	17h 7 m	1

PLEASE NOTE:-

- **Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester**

Abbreviation Used:-

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam.

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A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits

SYLLABUS

B. TECH.-First Semester **BRANCH- Bio Technology**	
SUBJECT CODE-BBT0101	**L - T - P** **3 – 1 - 0**
SUBJECT NAME- ELEMENTRY MATHEMATICS	**No. of hours-42**

Course Objective- The objective of this course is to familiarize the graduate engineers of Biotechnology with techniques in basic algebra, differential calculus, integration and solving Ordinary Differential Equations of first order. It aims to equip the students with standard concepts and tools from basic to intermediate level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcome –

CO1 - Apply concept of equation to solve quadratic equations and system of linear inequality in two variables.

CO2- Apply the concept of differentiation to find the derivative of different type functions, rate of change and maxima and minima.

CO3- Apply concept of integration to evaluate integrals and definite integrals.

CO4- Apply the concept of differentiation and integration to find the solution of differential equations.

CO5- Solve the problems of Profit, Loss, Number & Series, Coding & decoding and Algebra.

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping

Unit 1	Algebra	Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system. Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables graphically.	Class room Teaching, Smart Board, PPT, M-tutor.	8	**Assignment 1.1**	CO1
Unit 2	Differential Calculus	Functions, Limit, Continuity and Differentiability. Definition of derivative, physical and geometrical significance of derivative, derivative by first principal. Derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of	Class room Teaching, Smart Board, PPT, M-tutor.	8	**Assignment-2.1** **Assignment-2.2**	CO2

		implicit function. Concept of exponential and logarithmic functions and their derivative. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Applications of Derivatives: rate of change, maxima and minima (second derivative test only). Simple problems (that illustrate basic principles and understanding of the subject as well as real life situations).				
Unit 3	Integral Calculus	Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Basic properties of definite integrals and evaluation of definite integrals. Applications of the Integrals: Applications in finding the area under simple curves, especially lines, areas of	Class room Teaching, Smart Board, PPT, M-tutor.	10	**Assignment-3.1**	CO3

		circles/parabolas/ellipses (in standard form only).				
Unit 4	Differential Equations	Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations of first order and first degree by method of separation of variables, homogeneous differential equations . Solutions of linear differential equation of the type: $\frac{dy}{dx} + py = q$, where p and q are functions of x.	Class room Teaching, Smart Board, PPT, M-tutor.	8	**Assignment-4.1**	CO4
Unit 5	Aptitude-I	Simplification, Percentage, Profit, loss & discount, Average, Number & Series, Coding & decoding, Algebra.	Class room Teaching, Smart Board, PPT, M-tutor.	8	**Assignment-5.1**	CO5

References-

Text Books:

1. Mathematics - Textbook for Class XI, NCERT Publication

2. Mathematics Part I - Textbook for Class XII, NCERT Publication

3. Mathematics Part II - Textbook for Class XII, NCERT Publication

4. Quantitative Aptitude by R.S. Aggrawal

Reference Books:

1) Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill)

2) Advanced modern engineering mathemtics by Glyn james (pearson education)

Links:

Unit-1

https://www.youtube.com/watch?v=Ujs30gztM5E

- https://www.youtube.com/watch?v=9MFjoGm06dg
- https://www.youtube.com/watch?v=l1Xri-tvd6g
- https://www.youtube.com/watch?v=NHx_-vE-zQo
- https://www.youtube.com/watch?v=gI3y4OWlLO4

Unit-2

- https://youtu.be/hswdwcNhQ0g
- https://youtu.be/EkkATH3W1Mo
- https://youtu.be/r031pzhBP5c
- https://www.youtube.com/watch?v=lTtsFrkBsOI
- https://www.youtube.com/watch?v=_9MVn-Jw2G4
- https://www.youtube.com/watch?v=HrymMfWU_x0
- https://www.youtube.com/watch?v=dEPr5D6CqQQ
- https://www.youtube.com/watch?v=XzIypjhzj8c
- https://www.youtube.com/watch?v=ZqHPcKq6VNI

Unit-3

- https://www.youtube.com/playlist?list=PLbu_fGT0MPstBzAW5gGWLltksM_yAs3si
- https://youtu.be/z0ajJjA3_Ns

Unit-4

- https://youtu.be/f-4tMNFUqyU
- https://youtu.be/AX_0jNDIi9I
- https://youtu.be/BHdXOPD4cvo
- https://youtu.be/OET0qwat15o

Unit-5

https://www.GovernmentAdda.com

B. Tech.-First Semester

Branch- Bio Technology

Subject Code-BBT0102	**L - T - P** **3 – 1 - 0**
Subject Name-Remedial Biology	**No. of hours-40**

Course Objective- To introduce students' basic knowledge about structure and function of biomolecules. develop understanding about cell biology, and nucleic acids and understand the morphology and anatomy of plants

Course Outcome –

CO1 -To understand the basics of living systems K1, K2

CO 2 To understand key common features of living organisms &

its classification K1, K2

CO 3 To know the anatomy and functions of plants K1, K2

CO 4 To know the concepts of alleles and genes K1, K2

CO 5 To understand the plant physiology

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Unit 1	Cell Biology	The cell concept, structure of prokaryotic, eukaryotic cells, plant cells and	Smart board, ppts	8	NA	CO1

		animal cells, Structure and function of cell membrane, cell organelles and their function. Structure and use of compound microscope, Macro and micro molecules, Basic chemical constituents of living body. **Carbohydrates-Classification of carbohydrates, functions of carbohydrates, Lipids-Classification and functions of lipids, Proteins-Structure and functions of proteins, Enzymes-Chemical nature, classification and properties of enzymes, mechanism of enzyme activity**				
Unit 2	**Classification of living organisms,**	**Classification of living organisms (Five kingdom classification, major groups and principles of classification in each kingdom), Salient features of kingdom Monera, Protista and Fungi.**	**Smart board, ppts**	**8**	**NA**	**CO 2**

		Importance of microbiology, Importance of microorganisms in various fields, Classification and features of microorganisms. - Systematic and binomial system of nomenclature, Concept of animal and plant classification.				
Unit 3	**Morphology and anatomy of plants**	**Tissues in animal and plants, Morphology, anatomy and functions of different parts of plants: Root, stem, leaf, inflorescence, flower, fruit and seed, Concepts of botanical garden, herbaria, zoological park and museums.**	**Smart board, ppts**	**8**	**NA**	**CO3**
Unit 4	**. Cell division and Genetics**	**Concepts of alleles and genes, Mendelian Experiments, Cell cycle (Elementary Idea), mitosis and meiosis, techniques to study mitosis and meiosis**	**Smart board, ppts**	**8**	**NA**	**CO14**
Unit 5	**Plant Physiology**	**Plant Physiology: Concepts of diffusion, osmosis, imbibitions, Movement of**	**Smart board, ppts**	**8**	**NA**	**CO5**

		water, food, nutrients and gases, Photosynthesis, plant growth and development				

References-

Text Books:

1. Biology-Textbook of Class XI, NCERT Publication

2. Biology-Textbook of Class XII, NCERT Publication

3.Together With Biology Study Material for Class 12

Reference Books: Biology 12th Edition by Raven and George Johnson and Kenneth Mason and Jonathan Losos and Tod Duncan. McGrawHill Publications 2. TEXTBOOK OF BIOTECHNOLOGY by PATNAIK, McGraw Hill 3. Basic Biotechnology 3rd Edition by Colin Ratledge& Bjorn Kristiansen, Cambridge University Press

Links: https://www.youtube.com/watch?v=_WM2hJmjctI

https://www.youtube.com/watch?v=ZyWYID2cTK0&t=2s

https://www.youtube.com/watch?v=URUJD5NEXC8&t=28s

Unit 2 https://www.youtube.com/watch?v=qlOOGk7ryxc

https://www.youtube.com/watch?v=b8MfRHfV4Q4

Unit 3 https://www.youtube.com/watch?v=w6yyWyzwqhg

https://www.youtube.com/watch?v=Tl4bQEWN7cQ

https://www.youtube.com/watch?v=cBIGu60gJN0&list=PLKlDmFiIyAnem1SOTmMKXyUy5TDoTVor

Unit 4 https://www.youtube.com/watch?v=EJEd3WhE5-I&t=62s

https://www.youtube.com/watch?v=HyJ86mS2Naohttps://www.youtube.com/watch?v=UD0n3g

fZ0yg

Unit 5 https://www.youtube.com/watch?v=WVaRdAGV11M&t=1111s

https://www.youtube.com/watch?v=9tf42ruBr4g&t=969shttps://www.youtube.com/watch?v=9tf

42ruBr4g&list=RDCMUCtKAQhsa1D_zKbc3yZmwARQ&start_radio=1&t=1012

B. Tech.- First Semester

Branch- CSE/CSE-R/CS/IT/M.Tech.(Int.)/ CSE(DS)/CSE(IOT)/ CSE(AMIL)/CSE(AI)/CYS/ME/BT

Subject Code- BEC0101	**L - T - P** **3 -1- 0**
Subject Name- Basic Electrical & Electronics Engineering	**No. of hours- 49**

Course Objective-

1. To provide the basics of DC and AC analysis of (Single phase and Three phase) electrical circuits.
2. To study motors used in robotics, the basics of transformer and its efficiency calculation.
3. To impart elementary knowledge of layout of Power System, Earthing, and Energy Consumption.
4. To provide the knowledge of Diode, Display devices, Op-Amp, Sensors, IoT and its application.

Course Outcome –After successful completion of this course students will be able to

CO1: Apply the principle of KVL/KCL and network theorems for analysis of D.C circuit.

CO2: Analyze the steady state behavior of single phase and three phase AC electrical circuits, Earthing, and energy calculation.

CO3: Illustrate and analyze special motors, working principles of a single-phase transformer and components of Power system.

CO4: Explain the construction, working principle, and application of PN junction diode, Zener diode and Display devices.

CO5: Explain the concept of Op-Amp, Digital multimeter, Sensors, IoT and its applications.

Course Content

Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required**	**Aligned Practical/Assignment/ Lab**	**CO Mapping**

				(T=L+P)		
Unit 1	**D.C CIRCUIT ANALYSIS AND NETWORK THEOREMS**	Concept of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, source transformation, Kirchhoff's Law: loop and nodal methods of analysis, star delta transformation, network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	Digital Smart Board, PPT, m-Tutor	10	Assignment 1.1, Assignment 1.2	CO1

Unit 2	**STEADY STATE ANALYSIS OF AC CIRCUIT**	**Single phase AC circuit:** AC fundamentals, concept of phasors, phasor representation of sinusoidally varying voltage and current, analysis of series and parallel RLC circuits, j-notation, Different types of power, power factor, resonance in series and parallel circuits. Importance of Earthing, Elementary calculations for energy consumption,	Digital Smart Board, PPT, m-Tutor	10	Assignment 2.1, Assignment 2.2	CO2
Unit 3	**SINGLE PHASE TRANSFORMER AND ELEMENTS**	**Single Phase Transformer:** Principle of	Digital Smart Board,	10	Assignment 3.1, Assignment 3.2	CO3

	OF POWER SYSTEM	operation, construction, EMF equation, equivalent circuit, losses and efficiency. **Introduction to Elements of Power System:** General layout of Power system, Conventional and renewable energy sources. **Special motors used in robotics:** Brushless motor, stepper motor, servomotor	PPT, m-Tutor			
Unit 4	**SEMICONDUCTOR DIODE AND THEIR APPLICATIONS**	**Introduction of Semiconductors:** Intrinsic and Extrinsic, P-N Junction Diode: Depletion layer, V-I characteristics,	Digital Smart Board, PPT, m-Tutor	10	Assignment 4.1, Assignment 4.2	CO4

		Half and Full Wave rectification, DC charger architecture for EV. Breakdown Mechanism: Zener and Avalanche, Zener Diode as Shunt Regulator. **Display Devices** Liquid Crystal Display (LCD), Light Emitting Diode (LED), Organic-Light Emitting Diode (O-LED), 7-segment display.				
Unit 5	**OPERATIONAL AMPLIFIERS**	Introduction, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier,	Digital Smart Board, PPT, m-Tutor	9	Assignment 5.1, Assignment 5.2	CO5

		Summing Amplifier, Integrator, Differentiator). **Electronic Instrumentation** Digital Multimeter (DMM), Types of sensor, Introduction to IoT and its application in smart Grid.				

References-

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.
3. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education
4. J.B. Gupta, Basic Electrical Engineering, Kataria& Sons
5. Robert L. Boylestad / Louis Nashelsky"Electronic Devices and Circuit Theory", Latest Edition, Pearson Education.
6. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.
4. David A. Bell, "Electronic Devices and Circuits",Latest Edition, Oxford University Press.
5. Jacob Millman, C.C. Halkias, Stayabratajit, "Electronic Devices and Circuits", Latest Edition, TMH.

Links:

UNIT-1

1. https://youtu.be/FjaJEo7knF4

2. https://youtu.be/UsLbB5k9iuY
3. https://youtu.be/1QfNg965OyE
4. https://youtu.be/wWihXHCOmUc

UNIT-2

1. https://youtu.be/ulGKCeOoR88
2. https://youtu.be/YLGrugmDvc0
3. https://youtu.be/0f7YkVorOmY
4. https://youtu.be/LM2G3cunKp4
5. https://youtu.be/S5464NnKOq4

UNIT-3

1. https://youtu.be/GgckE4H5AJE
2. https://youtu.be/OKkOif2JYRE
3. https://youtu.be/qSyUFp3Qk2I
4. https://youtu.be/GROtUE6ILc4
5. https://youtu.be/k_FqhE0uNEU

UNIT-4

1. https://youtu.be/EdUAecpYVWQ?list=PLwjK_iyK4LLBj2yTYPYKFKdF6kIg0ccP2
2. https://youtu.be/MZPeRlst8rQ
3. https://youtu.be/qQucInufX-s
4. https://youtu.be/tPFI2_PdCYA
5. https://youtu.be/zA-UtZ-s9GA

UNIT-5

1. https://youtu.be/AuZ00cQ0UrE?list=PLwjK_iyK4LLDBB1E9MFbxGCEnmMMOAXOH
2. https://youtu.be/aU24RWIgJVs?list=PLwjK_iyK4LLDBB1E
3. https://youtu.be/c5NeTnp_poA
4. https://youtu.be/KLGbPgls18k

https://youtu.be/UFJzQH3G1Ko?list=PLVrieKUj5RceFRq5MKy-f-EHdumStFPLt

B. Tech. - First Semester

Branch - CS/CSE/ CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI) /ME/M. Tech (Int.)/BT

Subject Code-BSL0101	**L - T - P** **2 - 0 – 0**
Subject Name- Acquiring Business Communication (ABC)	**No. of hours- 24 + 48 = 72**

Course Objectives:

- To improve proficiency in the English language to the Intermediate level (B1/B2) of CEFR (Common European Framework of Languages).
- To impart business communication skills.
- To motivate students to look within and create a better version of 'self.'
- To introduce the key concepts of ethics, etiquette, and life skills.
- To train for enhanced career prospects.

Course Outcomes:

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

CO1 – Improve proficiency in English to the next level of CEFR.

CO2 - Develop business communication skills.

CO3 - Demonstrate improved versions of themselves.

CO4 – Acquire the concepts to cope better at the workplace.

CO5 – Participate in the placement process with confidence.

Course Content					
Module	**Topics Covered**	**Pedagogy**	**Lecture Required (T=L+P)**	**Aligned Practical/Assignment/Lab**	**CO Mapping**
I - Reading with Cognitive Skills	Importance of communicating in English Overview of ABC Objective: To motivate the students to acquire the skill of communicating well. Outcome: The students realize the importance and understand the course and what is expected of them.	**Video Clips of famous personalities who have learnt to communicate well e.g., Kapil Dev, Jahnvi Panwar, APJ Abdul Kalam, etc.**	1	Assignment 1: Story Review (PDF of short stories to be shared to encourage reading habits)	CO1
	Basics of Workplace Communication • Process • Barriers Objective: To facilitate the student's ability to identify and analyse aspects of miscommunication in real-life situations. Outcome: The students can identify impediments to effective communication and learn to overcome those.	Video streaming followed by Discussions and problem-solving activities.	1	**Humorous video clips on miscommunication - Students will analyse the video clips for a deeper understanding of the nuances of effective and ineffective communication.**	CO2
	Reading Comprehension Objective: To foster students' reading comprehension skills by	Students will actively interact with the reading material by engaging in this activity, collaborating with	1	Think-Pair-Share for Reading Comprehension (academic texts, Journals, research papers, general interest)	CO1

	engaging them in activities that involve comprehending texts - understanding instructions, filling forms, interpreting professional contents. Outcome: The students will become adept at navigating diverse texts, understanding, and following directions, and accurately filling out official forms.	their peers, and refining their comprehension skills. The think-pair-share approach fosters critical thinking, oral communication, and the ability to construct meaning from written texts.			
	Reading Techniques for Time Management Objective: To develop students' ability to quickly locate relevant information in texts. Outcome: Students will learn to read and comprehend faster.	Practice reading a variety of texts and focus on identifying keywords, headings, and topic sentences. Also, to analyze and synthesize information from a selected text and use it for tasks such as paraphrasing, note making, chart and table representation.	1	Activity 1: Skim and Scan Race Activity 2: Speed Reading Challenge Activity 3: Information Gap Activity	CO4
	Online Assessment: Apply the various reading techniques to extract information from a given text.	Online Assessment	1		

	Critical Reading Objective: To promote critical thinking and engage students in thoughtful discussions about a selected reading material. Outcome: The students will develop skills in identifying key arguments, evaluating evidence, and challenging assumptions.	Group discussion on selected material.	1	**Critical Reading Discussion Circle – On short stories, movies, reviews.**	CO3
	Hansei Session Objective: To develop students' cognitive skills and critical thinking. through a Outcome: The students will develop self-awareness, metacognition, and a growth mindset, empowering students to become more effective and efficient readers.	The students will be able to reflect on their reading experiences, evaluate their cognitive skills employed during the process, and identify strategies for improving their comprehension.	1	Hansei activity focused on reading comprehension.	CO4
II – Business Writing	Vocabulary Building Objective: To expand participants' vocabulary and deepen their understanding of word formation. Outcome: Students will develop business vocabulary and effectively communicate in various professional settings.	Introduction to the General Service List of Words by Michael West, to familiarize students with word formation concepts in the context of business communication, enhancing their ability to understand and create a specialized vocabulary for	1	Activity 1: Word Association Activity 2: Vocabulary Charades Activity 3: Word Formation Relay using prefixes and suffixes. Activity 4: Root Word Finder	CO2

		effective professional interactions.			
	Language Toolbox Objective: To enhance language proficiency of the students by helping them bring in variety in their usage of words. Outcome: The students will become familiar with good workplace vocabulary and acquire linguistic versatility.	Studying and practising abbreviations, one-word substitutions, homophones, homonyms, synonyms, and antonyms. Students will develop a deeper understanding of these language tools and improve their ability to communicate effectively in various contexts.	2	Activity 1: Homophone Pictionary Activity 2: Synonym and Antonym Match-Up Activity 3: One-Word Substitution Brainstorm Activity 4: Abbreviation Scavenger Hunt Class Assignment: To fill in or identify the corporate terms, cliches and technical terminology in the assigned text.	CO2
	Sentence Construction Objective: To help the students know the correct sentence construction rules and techniques. Outcome: The students will be able to use effective and well-formed sentences.	The students will actively participate in the Sentence Building activities, thereby enhancing their understanding of the requisites of a good sentence.	2	Activity 1: Sculpting a good Sentence. Activity 2: Sentence Construction Masterclass Activity 3: Framing a story using jumbled sentences. Activity 4: Analysing famous dialogues from movies or novels.	CO1
	Paragraph writing Objective: To make the students understand the fundamental organization of a paragraph. Outcome: Students will be able to compose effective	The students will participate in a blog writing activity wherein they will be asked to compose paragraphs based on visual and	2	Writing a blog through Visual and verbal prompts.	CO1

	paragraphs and express their views and opinions in an organized, and logical manner.	verbal prompts. Through the activity the students will be familiarised with the important aspects of paragraph writing like unity, coherence, clarity, etc.			
III - Mastering the art of listening and Speaking (Professional & Empathetic Listening)	**Art of Listening** **Objective**: To practice active listening, empathy, and effective communication. **Outcome**: Participants will engage in focused listening and learn to comprehend and respond.	The module includes guided practice sessions, role-plays, and simulations to develop active listening skills and empathy. Reflection and discussion sessions encourage self-awareness and strategy exploration. Instructors provide personalized feedback to refine participants' listening abilities.	1	**Activity 1:** Listening exercises. **Activity 2:** Listening to various suggested podcasts. **Class Assignment**: Task-based listening exercise	CO1
	Phonetic Understanding **Objective**: To develop participants' ability to enunciate each sound clearly in Standard Indian English (Neutral Accent). **Outcome**: Participants will improve their auditory	It aims to develop participants' ability to enunciate sounds clearly in Standard Indian English. It includes focused practice on sound production,	1	**Activity1:** Pronunciation exercises in English **Activity 2:** Identifying the common English words pronounced differently	CO1

	perception skills and develop a heightened awareness of the subtle sound distinctions in Standard English.	auditory perception training, and increasing awareness of sound distinctions in Standard English. This pedagogy enhances participants' communication clarity and comprehension in English.		in different regions of the world.	
	Nuances of Speaking **Objective**: To help participants understand, recognize and practice correct intonation, voice modulation, tone, pitch, and accent. **Outcome**: Participants will enhance their ability to differentiate between similar sounds and improve their pronunciation accuracy in Standard English words.	The pedagogy focuses on understanding, recognizing, and practicing correct intonation, voice modulation, tone, pitch, and accent. Through interactive activities and targeted exercises, participants develop a keen awareness of these aspects of speech and apply them in their communication. The outcome is improved differentiation between similar sounds and enhanced	1	**Activity 1:** Application-based exercises on the nuances of speaking. **Activity 2:** Listen to the suggested list of podcasts/ ted talks. **Activity 3:** Practicing correct pronunciation of commonly mispronounced words.	CO3

		pronunciation accuracy in Standard English words.			
	Art of Public Speaking **Objective**: To help students speak with confidence in public, using various verbal and non-verbal aspects of speech. **Outcome**: Students will gain awareness of speaking in a professional environment and enhance their overall communication in English.	Through interactive exercises and practical application, students gain awareness of professional speaking and improve their overall English communication abilities, leading to enhanced public speaking proficiency.	1	**Activity 1:** Delivering extempore speeches on familiar topics **Activity 2:** JAM sessions	CO2
	Facing an Interview **Objective**: To develop the ability to face an interview. **Outcome**: Students will be able to speak in a professional environment and answer the basic questions of any interview confidently.	It focuses on providing students with practical guidance and training in interview skills through interactive exercises, mock interviews, and feedback sessions.	1	**Activity 1:** Speaking tests. **Activity 2:** Mock Interview Sessions	CO5
	Hansei Session **Objective:** To foster self-reflection and continuous growth in professional and empathetic listening and	Reflecting on their experiences	1	**Hansei Activity**: Create a video on a topic that will interest college students incorporating the nuances of speaking that you have learned.	CO4

	speaking skills through a Hansei activity**.** **Outcome:** By engaging in the Hansei activity, participants will reflect on their experiences with professional and empathetic listening and speaking, identify areas of strength and areas for improvement, and develop strategies to enhance their skills. This activity promotes self-awareness, active listening, effective communication, and empathy, empowering participants to build stronger relationships, enhance their professional interactions, and become more impactful communicators in various settings.				
IV - Refining the Triad: (Ethical, Empathetical Leadership & Synergy)	**Leadership role play:** **Objective:** Recognize the values that leaders/celebrities demonstrate. **Outcome**: Students will get motivated to look within and create a better version of themselves.	The teaching pedagogy for the Leadership Role Play session involves interactive role-playing activities where students portray leaders or celebrities and demonstrate their values and qualities.	1	**Activity1:** Role-play activity **(Hansei) Activity 2:** Take the colored paper and write about the value that is closest to your heart and how you will demonstrate a leader in your life. **Online Assessment: Links to videos of some famous leaders and celebrity interviews will**	CO 3

				be shared. Taking inspiration from them students will work in pairs and will enact and record their interview videos.	
	Etiquette & Ethics: **Objective:** Students will recognize the key features of corporate etiquette **Outcome:** Students will be able to learn and imbibe corporate etiquette in real situations.	The teaching pedagogy for the Etiquette & Ethics module involves interactive discussions, case studies, and role-playing exercises to help students recognize key features of corporate etiquette.	1	**Activity 1:** Videos on corporate etiquette and recognizing the key features. **Online Assessment: Hansei Activity - Take an interview of various working-class people.**	CO4
	Emotional Intelligence in real-life workplace scenarios **Objective:** To make students identify and be aware of emotions by introducing the concepts of values and life skills **Outcome**: Students will be able to harness the emotions and apply it to thinking and problem solving: Manage and regulate emotions.	It involves experiential learning through discussions, case studies, and interactive exercises to help students identify and be aware of their emotions.	1	**Activity 1:** Think- Pair-Share activities using various emojis and emotions in different situations. **Activity 2:** To show NDTV's Coverage on the lead actress of "SECRET SUPERSTAR" Zaira Wasim and her battle with Anxiety and Depression.	CO4
	Hansei Activity	Self - reflection	1	**Activity: Hansei (Self-Reflection)**	CO4

	Objective: To promote self-reflection and continuous growth in ethical leadership, empathetic leadership, and creating synergy through a Hansei activity. **Outcome:** By engaging in the Hansei activity, participants will reflect on their experiences with ethical and empathetic leadership and creating synergy within teams or organizations.			Understanding themselves better in terms of Emotional Intelligence by Quick-Self Check (Situation based activity).	

Course Book – There are no course books. Hand-outs and materials will be prepared by the teachers, who will have an instructional manual to help them.

Reference Books:

1. Cambridge English Business Benchmark (Pre-intermediate to Intermediate), 2nd edition, Norman Whitby, Cambridge University Press, 2006, UK.

2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.

3. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

4. Talbot, Fiona. Improve Your Global Business English Kogan Page, 2012.

5. Leech Geoffery. Communicative Grammar of English. Pearson Education Harlow, United Kingdom, 1994.

6. Sethi. J. A Course in Phonetics and Spoken English Prentice Hall India Learning Private Limited; second edition (1999)

7. Anderson, Paul V. Technical communication. 8th ed. Cengage Learning, 2011.

8. IELTS 11: General Training with answers. Cambridge English

Links:

Online reference e books and other reference materials:

1. http://promeng.eu/downloads/training-materials/ebooks/soft-skills/effective-communication-skills.pdf
2. http://ncert.nic.in/textbook/pdf/iees101.pdf
3. http://www.infocobuild.com/education/audio-video-courses/literature/CommunicationSkills-IIT-Kanpur/lecture-09.html

Online Resources:

4. https://www.youtube.com/watch?v=JIKU_WT0Bls
5. https://www.youtube.com/watch?v=6Ql5mQdxeWk
6. https://www.youtube.com/watch?v=fE_cS75Lcvc

(MTUTOR LINK):

7. https://www.m-tutor.com/courses-detail.php?tid=859133&topicid=198404&viewtype=&searchtopics=&selectedcourse=396&selectedsubject=5710&selectedunit=&filter=landing
8. https://www.m-tutor.com/courses-detail.php?tid=858987&topicid=198291&viewtype=&searchtopics=&selectedcourse=396&selectedsubject=5710&selectedunit=&filter=landing
9. https://www.m-tutor.com/courses-detail.php?tid=858472&topicid=197673&viewtype=&searchtopics=&selectedcourse=396&selectedsubject=5710&selectedunit=&filter=landing
10. https://www.m-tutor.com/courses-detail.php?tid=858967&topicid=198195&viewtype=&searchtopics=&selectedcourse=396&selectedsubject=5710&selectedunit=&filter=landing

Free Apps to Practice English:

1. Memrise - https://www.memrise.com
2. Open Language - https://open-language.en.uptodown.com
3. Duolingo - https://englishtest.duolingo.com/applicants
4. Rosetta Stone - https://www.rosettastone.com/product/mobile-apps/
5. FluentU - https://www.rosettastone.com/product/mobile-apps/

B. Tech.- First Semester

Branch- Branch – CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT

Subject Code- BASL0102	**L - T - P** **2 - 0 - 0**
Subject Name- French Language	**No. of hours- 24**

Course Objectives:

1. To help the students learn to articulate in French language in day-to-day real-life situations.

2. To enable the students acquire the four basic skills LSRW (Listening, Speaking, Reading, and Writing) of language learning.

Course Outcomes:

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

CO1 - Recognize the basic sounds, letters, numbers, words, and phrases of French.

CO2 - Develop basic French vocabulary.

CO3 - Use simple vocabulary and sentences in day-to-day life.

CO4 - Introduce a third person

CO5 - Develop basic skills in writing and speaking

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment /Lab	CO Mapping
Unit 1	**Introduction to French**	• Basic greetings • French letters, sounds	Audio-lingual method & reference of the learning aids	5 hours	Assignment on- Greetings, numbers, verb conjugation, adjective and basic questions	CO1

		and accents • Numbers • The subject pronouns • Verbs- être, avoir • Basic adjectives (How to change into feminine form) • Introductory questions and Self introduction				
Unit 2	**Vocabulary Building**	• Days of the week, months of the year and date • Colors • Basic vocabulary • Articles (indefinite and definite) • How to make nouns plural • Use of C'est and Ce sont	Learning through attractive pictures, word-picture association & question-answer patterns.	6 hours	Assignment on- days, months, colors, articles, nationality, professions and making sentences plural	CO2

		• Vocabulary of nationality and professions • Introduction of a friend				
Unit 3	**Everyday Common Simple Sentences**	• Contracted articles with à • Vocabulary of transports • Use of prepositions à and en • Time • Negation • 3 ways to frame question and how to reply accordingly	Communicative method and learning through videos, Total Physical Respond Methodology (TPR), activities might include: dialogue framing, question making.	7 hours	Assignment on- contracted articles, transports, prepositions (à and en), time, negative sentences, and questions	CO3
Unit 4	**Reading & Writing**	• Vocabulary of family members • Introduction of a family member • "ER" verbs with exceptions	Tasked-Based Learning, Grammar-Translation Method, Reading Aids, Reference Books	3 hours	Assignment on- family members and verb conjugation	CO4

Unit 5	**Skilled writing**	• How to fill a basic form • How to write a brief post card in French.	Communicative and Tasked-Based Learning method, activities might include: developing writing skills through various forms of exercises.	3 hours	Assignment on- writing post card in French and filling form	CO5
Reference Books: 1. Edito 1 (Méthode de français/Cahiers d'exercices) 2. Echo A1 (Méthode de français/Cahier d'exercices) 3. Saison A1 (Méthode de français/Cahier d'exercices)						

B. Tech.- First Semester **Branch- Branch – CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT**	
Subject Code – BASL0103	**L - T - P** **2 - 0 - 0**
Subject Name – German Language	**No. of hours- 24**
Course Objectives: **1. To help the students learn to articulate in German language in day-to-day real-life situations.** **2. To enable the students acquire the four basic skills LSRW (Listening, Speaking, Reading, and Writing) of language learning.**	

Course Outcomes:

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

CO1 - Understand and be familiar with basic German Language concepts and the culture

CO2- Recognise the fundamental vocabulary

CO3- Use simple vocabulary and sentences in everyday conversations

CO4- Read and write simple sentences

CO5- Use complex sentences and develop basic writing skills

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Unit 1	**Introduction to German**	• Letters and Numbers • German Greetings and Self Introduction • Personal Pronouns and Verb Conjugations (Regular and Irregular Verbs) • W-Question ➢ Simple Sentences	Audio-lingual method & reference books	**4 Hours**	**Assignment on – Verb Exercises, Question Making**	CO1

Unit 2	**Vocabulary building**	• The concept of German Articles (Definite and Indefinite) • Nouns and Articles • Days, Months, & Seasons • Adjectives • Negation	Learning through attractive pictures, audio-lingual method Activities will include pantomiming, word-picture association & question-answer patterns.	**4 Hours**	**Assignment on – Articles ,Vocabulary, Negative Sentences**	CO2
Unit 3	**Everyday common simple sentences**	• Basic directions • Imperativ • Date and Time • Modal Verben ➢ (Basic everyday life conversations and making appointments)	Communicative method and learning through videos, Total Physical Respond Methodology (TPR),	**4 Hours**	**Assignment on – Sentence Making and Dialogue**	CO3
Unit 4	**Reading and Writing**	• Separable Verbs • Possessive Pronouns • Sentences - Nommina tiv, Akkusativ, Dativ ➢ Translations (English to German,	Tasked-Based Learning, Grammar-Translation Method, Reading Aids, Reference Books	**6 Hours**	**Assignment on – Translations and Sentence Making, Form Filling exercises**	CO4

		German to English) ➢ Short Text and Form Filling				
Unit 5	**Skilled Writing**	• Changeable Prepositions • Present Perfect Tense • Past Tense of – To have and To Be • Health and Body, Vacations • Leisure Activities, Celebrations ➢ E-mail Writing	Communicative and Tasked-Based Learning method, Grammar-Translation, activities will include developing writing skills through various forms of exercises.	**6 Hours**	**Assignment on - Vocabulary Exercises, Usage of Prepositions, Changing a sentence/Text from Present tense to past tense, E-mail writing**	CO5
Reference Books: ➢ **Netzwerk A1 (Goyal Saab Publications)** ➢ **Studio D A1 (Goyal Saab Publications)** ➢ **Langescheidt Dictionary**						

B. Tech.- First Semester **Branch- Branch – CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT**	
Subject Code – BASL0104	**L - T - P** **2 - 0 - 0**
Subject Name – Japanese Language	**No. of hours- 24**

Course Objectives:

1. To help the students learn to articulate in Japanese language in day-to-day real-life situations.

2. To enable the students acquire the four basic skills LSRW (Listening, Speaking, Reading, and Writing) of language learning.

Course Outcomes:

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

CO1 - Understand and be familiar with basic Japanese Language concepts and the culture.

CO2- Recognise the fundamental vocabulary.

CO3- Use simple vocabulary and sentences in everyday conversations.

CO4- Read and write simple sentences.

CO5- Use complex sentences and develop basic writing skills.

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment /Lab	CO Mapping
Unit 1	**Introduction to Japanese**	• General features of Japanese • Japanese scripts • Pronunciation of Japanese words • Classroom instructions • Daily greetings and expressions	Audio-lingual method & reference books	**5 Hours**	**Assignment on – Verb Exercises, Question Making**	CO1

		• Numerals, Months name Days of the week, Time & Calendar • Family members • Vocabulary lessons 1&2 • Sentence pattern & Example sentences • Self-introduction (jikoshokai)				
Unit 2	**Vocabulary building**	• Country, language, and people • Basic conversations • Vocabulary lessons 3&4 • Use of patterns (KO, SO, AA, and DO) • Conversations between guests and hosts • Conversations between customers and shopkeepers	Learning through attractive pictures, audio-lingual method. Activities might include pantomiming, word-picture association & question-answer patterns.	**5 Hours**	**Assignment on – Articles, Vocabulary, and Negative Sentences**	CO2

Unit 3	**Everyday common simple sentences**	• Vocabulary lessons 5&6 • Grammar explanation • Colour & taste • Conversations in post office • Conversations with friends • Making a request • Making an enquiry – Railway Station • Buying Fruits & Vegetables • Names of the Animals • Question formation	Communicative method and learning through videos, Total Physical Respond Methodology (TPR), activities might include dialogue framing, question making.	**5 Hours**	**Assignment on – Sentence Making and Dialogue**	CO3
Unit 4	**Reading and Writing**	• Scanning based Newspaper reading • Transportation • KANJI Form of Writing – 40 Characters • Shopping Counters • Basic Japanese grammar rules – particles: か (ka), は (wa), の	Tasked-Based Learning, Grammar-Translation Method, Reading Aids, Reference Books	**4 Hours**	**Assignment on – Translations and Sentence Making**	CO4

		(no), と (to), を (o), に (ni), も (mo), が (ga), や (ya). • Kara, Soshite • Grammar - Present, Past, Future • Adjectives • Vocabulary Lessons 7&8				
Unit 5	**Skilled Writing**	• Write short text on oneself. • Grammar: Pronouns – subject, object, possessive, Modal verbs	Communicative and Tasked-Based Learning method, Grammar-Translation, activities might include - developing writing skills through various forms of exercises.	**5 Hours**	**Assignment on - Vocabulary Exercises, Usage of Prepositions, Changing a sentence/Text from Present tense to past tense.**	CO5

Reference Book(s):

- ***Minna no nihongo – N5***

Link(s):

- ***https://www.youtube.com/@NihonGoal/community***

B. Tech.- First Semester

Branch- CSE/CSE-R/CS/IT/M.Tech.(int.)/CSE(IOT)/CSE(DS)/CSE(AI)/CSE((AIML)/CYS/ECE/ECE(VLSI)/ME/BT

Subject Code-BCSE0151	**L - T - P** **0 – 0 – 6**
Subject Name- Problem Solving using Python	**No. of hours-68**

Course Objective- To provide Basic knowledge of Python programming and to implement programming skills for solving real-world problems.

Course Outcome –

CO1 - Understanding basic programming logic.

CO2- Implement python programs using decision control statements.

CO3- Implement user defined functions and modules in python.

CO4- Implement python data structures –lists, tuples, set, dictionaries.

CO5- Apply programming concepts to solve real world problem

Course Content						
Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required (T=L+P)**	**Aligned Practical/Assignment/ Lab**	**CO Mapping**
Unit 1.	**Basics of python programming**	Problem Solving, Techniques, Algorithm, Building blocks of algorithms (statements, state, control flow, functions), Notation, Flow chart, Pseudo code, programming language, Categories of programming languages.	Lecture , Hands-on exercise, Demonstration, practical lab	6(4+2)	Implementation of basic Python programs.	1
		A Brief History of Python, Applications areas of python, The Programming Cycle for Python, Python IDE, Interacting		3(1+2)	Installation of IDE and Command Prompt.	1

		with Python Programs.				
		Elements of Python: keywords and identifiers, variables, data types and type conversion,		3(1+2)	Demonstrate the use of these in python programs.	1
		operators in python, expressions in python, strings.		3(1+2)	Develop python program to demonstrate use of Operators.	1
Unit 2	**Decision Control Statements**	Conditionals: Conditional statement in Python (if-else statement, its working and execution)	Hands-on exercise, Demonstration, lectures, practical lab	3(1+2)	Develop programs for the use of conditional statements.	2
		Nested-if statement and elif statement in Python, Expression Evaluation & Float Representation.		4(1+3)	Develop programs of different types of statements.	2
		Loops: Purpose and		7(2+5)	Hands on practice on Loops.	2

		working of loops, while loop, For Loop, Nested Loops, Break and Continue, pass statement.				
Unit 3	**Function and Modules**	Introduction of Function, calling a function, Function arguments, built in function, scope rules	Lecture , Hands-on exercise, Demonstration, practical lab	4(1+3)	Learn about how to call or create the functions.	3
		Passing function to a function, recursion, Lambda functions		7(4+3)	Hands-on functions .	
		Modules and Packages: Importing Modules, writing own modules, Standard library modules, dir( ) Function, Packages in Python		4(1+3)	Develop python programs for modules.	

Unit 4	**Basic Data structures in Python**	Strings: Basic operations, Indexing and Slicing of Strings, Comparing strings	Lecture , Hands-on exercise, Demonstration, practical lab	3(1+2)	Implement and play with strings.	4
		Regular expressions. Python Basic Data Structure: Sequence, Unpacking Sequences, Mutable Sequences,		4(1+3)	Demonstration of the regular expression.	
		Lists, Looping in lists, Tuples, Sets, Dictionaries. Map, filter, Reduce, Comprehension		7(3+4)	Implement different methods for these data structures.	
Unit 5	**File and Exception handling**	Files and Directories: Introduction to File Handling in Python, Reading and Writing files, Additional file methods,	Lecture , Hands-on exercise, Demonstration, practical lab	4(1+3)	Learn Python file handling methods and python file operations	5

		Working with Directories.				
		Exception Handling, Errors, Run Time Errors, Handling IO Exception, Try-except statement, Raise		6(2+4)	Learn about Python exception handling methods	5

References-

Text Books:

1. Magnus Lie Hetland, "Beginning Python-From Novice to Professional"—Third Edition, Apress
2. Python Programming using Problem solving approach by ReemaThareja OXFORD Higher education
3. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

Reference Books:

1. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.
3. Allen B. Downey, “Think Python: How to Think Like a Computer

Links:

UNIT 1: https://nptel.ac.in/courses/106/106/106106182/

UNIT 2: https://nptel.ac.in/courses/106/106/106106212/

https://www.youtube.com/watch?v=PqFKRqpHrjw

UNIT 3: https://nptel.ac.in/courses/106/106/106106145/ https://www.youtube.com/watch?v=m9n2f9lhtrw https://www.youtube.com/watch?v=oSPMmeaiQ68 **UNIT 4:** https://nptel.ac.in/courses/106/106/106106145/ https://www.youtube.com/watch?v=ixEeeNjjOJ0&t=4s **UNIT 5:** https://nptel.ac.in/courses/106/106/106106145/ https://www.youtube.com/watch?v=NMTEjQ8-AJM

LAB:

Total No. of Practicals : 228				
List of Practicals				
Lab No.	**Unit**	**Topic**	**Program Logic Building**	**CO Mapping**
1.1	1	Basic Python(Syntax, Variable, Type Conversion)	Python Program to Print Statement	CO1
1.2	1	Basic Python(Syntax, Variable, Type Conversion)	Swap two variables without using a temporary variable.	CO1
1.3	1	Basic Python(Syntax, Variable, Type Conversion)	Check if a given number is even or odd.	CO1

1.4	1	Basic Python(Syntax, Variable, Type Conversion)	Find the largest of three numbers.	CO1
1.5	1	Basic Python(Syntax, Variable, Type Conversion)	Convert a string to an integer.	CO1
1.6	1	Basic Python(Syntax, Variable, Type Conversion)	Convert an integer to a string.	CO1
1.7	1	Basic Python(Syntax, Variable, Type Conversion)	Convert a string to a floating-point number.	CO1
1.8	1	Basic Python(Syntax, Variable, Type Conversion)	Convert a floating-point number to an integer.	CO1
1.9	1	Basic Python(Syntax, Variable, Type Conversion)	WAP to demonstrate implicit and explicit type conversion.	CO1
1.10	1	Basic Python(Syntax, Variable, Type Conversion)	Convert Employee Count to Binary	CO1
1.11	1	Basic Python(Syntax, Variable, Type Conversion)	Convert Revenue to Currency Format	CO1

1.12	1	Operators	Write a program to Calculate Sum of 5 Subjects and Find Percentage (Max Mark in each subject is 100).	CO1
1.13	1	Operators	Write a program to find gross salary.	CO1
1.14	1	Operators	Write a program to Calculate Area of Rectangle, Square.	CO1
1.15	1	Operators	Write a program to Calculate Area of Scalene Triangle and Right-angle Triangle.	CO1
1.16	1	Operator	Write a program to find the perimeter of a circle, rectangle and triangle.	CO1
1.17	1	Operator	Write a program to Compute Simple Interest.	CO1
1.18	1	Operator	Write a program to Convert Fahrenheit temperature in to Celsius.	CO1
1.19	1	Operator	Write a program to Find the Gravitational Force Acting Between Two Objects.	CO1
1.20	1	Operator	Write a program to swap the values of two variables with and without using third variable.	CO1
1.21	1	Operator	Write a program to perform arithmetic operations on a = 8, b = 3.	CO1
1.22	1	Operator	Write a program to apply relational operations on a=8, b=3.	CO1
1.23	1	Operator	Write a program to apply assignment operations on a=8, b=3.	CO1

1.24	1	Operator	Write a program to apply logical operations on a=8, b=3.	CO1
1.25	1	Operator	Write a program to apply bitwise operations on a=8, b=3.	CO1
1.26	1	Operator	Write a program to apply identity operators.	CO1
1.27	1	Operator	Write a program to Swap the Contents of two Numbers using Bitwise XOR Operation	CO1
1.28	1	Operator	WAP to find the absolute value of the given number.	CO1
1.29	1	Operator	Write a program to Add two Complex Numbers.	CO1
1.30	1	Operator	Write a Program to find roots of a quadratic expression.	CO1
1.31	1	Arithmetic Operator	Program to perform basic arithmetic operations (addition, subtraction, multiplication, division) on two numbers.	CO1
1.32	1	Arithmetic Operator	Program to calculate the area of a rectangle using the multiplication operator.	CO1
1.33	1	Arithmetic Operator	Program to calculate the average of a list of numbers using the division operator.	CO1
1.34	1	Comparison Operator	Program to compare two numbers and determine if they are equal.	CO1

1.35	1	Comparison Operator	Program to compare two numbers and determine whether they are greater than or less than .	CO1
1.36	1	Comparison Operator	Program to check if a given string is equal to a specific value.	CO1
1.37	1	Logical Operator	Write a program to apply Logical AND operator on two operands.	CO1
1.38	1	Logical Operator	Write a program to apply Logical OR operator on two operands.	CO1
1.39	1	Logical Operator	Write a program to apply Logical NOT operator on an operand.	CO1
1.40	1	Assignment operator	Program to increment or decrement a variable using assignment operators.	CO1
1.41	1	Assignment operator	Program to calculate compound interest using compound assignment operators.	CO1
1.42	1	Bitwise Operator	Program to perform bitwise AND, OR, XOR, left shift, and right shift operations.	CO1
1.43	1	Bitwise Operator	Program to check if a given number is odd or even using bitwise operators.	CO1
2.1	2	Conditional Statements	Write a program to Accept two Integers and Check if they are Equal.	CO 2

2.2	2	Conditional Statements	Write a program to Check if a given Integer is Positive or Negative and Odd or Even.	CO 2
2.3	2	Conditional Statements	Write a program to Check if a given Integer is Divisible by 7 or not.	CO 2
2.4	2	Conditional Statements	Write a program to find the greatest of three numbers using else if ladder.	CO 2
2.5	2	Conditional Statements	Write a program to find the greatest of three numbers using Nested if.	CO 2
2.6	2	Conditional Statements	Write a program to convert an Upper-case character into lower case and vice-versa.	CO 2
2.7	2	Conditional Statements	Write a program to check weather an entered year is leap year or not.	CO 2
2.8	2	Conditional Statements	Write a Program to check whether an alphabet entered by the user is a vowel or a constant.	CO 2
2.9	2	Conditional Statements	Write a program to print day according to the day number entered by the user.	CO 2
2.10	2	Conditional Statements	Write a program to print color name, if user enters the first letter of the color name.	CO 2
2.11	2	Conditional Statements	Write a program to Simulate Arithmetic Calculator.	CO 2
2.12	2	Conditional Statements	Write a menu driven program for calculating area of different geometrical figures such as circle, square, rectangle, and triangle.	CO 2
2.13	2	Conditional Statements	WAP that accepts the marks of 5 subjects and finds the percentage marks obtained by the student. It	CO 2

			also prints grades according to the following criteria: Between 90-100% Print 'A', 80-90% Print 'B', 60-80% Print 'C', 50-60% Print 'D', 40-50% Print 'E', Below 40% Print 'F'.	
2.14	2	Conditional Statements	WAP to enter a character and then determine whether it is a vowel, consonants, or a digit.	CO 2
2.15	2	Loops	Write a program to display all even numbers from 1 to 20	CO 2
2.16	2	Loops	Write a program to print all the Numbers Divisible by 7 from 1 to 100.	CO 2
2.17	2	Loops	Write a program to print table of any number.	CO 2
2.18	2	Loops	Write a program to Find the Sum of first 50 Natural Numbers using for Loop.	CO 2
2.19	2	Loops	Write a program to calculate factorial of a given number using for loop and also using while loop.	CO 2
2.20	2	Loops	Write a program to count the sum of digits in the entered number.	CO 2
2.21	2	Loops	Write a program to find the reverse of a given number.	CO 2
2.22	2	Loops	Write a program to Check whether a given Number is Perfect Number.	CO 2
2.23	2	Loops	Write a program to Print Armstrong Number from 1 to 1000.	CO 2
2.24	2	Loops	Write a program to Compute the Value of X^n.	CO 2

2.25	2	Loops	Write a program to Calculate the value of ${}^{n}C_{r}$.	CO 2
2.26	2	Loops	Write a program to generate the Fibonacci Series.	CO 2
2.27	2	Loops	Write a program to check whether a given Number is Palindrome or Not.	CO 2
2.28	2	Loops	Write a program to Check whether a given Number is an Armstrong Number.	CO 2
2.29	2	Loops	Write a program to print all prime numbers from 1-500.	CO 2
2.30	2	Loops	Write a program to find the Sum of all prime numbers from 1-1000.	CO 2
2.31	2	Loops	Write a program to display the following pattern: *	CO 2
2.32	2	Loops	Write a program to display the following pattern: * * * * * *	CO 2

			* * * * * * * * *	
2.33	2	Loops	Write a program to display the following pattern: 1 1 2 1 2 3 1 2 3 4 1 2 3 4 5	CO 2
2.34	2	Loops	Write a program to display the following pattern: A B B C C C D D D D E E E E E	CO 2
2.35	2	Loops	Write a program to display the following pattern: * * * * * * * * * * * * * *	CO 2

			*	
2.36	2	Loops	Write a program to display the following pattern: 1 2 3 4 5 1 2 3 4 1 2 3 1 2 1	CO 2
2.37	2	Loops	Write a program to display the following pattern: * * * * * * * * * * * * * * * *	CO 2
2.38	2	Loops	Write a program to display the following pattern: * * * * * * * * * * * * * * * * * * * * * * * * *	CO 2
2.39	2	Loops	Write a program to display the following pattern (Pascal Triangle):	CO 2

			1 1 1 1 2 1 1 3 3 1 1 4 6 4 1 1 5 10 10 5 1	
2.40	2	Loops	Write a program to display the following pattern: 1 2 3 4 5 6 7 8 9 10	CO 2
2.41	2	Loops	Write a program to display the following pattern: A B C D E F G F E D C B A A B C D E F F E D C B A A B C D E E D C B A A B C D D C B A A B C C B A A B B A A A	CO 2

2.42	2	Loops	Write a program to display the following pattern: * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *	CO 2
2.43	2	Loops	Write a program to display the following pattern: 0 0 01 10 010 010 0101 1010 0101001010	CO 2
2.44	2	Loops	Write a program to display the following pattern:	CO 2

			A B C D E F G H I J K L M N O	
2.45	2	Loops	Write a program to display the following pattern: A BAB CBABC DCBABCD EDCBABCDE	CO 2
2.46	2	Loops	Write a program to Find the Sum of A.P Series.	CO 2
2.47	2	Loops	Write a program to Find the Sum of G.P Series.	CO 2
2.48	2	Loops	Write a program to Find the Sum of H.P Series.	CO 2
2.49	2	Loops	Write a program to print the following sequence of integers. 1, 2, 4, 8, 16, 32	CO 2
2.50	2	Loops	Write a program to find the Sum of following Series: (1*1) + (2*2) + (3*3) + (4*4) + (5*5) + ... + (n*n)	CO 2
2.51	2	Loops		CO 2

			Write a program to find the Sum of following Series: (1^1) + (2^2) + (3^3) + (4^4) + (5^5) + ... + (n^n)	
2.52	2	Loops	Write a program to find the Sum of following Series: (1!/1) + (2!/2) + (3!/3) + (4!/4) + (5!/5) + ... + (n!/n)	CO 2
2.53	2	Loops	Write a program to print the following Series: 1, 2, 3, 6, 9, 18, 27, 54, ... upto n terms	CO 2
2.54	2	Loops	Write a program to print the following Series: 2, 15, 41, 80, 132, 197, 275, 366, 470, 587	CO 2
2.55	2	Loops	Write a program to print the following Series:1, 3, 4, 8, 15, 27, 50, 92, 169, 311	CO 2
2.56	2	Loops	Write a program to Convert the given Binary Number into Decimal.	CO 2
2.57	2	Loops	Write a program to Convert Binary to Hexadecimal.	CO 2
2.58	2	Loops	Write a program to find out L.C.M. of two numbers.	CO 2
2.59	2	Loops	Write a program to find out H.C.F. of two numbers.	CO 2
2.60	2	Loops	Python Program to Accept Three Digits and Print all Possible Combinations from the Digits.	CO 2
2.61	2	Loops	Python Program to Print Odd Numbers within a Given Range.	CO 2
2.62	2	Loops	Python Program to Find the Smallest Divisor of an Integer.	CO 2

2.63	2	Loops	Python Program to Count the Number of Digits in a Number	CO 2
2.64	2	Loops	Python program to find GCD between two given integer numbers.	CO 2
3.1	3	Functions	Write a Python function to find the Max of three numbers.	CO3
3.2	3	Functions	Write a Python function to sum all the numbers in a list. Sample List : (8, 2, 3, 0, 7) Expected Output : 20	CO3
3.3	3	Functions	Write a Python program to reverse a string. Sample String : "1234abcd" Expected Output : "dcba4321"	CO3
3.4	3	Functions	Write a Python function to check whether a number falls in a given range.	CO3
3.5	3	Functions	Write a Python function that accepts a string and calculate the number of upper-case letters and lower-case letters. Sample String: 'The quick Brow Fox' Expected Output : No. of Upper case characters : 3 No. of Lower case Characters : 1	CO3
3.6	3	Functions	Write a Python function that takes a number as a parameter and check the number is prime or not.	CO3

3.7	3	Functions	Write a Python function that checks whether a passed string is palindrome or not.	CO3
3.8	3	Functions	Write a Python function that prints out the first n rows of Pascal's triangle.	CO3
3.9	3	Functions	Write a Python function that accepts a hyphen-separated sequence of words as input and prints the words in a hyphen-separated sequence after sorting them alphabetically. *Sample Items:* green-red-yellow-black-white Expected Result: black-green-red-white-yellow	CO3
3.10	3	Functions	Python function to convert height (in feet and inches) to centimeters	CO3
3.11	3	Functions	Python function to Convert Celsius to Fahrenheit.	CO3
3.12	3	Functions	Implement a function to check if two strings are anagrams of each other.	CO3
3.13	3	Functions	Python function to display all the Armstrong number from 1 to n.	CO3
3.14	3	Recursion	Write a program using recursion to compute factorial of a given number.	CO3
3.15	3	Recursion	Write a program to print Fibonacci Series using recursion.	CO3
3.16	3	Recursion	Write a program to calculate sum of numbers 1 to N using recursion.	CO3
3.17	3	Recursion	Write a program to Find Sum of Digits of the Number using Recursive Function.	CO3

3.18	3	Recursion	Write a program to print Tower of Hanoi using recursion.	CO3
3.19	3	Recursion	Python Program to Determine How Many Times a Given Letter Occurs in a String Recursively	CO3
3.20	3	Recursion	Python Program to Find the Binary Equivalent of a Number Recursively	CO3
3.21	3	Recursion	Python Program to Find the GCD of Two Numbers Using Recursion	CO3
3.22	3	Recursion	Python Program to Find the Power of a Number Using Recursion	CO3
3.23	3	Recursion	WAP to compute the sum of all the elements of the list using reduce() function.	CO3
3.24	3	Modules and Pacakges	A) Write a program to create a module and import the module in another python program.	CO3
3.25	3	Modules and Pacakges	Write a program program to import all objects from a modules, specific objects from module and provide custom import name to the imported object from the module.	CO3
3.26	3	Modules and Pacakges	Create a python package having atleast two modules in it.	CO3

3.27	3	Modules and Pacakges	Create a python package having atleast one subpackage in it.	CO3
4.1	4	String	Python program to check whether the string is Symmetrical or Palindrome	CO 4
4.2	4	String	Ways to remove i'th character from string in Python	CO 4
4.3	4	String	Python program to Check if a Substring is Present in a Given String	CO 4
4.4	4	String	Find length of a string in python (4 ways)	CO 4
4.5	4	String	Python program to print even length words in a string	CO 4
4.6	4	String	Python program to accept the strings which contains all vowels	CO 4
4.7	4	String	Remove all duplicates from a given string in Python	CO 4
4.8	4	String	Python program to Maximum frequency character in String	CO 4
4.9	4	String	Python Program to Replace all Occurrences of 'a' with $ in a String	CO 4
4.10	4	String	Python Program to Form a New String where the First Character and the Last Character have been Exchanged	CO 4
4.11	4	String	Python Program to Count the Number of Vowels in a String	CO 4

4.12	4	String	Python Program to Take in a String and Replace Every Blank Space with Hyphen	CO 4
4.13	4	String	Python Program to Calculate the Length of a String Without Using a Library Function	CO 4
4.14	4	String	Python Program to Remove the Characters of Odd Index Values in a String	CO 4
4.15	4	String	Python Program to Calculate the Number of Words and the Number of Characters Present in a String	CO 4
4.16	4	String	Python Program to Take in Two Strings and Display the Larger String without Using Built-in Functions	CO 4
4.17	4	String	Python Program to Check if a String is a Pangram or Not (A pangram is a sentence that uses all 26 letters of the English alphabet at least once. like" The quick brown fox jumps over the lazy dog")	CO 4
4.18	4	String	Python Program to Accept a Hyphen Separated Sequence of Words as Input and Print the Words in a Hyphen-Separated Sequence after Sorting them Alphabetically	CO 4
4.19	4	String	Python Program to Form a New String Made of the First 2 and Last 2 characters From a Given String	CO 4
4.20	4	String	Python Program to Count the Occurrences of Each character in a Given String Sentence	CO 4
4.21	4	String	Python Program to Check if a Substring is Present in a Given String	CO 4

4.22	4	String	Python Program to Find the Most Repeated Word in a String.	CO 4
4.23	4	Regular Expression	Write a python program to check the validity of a password given by the user. The password should satisy the following criteria: i) Contain atleast 1 letter between a and z. ii) Contain atleast 1 number between 0 and 9. iii) Contain atleast 1 letter between A and Z. iv) Contain atleast 1 character from $,#,@. v) Maximum length of password 6. vi) Maximum length of password:12.	CO 4
4.24	4	Regular Expression	Write a python program to validate mobile number.	CO 4
4.25	4	Regular Expression	Given an input file which contains a list of names and phone numbers separated by spaces in the following: i) Phone number contains a 3- or 2-digit area code and a hyphen followed by an 8-digit number. **ii)** Find all names having phone number with a 3digit area code using regular expression.	CO 4
4.26	4	List	Program to interchange first and last elements in a list	CO 4
4.27	4	List	WAP to find min, max and average of elements of a list having numeric data	CO 4
4.28	4	List	Program to check if element exists in list	CO 4
4.29	4	List	Program for Reversing a List	CO 4

4.30	4	List	Program to Multiply all numbers in the list	CO 4
4.31	4	List	Program to find smallest and largest number in a list	CO 4
4.32	4	List	Program to find second largest number in a list	CO 4
4.33	4	List	Program to print all even numbers in a range	CO 4
4.34	4	List	Program to print all negative numbers in a range	CO 4
4.35	4	List	Program to Remove multiple elements from a list in Python	CO 4
4.36	4	List	Program to Cloning or Copying a list	CO 4
4.37	4	List	Program to Count occurrences of an element in a list	CO 4
4.38	4	List	Program to find Cumulative sum of a list	CO 4
4.39	4	List	Program to Break a list into chunks of size N in Python	CO 4
4.40	4	List	Python Program to transpose of Matrix.	CO 4
4.41	4	List	Python Program to Add Two Matrices.	CO 4
4.42	4	List	Python Program to Multiply Two Matrices.	CO 4
4.43	4	List	Program to get K^{th} Column of Matrix	CO 4
4.44	4	List	WAP to print all even numbers of a list using list comprehension.	CO 4

4.45	4	List	WAP that prompts user to enter an alphabet and then print all the words that starts with that alphabet from the list of words.	CO 4
4.46	4	List	WAP to transpose a given matrix using list comprehension.	CO 4
4.47	4	List	Print All the characters of a string using list Comprehension	CO 4
4.48	4	List	Write a program to calculate square of numbers upto n using list comprehension.	CO 4
4.49	4	Tuple	Python program to Find the size of a Tuple	CO 4
4.50	4	Tuple	Python – Maximum and Minimum K^{th} elements in Tuple	CO 4
4.51	4	Tuple	Create a list of tuples from given list having number and its cube in each tuple	CO 4
4.52	4	Tuple	Python – Flatten tuple of List to tuple	CO 4
4.53	4	Set	Python Program to Count the Number of Vowels Present in a String using Sets	CO 4
4.54	4	Set	Python Program to Check Common Letters in Two Input Strings	CO 4
4.55	4	Set	Python Program that Displays which Letters are in the First String but not in the Second	CO 4
4.56	4	Set	Python Program that Displays which Letters are Present in Both the Strings	CO 4

4.57	4	Set	Python Program that Displays which Letters are in the Two Strings but not in Both	CO 4
4.58	4	Dictionary	Python Program to Add a Key-Value Pair to the Dictionary	CO 4
4.59	4	Dictionary	Python Program to Concatenate Two Dictionaries into One.	CO 4
4.60	4	Dictionary	Python Program to Check if a Given Key Exists in a Dictionary or Not	CO 4
4.61	4	Dictionary	Python Program to Generate a Dictionary that Contains Numbers (between 1 and n) in the Form (x,x*x).	CO 4
4.62	4	Dictionary	Python program to create an instance of an Ordered dict using a given dictionary. Sort the dictionary during the creation and print the members of the dictionary in reverse order.	CO 4
4.63	4	Dictionary	Python Program to Sum All the Items in a Dictionary	CO 4
4.64	4	Dictionary	WAP to create dictionary which has characters of given string as keys and frequency of characters as values.	CO 4
4.65	4	Dictionary	Python Program to Multiply All the Items in a Dictionary	CO 4
4.66	4	Dictionary	Python Program to Remove the Given Key from a Dictionary	CO 4
4.67	4	Dictionary	Python Program to Form a Dictionary from an Object of a Class	CO 4

4.68	4	Dictionary	Python Program to Map Two Lists into a Dictionary	CO 4
4.69	4	Comprehension	Write a program Filtering even numbers from a list using tuple comprehension	CO 4
4.70	4	Comprehension	Creating a list of tuples from two lists using comprehension function	CO 4
4.71	4	Comprehension	Extracting the first character from each word in a list of strings	CO 4
4.72	4	Comprehension	Swapping keys and values in a dictionary	CO 4
4.73	4	Comprehension	Filtering even numbers from a dictionary:	CO 4
4.74	4	Comprehension	Write a Program to calculate square of number using dictonary comprehension	CO 4
5.1	5	File handling and Exceptional Handling	Python program to read file word by word	CO 5
5.2	5	File handling and Exceptional Handling	Python program to read character by character from a file	CO 5
5.3	5	File handling and Exceptional Handling	Python – Get number of characters, words, spaces and lines in a file	CO 5
5.4	5	File handling and Exceptional Handling	Program to Find ‘n’ Character Words in a Text File	CO 5
5.5	5	File handling and Exceptional Handling	Python Program to obtain the line number in which given word is present	CO 5

5.6	5	File handling and Exceptional Handling	Count number of lines in a text file in Python	CO 5
5.7	5	File handling and Exceptional Handling	Python Program to remove lines starting with any prefix	CO 5
5.8	5	File handling and Exceptional Handling	Python Program to Eliminate repeated lines from a file	CO 5
5.9	5	File handling and Exceptional Handling	Python Program to read List of Dictionaries from File	CO 5
5.10	5	File handling and Exceptional Handling	Python – Append content of one text file to another	CO 5
5.11	5	File handling and Exceptional Handling	Python program to copy odd lines of one file to other	CO 5
5.12	5	File handling and Exceptional Handling	Python Program to merge two files into a third file	CO 5
5.13	5	File handling and Exceptional Handling	Python program to Reverse a single line of a text file	CO 5
5.14	5	File handling and Exceptional Handling	Python program to reverse the content of a file and store it in another file	CO 5
5.15	5	File handling and Exceptional Handling	Python Program to handle divide by zero exception.	CO 5

5.16	5	File handling and Exceptional Handling	WAP to handle multiple exception.	CO 5
5.17	5	File handling and Exceptional Handling	Python program to combine each line from first file with the corresponding line in second file.	CO 5
5.18	5	File handling and Exceptional Handling	Write a program to copy the contents of one file to another.	CO 5
5.19	5	File handling and Exceptional Handling	Write a program to print First 5 line in a file	CO 5
5.20	5	File handling and Exceptional Handling	a) Write a program to catch the following exception: i) Value error ii) Index error iii) Name error iv) Type error v) Divide zero error b) Write a program to create user defined exceptions. c) Write a program to understand the use of else and finally block with try block. **d)** Write a python program that uses raise and exception class to throw an exception.	CO 5

Subject Code-BEC0151	**L T P** **0 0 2**
Subject Name- Basic Electrical & Electronics Engineering Lab	**No. of Hours: 32**

Course Objective-

1. The student will learn laws and theorems used for analysis of electrical circuits along with steady state behavior of single phase, transformer and different types of safety devices.
2. The student will learn about semiconductors diodes applications, Op-Amp circuits.

Course Outcome-

CO1- Apply the principle of KVL/KCL and theorem to analysis DC Electric circuits.

CO2- Demonstrate the behavior of AC circuits connected to single-phase AC supply and measure power in single phase as well as three phase electrical circuits.

CO3- Calculate efficiency of a single-phase transformer and energy consumption.

CO4- Understand the concept and applications of diode, Op-Amp, sensors and IoT.

Total No. of Practicals

List of Practicals

Lab No.	Unit	Topic	Program Logic Building	CO Mapping
	I	1. To Verify Kirchhoff's laws of a circuit 2. To Verify Superposition Theorem of a circuit. 3. To Verify Thevenin's Theorem of a circuit. 4. To Verify Norton's Theorem of a circuit. 5. To Verify Maximum Power Transfer Theorem of a circuit.		CO1
	II	6. Measurement of power and power factor in a single-phase ac series inductive circuit and improvement of power factor using capacitor. 7. Study of phenomenon of resonance in RLC series circuit and obtain resonant Frequency. 8. Study and Calibration of single-phase energy meter.		CO2
	III	9. To study wiring of distribution board including power plug using MCB, ELCB. 10. Visit your college substation and familiarize the supply system, Transformer, HT Panel, solar panel and		CO3

		Distribution etc. Perform Energy audit of labs and rooms of different blocks.		
	IV	11. Study of Cathode Ray Oscilloscope and perform: a) Calibration of CRO b) Component testing using CRO c) Draw the VI- characteristics of Diode. 12. To design half wave and full wave rectifier circuits using diode. 13. To generate random numbers using 7-Segment display using decoder IC		CO4
	V	14. Design Op-Amp circuit for the following operations. a) inverting, b) non-inverting, c) adder, d) differentiator e) integrator circuit 15. To study wheat stone bridge by using load cell sensor. 16. To understand the concept of Wireless Home Automation System based on IoT for controlling lights and fans.		CO4

Subject Code-BASL0151	**L T P**
Subject Name- ABC (Lab)	**0 0 4**
	Total No. of Hours: 48

Total No. of Activities – 24

List of Activities

Activity	**Modules**	**Topic**	**Program Logic Building**	**CO Mapping**
Anubhava Activities	1	**Getting rid of stage fear**	Participants will gain confidence in expressing themselves through dance, overcome inhibitions, and develop a sense of freedom and creativity.	CO2

Dumb Charades	1	**Enhancing communication skills and non-verbal expressions**	Participants will improve their ability to communicate effectively using non-verbal cues, develop teamwork and collaboration skills, and enhance their creativity in conveying messages.	CO1
Chinese Whisper	1	Developing active listening and accurate communication skills	Participants will enhance their listening skills, practice conveying information accurately, and understand the importance of clear communication and active listening in avoiding miscommunication.	CO1
Picture Reading – Story Telling	2	Practice sessions for storytelling skills	Participants will enhance their ability to comprehend and interpret information from visual aids, develop storytelling skills, and engage in imaginative and creative thinking.	CO3
Reading Diagrams, Graphs, and Pie Charts	2	Exercises based on charts and diagrams	Participants will improve their ability to interpret and analyse data presented in diagrams, graphs, and pie charts, develop critical thinking skills, and make informed decisions based on visual information.	CO1
Assessment	2	Online Assessment		
Analysing Case Studies	2	Case Study: Badger Mining Corp Case Study	Participants will develop critical thinking skills, analyse the effectiveness of communication practices, and gain insights into real-world communication challenges and their solutions.	CO4
Reading Comprehension Exercise	2	Exercises based on reading comprehension	Participants will enhance their reading comprehension abilities, improve vocabulary and language skills, and develop strategies for efficient and effective reading.	CO1

Filling a Form	1	Filling forms accurately	Participants will improve their ability to understand and follow instructions, enhance their attention to detail, and develop proficiency in accurately filling out forms.	CO2
Flipped Classroom	1	Interactive reading experience through flipped class methodology	Participants will actively engage with reading materials, participate in discussions and activities that deepen understanding, and develop independent learning skills.	CO1
Infographics	1	Analysing information based on infographics	Participants will improve their ability to interpret and analyse information presented in infographics, develop visual literacy skills, and effectively communicate complex concepts using visual aids.	CO1
Songs and decoding the lyrics.	1	Decoding song lyrics	Participants will enhance their listening skills, improve understanding of language nuances through song lyrics, and develop an appreciation for different genres of music.	CO1
Assessment	2	Online Assessment		
Listening to instructions and directions	1	Listening based activity	Participants will improve their listening comprehension, enhance their ability to follow instructions & directions, and practice attention to detail.	CO2
Speech Analysis	2	Speech Analysis	Participants will develop critical thinking skills, analyze speech techniques and delivery styles, and gain insights into effective public speaking strategies.	CO3
Views on News	2	News Analysis	Participants will develop active listening skills, gain knowledge of current events, and engage in thoughtful discussions to express their views and opinions.	CO4

Introducing your partner	4	Introducing others and oneself	Participants will improve their active listening skills, develop clarity in communication, and effectively convey specific information about their partner and themselves to others.	CO2
Role Plays	4	Role Playing Situations	Participants will practice effective communication strategies, develop empathy and understanding, and improve their ability to handle real-life situations through role-playing exercises.	CO4
GD (Group Discussion)	4	Group Discussions	Participants will enhance their ability to express their opinions, actively listen to others, and engage in constructive discussions to develop well-rounded perspectives.	CO5
Interview Handling Skills	4	**Mock Interviews: Practising Behavioural and FAQs**	The students will be able to respond to behavioural interview questions efficiently.	CO5
Presentation Skills	4	Articulating insights: Presentations	Participants will enhance their ability to deliver engaging presentations, effectively communicate their ideas, and exhibit confidence in public speaking.	CO5
Final Assessment	2	**Writing Task for the Final Internal Assessment**	Final Assessment	
Final Assessment	2	**Group Presentations for Final Internal Assessment**	Final Assessment	

B. Tech.-Second Semester

Branch-Bio Technology

Subject Code-BBT0201	**L - T - P** **3 – 1- 0**
Subject Name-Introduction to Biotechnology	**No. of hours-40**

- **Course Objective-. To introduce students basic knowledge about structure and function of bio molecules.**
- **2. To develop understanding about cell biology, microbiology and nucleic acids.**
- **3. To understand the biotechnological applications in the field of immunology and bioinformatics.**

Course Outcome –

CO1 - Acquire the basic knowledge of biomolecules and their functions.K1,K2

CO 2 Understand the concept of cell structure and microbiology.K1,K2

CO 3 Understand the concept of nucleic acids and their key functions K1, K2

CO 4 Understand the concept of immune system and various components involved in it. K1,K2

CO 5 Describe the wide applications of biotechnology and concept of bioinformatics K1,K2

Course Content

Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required (T=L+P)**	**Aligned Practical/Assignment/Lab**	**CO Mapping**

Unit 1	(**Biochemistry)**	**Component of the cell, structure and biochemical functions, Biomolecules-Carbohydrates, lipids, proteins, Nucleic acids, Structure and classification of enzymes**	**Smart Board, PPT,M tutor**	**8**	**NO lab**	**CO 1**
Unit 2	**Cell Biology and Microbiology**	**Eukaryotic, Prokaryotic cells, Cell cycle – Mitosis and Meiosis, History and development of Microbiology, Classification and Nomenclature of Microorganisms - concept of kingdom-protista, prokaryote and eukaryotes**	**Smart Board, PPT,M tutor**	**8**	**NO lab**	**CO 2**
Unit 3	**Molecular Biology**	**Introduction to nucleic acids: Nucleic acids as genetic material, Structure and**	**Smart Board, PPT,M tutor**	**8**	**NO lab**	**CO 3**

		physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA.				
Unit 4	**Immunology**	**Cells of immune system, Development, maturation, activation and differentiation of T-cells and Bcells, Phagocytosis process**	**Smart Board, PPT,M tutor**	**8**	**NO lab**	**CO 4**
Unit 5	**Biotechnology Applications**	**Industrial production, Drug discovery and development, applications of biotechnology include GMO (genetically modified organism), biopesticides, insulin, gene therapy, transgenic animals, bioremediation, biotechnology sector in India**	**Smart Board, PPT,M tutor**	**8**	**NO lab**	**CO 5**

References-

Text Books:

1. Introduction To Biotechnology 3rd Edition by Thieman and William, Pearson

2. Biotechnology by BD Singh. Kalyani Publishers

3.NCERT BOOK class 11 and 12

Reference Books:1. Biology 12th Edition by Raven and George Johnson and Kenneth Mason and Jonathan Losos and Tod Duncan. McGrawHill Publications 2 TEXTBOOK OF BIOTECHNOLOGY by PATNAIK, McGraw Hill 3.. Basic Biotechnology3rd Edition by Colin Ratledge&Bjorn Kristiansen, Cambridge University Press NPTEL/ Youtube/ Faculty V

B. Tech.- Second Semester

Branch- ME/BT

Subject Code-BAS0201B	**L - T - P** **3 – 1 - 0**
Subject Name- ENGINEERING PHYSICS	**No. of hours-40**

Course Objective-

1. To provide the knowledge of Relativistic Mechanics and their uses to engineering applications.

2. To provide the knowledge of Quantum Mechanics and to explore possible engineering utilization.

3. To provide the knowledge of interference and diffraction.

4. To provide the knowledge of Crystallography and its uses to engineering applications.

5. To provide the basic knowledge of Superconductivity and Nanotechnology which is necessary to understand the working of modern engineering tools and techniques.

Course Outcome – After completion of this course students will be able to:

CO1 - Solve the relativistic mechanics problems.

CO2- Apply the concept of quantum mechanics.

CO3- Apply the laws of optics and their application in various processes.

CO4- Calculate the various parameters of crystal structures.

CO5- Explain the basic phenomena of superconductivity and nanotechnology.

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Unit 1	**Relativistic Mechanics**	Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's	Smartboard, PPT	8	Assignment 1.1,1.2,1.3	CO1

		mass energy relation, Relativistic relation between energy and momentum, Massless particle. Some engineering applications(qualitative): Global positioning system (GPS), Application to Satellites.				
Unit 2	**Quantum Mechanics**	Introduction to wave-particle duality, de Broglie matter waves, Phase and group velocities, Heisenberg's uncertainty principle and its applications, Wave function characteristics and significance, Time-dependent and time- independent Schrödinger's wave equations, Particle in one-dimensional rigid box, Theory of Quantum excitation of the Higgs field (Higgs Boson or GOD particle)(qualitative).	Smartboard, PPT	8	Assignment 2.1, 2.2, 2.3/Exp. 7,5, 19	CO2
Unit 3	**Wave Optics**	Coherent sources, Interference in	Smartboard, PPT	10	Assignment 3.1, 3.2/Exp.1,2,4	CO3

		uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications, Fraunhofer diffraction at single slit and at double slit, absent spectra, Diffraction grating, grating spectra, Rayleigh's criterion of resolution, Resolving power of grating, Optical filters.				
Unit 4	**Crystal Physics**	Crystalline and non-crystalline materials, Crystal systems and Bravais lattices, Space lattices of cubic systems, Miller indices, Relation between inter-planer distance and cube edge, crystal structure of NaCl and diamond, Atomic packing factor of the cubic system, Relation between lattice constant and density. Diffraction of X-rays by crystal planes, Bragg's law.	Smartboard, PPT	6	Assignment 4.1, 4.2	CO4

Unit 5	**Superconductivity and Nanomaterials**	Temperature dependence of resistivity, Effect of magnetic field (Meissner effect), Penetration depth, Type I and Type II Superconductors, Temperature dependence of critical field, BCS theory(qualitative), High temperature superconductors, Some engineering applications(qualitative): Concept of Maglev vehicles (Bullet Trains & hyper loop trains). Introduction to nanomaterials, Basic principles of nano- science and technology, Creation and use of bucky balls, Structure, properties and uses of carbon nanotubes. Some engineering applications(qualitative): Radar absorbing materials (RAM) or Stealth materials used in military aircrafts (e.g. Rafale). Transformation of	Smartboard, PPT	8	Assignment 5.1, 5.2	CO5

		micro to nano-UAVs (Drones)				

References-

Text Books:

1. A. Beiser, Concepts of Modern Physics (McGraw Hill)

2. Brijlal & Subramanian, Optics (S. Chand)

3. Neeraj Mehta, Applied Physics for Engineers (PHI Learning, New)

Reference Books:

1. Robert Resnick, Introduction to Special Theory of Relativity (Wiley)

2. Katiyar and Pandey, Engineering Physics: Theory and Practical (Wiley India)

3. H. K. Malik and A. K. Singh, Engineering Physics- (McGrawHill)

4. J.W. Jewett , Jr. and R. A. Serway , Physics for Scientists and Engineers with Modern Physics,7th Edn. (CENGAGE Learning)

5. C. Kittel , Solid State Physics,7th Edn. (Wiley Eastern)

6. V. Raghavan, Materials Science and Engineering (Prentice Hall, India)

7. S.O. Pillai , Solid State Physics,5th Edn (New Age International)

8. R. Booker and E. Boysen , Nanotechnology (Wiley Publ.)

9. K.Rajagopal, Engineering Physics, 2nd Edn. (PHI Learning)

10. G. Aruldhas , Engineering Physics (PHI Learning)

11. S.D. Jain and G.S. Sahasrabudhe , Engineering Physics (Universities Press)

12. L. F. Bates, Modern Magnetism, (Cambridge Univ. Press)

13. F.T.S.Yu , X.-Y.Yang, Introduction to Optical Engineering (Cambridge Univ.Press)

14. G.Keiser, Optical Communications Essentials (Tata McGrawHill)

Links:

UNIT1: https://www.youtube.com/watch?v=lzBKlY4f1XA&list=PL10WTjZXSIlHKMnU4UCxpPsH-yAf_n1O6&index=11

UNIT2: http://nptel.ac.in/ **,** http://www.mit.edu/

UNIT3: https://www.youtube.com/watch?v=bWTxf5dSUBE **,** http://ocw.mit.edu/**,** http://nptel.ac.in/

UNIT4: https://www.youtube.com/watch?v=6vyYRnLvnqI

UNIT5: https://www.youtube.com/watch?v=0GD-18Jqnro, https://www.youtube.com/watch?v=dQhhcgn8YZo

B. Tech.-Second Semester

Branch- CS/CSE/ CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI) /ME/M. Tech (Int.)/BT

Subject Code-BCSE0203	**L - T - P** **2 – 1 - 0**
Subject Name- Design Thinking -I	**No. of hours-40**

Course Objective- The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcome – After completion of this course students will be able to:

CO1 - Develop a strong understanding of the design process and apply it in a variety of business settings

CO2-Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behaviour

CO3- Formulate specific problem statements of real time issues and generate innovative ideas using design tools

CO4- Apply critical thinking skills in order to arrive at the root cause from a set of likely causes **CO5-** Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments						
Course Content						
Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required** **(T=L+P)**	**Aligned Practical/Assignment/ Lab**	**CO Mapping**
Unit 1	Introduction	An overview of future skills, introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environment	Smartboard/PPT/Text book/Reference book	**10**	Practical Approach (Discussion and Activities), Workshop at School of Future Skills Activity related to observation & team building exercise	CO 1

		s, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world.				
Unit 2	**Ethical Values and Empathy**	Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family, society, institution, startup, socialization	Smartboard/PPT/Text book/Reference book	**8**	Practical Approach (Discussion and Activities)/ Assignment Activity related to Empathy Map and Journey Mapping	CO 2

		process. Ethical behaviour: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy				

		maps, emotional mapping, immersion and observations, Emotional Intelligence, customer journey maps, classifying insights after Observations, Classifying Stakeholders, Individual activity- 'Moccasin walk'				
Unit 3	**Problem Statement and Ideation**	Defining the problem statement, creating personas, Point of View (POV) statements. Research identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation	Smartboard/PPT/Text book/Reference book	**8**	Practical Approach (Discussion and Activities)/ Assignment Activity related to Brainstorming and Six Thinking Hats	

		basic design directions, Themes of Thinking, inspirations and references, brainstormin g, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea,				CO 3

		introduction to visual collaboration and brainstorming tools - Mural, JamBoard.				
Unit 4	**Critical Thinking**	Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism,	Smartboard/PPT/Text book/Reference book	**6**	Practical Approach (Discussion and Activities)/Assignment Activity related to identifying Biases	CO 4

		and politics. Case study on applying critical thinking on different scenarios.				
Unit 5	**Logic and Argumentation**	The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking.	Smartboard/PPT/Text book/Reference book	**8**	Practical Approach (Discussion and Activities)/Assignment	CO 5

		Group activity/role plays on evaluating arguments.				

References-

Text Books:

1. Arun Jain, UnMukt : Science & Art of Design Thinking, 2020, Polaris

2. Jeanne Liedta, Andrew King and Kevin Benett, Solving Problems with Design Thinking – Ten Stories of What Works,2013,Columbia Business School Publishing

3. RR Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional

Ethics, First Edition, 2009, Excel Books: New Delhi

Reference Books:

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey

2. Mootee, I. (2013). Design thinking for strategic innovation: What they can't teach you at business or design school. John Wiley & Sons.

3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA

4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

Links:

Unit I

https://nptel.ac.in/courses/110/106/110106124/

https://nptel.ac.in/courses/109/104/109104109/

https://designthinking.ideo.com/

https://blog.hypeinnovation.com/an-introduction-to-design-thinking-for-innovation-managers

https://www.creativityatwork.com/design-thinking-strategy-for-innovation/

https://www.youtube.com/watch?v=GFffb2H-gK0

Unit II

https://aktu.ac.in/hvpe/

http://aktu.uhv.org.in/

https://nptel.ac.in/courses/110/106/110106124/

https://swayam.gov.in/nd1_noc19_mg60/preview

Unit III

https://nptel.ac.in/courses/110/106/110106124/

https://swayam.gov.in/nd1_noc19_mg60/preview

https://www.udemy.com/course/design-thinking-for-beginners/

https://www.designthinking-methods.com/en/

https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them

Unit IV

https://www.forbes.com/sites/sap/2016/08/25/innovation-with-design-thinking-demands-critical-thinking/#340511486908

https://www.criticalthinking.org/pages/defining-critical-thinking/766

Unit V

https://www.udemy.com/course/critical-thinker-academy/

https://swayam.gov.in/nd2_aic19_ma06/preview

List of Suggested projects: An indicative list of projects where you will have to be actively engaged in field work to interact with stakeholders & apply Design Tools, such as –

Institutional Projects

1. Improving canteen experience

2. Improving library usage by students
3. Facilitating interaction between students of diverse ethnic backgrounds
4. Making college campus plastic-free
5. Segregating different kind of domestic waste
6. Adopting to plastic-ban
7. How can we improve classroom experience of students?
8. How can we ensure better communication with our institution alumni?

Or

Social Projects

9. How can we ensure that clean drinking water is handled properly?
10. How might we feed everybody in the world?
11. How can we solve voters' dissatisfaction by changing the voting system?
12. How can we help the school drop-outs to continue the study?
13. How to solve issue of waste management?
14. How can we solve issue of insensitivity of peoples towards street animals?
15. How to solve the issue of gender inequality in society / college / schools?
16. How can we improve College Experiences and helping teachers?
17. How can we ensure secured financial transactions and minimize scams?
18. Facilitating Water Conservation in domestic households
19. Making the elderly adapt to mobiles/smartphones.
20. Use design thinking to use empty lot's in our neighbourhood.

Or

A project on the theme: teens, human rights, water, privacy, violence, equity, immigration, change with growth, food waste and robotics.

Or

Industrial Projects

21. Windsor Airline's consistent flight delays are hurting the company's bottom line. How might we ensure that Windsor Airlines flights leave on time.
22. Being part of an ever-connected society, many people in the Global North can barely fathom that still more than 1.5 billion people live off the grid. Instead of simply plugging in, they use kerosene lanterns that only illuminate spots in their home, walk miles to charge their mobile phones, or run a diesel genset for their business. How do you reinvent Solar Energy Supply for them?
23. NGO provides services and financial support to people with developmental disabilities. But for parents of children with disabilities, navigating the long and sometimes bewildering bureaucratic process required to get such services often challenges their patience and persistence. Before NGO can determine which services, if any, are best for a child, staffers conduct a thorough assessment that entails meetings with parents, home visits by social workers, and evaluations by medical professionals including speech pathologists, psychologists, and nurses. Design a process to ensure Better and faster Service.
24. A company wish to provide internet access to everyone. Design a low cost, easily applicable model.
25. Use 'design thinking' can help lose weight, stop worrying, and change life of peoples.
26. Assume you are called in to help the struggling community bank, with around 40 employees and six branches. You immediately noticed that all banks offered the same lousy experience: bland, boring,

forgettable. Most banks offer the same products at basically the same rates, too. If Xling was able to come up with a great product, it would be copied by the bigger banks within days. What could you do to make the bank better?

27. Your city metro train service is facing issues of troublesome experiences of travelers. The team has notices that the queues often built up at the service counters because customers asked the same simple questions again and again. How would you improve the services.

28. Violent crime and the loss of young lives in assaults pose a frightening problem in many urban city districts. Use design thinking to find how to 'Designing Out Crime Research Center' as solution.

29. City Hospital simply wishes improving staff hand-washing habits could prevent these needless infections. While hospitals have plenty of communal sinks and hand-sanitizing dispensers, time-strapped caregivers simply don't use them, they noticed medical staff wiped their hands on their scrubs. Use design thinking to give solutions.

30. The Wiley produces traditionally crafted 'Dutch Wax Print' fabrics for Indian markets. Lately, the organization faces disrupted markets, competition, and Chinese counterfeit. Use design thinking to come up with a new vision to secure its future.

Or any of your Startup Idea as project

<table>
<tr><td colspan="2">B. Tech.-Second Semester

Branch- CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT</td></tr>
<tr><td>Subject Code-BCSE0252</td><td>L - T - P

0 –0 - 6</td></tr>
<tr><td>Subject Name- Advanced Python</td><td>No. of hours- 78 hours</td></tr>
<tr><td colspan="2">Course Objective- To become familiar with Python's Object-Oriented Concepts, functional programming And create GUI application and to gain the knowledge of Python libraries.</td></tr>
<tr><td colspan="2">Course Outcome –

CO1 - Implement classes and create instances in python</td></tr>
</table>

CO2- Implement GUI based Python application **CO3-** Use Python libraries for data handling. **CO4-** Analyze data using visualization libraries. **CO5-** Analyze web scraping application for real world data						
Course Content						
Unit	**Module**	**Topics Covered**	**Pedagogy**	**Lecture Required (T=L+P)**	**Aligned Practical/Assignment/Lab**	**CO Mapping**
Unit 1	**Classes and Objects**	Introduction: Python Classes and objects, User-Defined Classes, Class Variables and Instance Variables	Lecture , Hands-on exercise, Demonstration, practical lab	4(3+1)	Learn to create python classes and objects.	1
		Instance methods, Class method, static methods,		4(2+2)	Perform different types of class methods.	1
		constructor in python, parametrized constructor,		3(3+2)	Create a constructor to initialize an object in Python, Different types of constructors,	1

		Magic Methods in python,			Constructor overloading and chaining	
		Object as an argument, Instances as Return Values, namespaces,		2(1+1)	Implementation of Object as an argument, Instances and namespace	1
		Introduction to inheritance and polymorphism, **Abstract Class, Introduction to Abstraction and Encapsulation**		8(3+5)	Implementing inheritance and types of polymorphism.	1
Unit 2	**Functional and GUI Programming**	**Functional Programming**: Immutability, Closures and Decorators, generators	Hands-on exercise, Demonstration, lectures, practical lab	6(2+4)	Implementation of Decorators and generators	2
		Co-routines, iterators,		3(2+1)	Implement the functions of	2

		Declarative programming			iterators and co routines	
		GUI Programming: Intro to GUI Programming, Settling widgets in the window's interior, Numeric Widgets,		3(0+3)	Demonstration of GUI interface.	2
		Boolean Widgets, Selection Widgets, String Widgets, Date Picker, Color Picker, Container Widgets,		2(0+2)	Implement different types of GUI widgets.	2
		Creating a GUI Application, Tkinter, button, canvas		2(0+2)	Create GUI application using Tkinter and components.	2
Unit 3	**Libraries for Data Handling**	**NumPy:** Basic Operation, Indexing, slicing and Iterating	Lecture , Hands-on exercise, Demonstration,	3(1+2)	Demonstration on numpy, and mathematical operations on numpy.	3

			practical lab			
		Multidimensional arrays, NumPy Data types, Reading and writing data on Files		3(1+2)	Implementation of Multi-dimensional array.	
		SciPy: Introduction to SciPy, Create function, modules of SciPy.		3(1+2)	Learn to demonstrate the SciPy libraries.	
		Pandas : Series and Data Frames, Grouping, aggregation, Merge Data Frames,		3(1+2)	Learn to demonstrate the use of pandas, data frames..	
		Generate summary tables, Group data into logical pieces, Manipulation of data		3(1+2)	Creating tables and groups.	
Unit 4	**Libraries in Data**	**Matplotlib:** Scatter plot, Bar charts,	Lecture , Hands-on exercise,	3(1+2)	Learn to demonstrate the different	4

	Visualization	histogram, Stack charts	Demonstration, practical lab		visualization methods.	
		Legend title Style, Figures and subplots,		1(0.5+0.5)	Implementation on charts and figures.	4
		Plotting function in pandas, Labelling and arranging figures, Save plots.		3(1+2)	Implementation on plots and figures.	4
		Seaborn: style function, color palettes, heatmaps ,distribution plots, category plot, regression plot		3(1+2)	Implementation of seaborn library	4
		Plotly : Lineplots , Areaplots, Scatterplots, Bubbleplots , Stacked bar charts,		2(1+1)	Implementation of different types of plots.	4

		Grouped bar charts, Pie charts, Tables, Dashboards		2(1+1)	Implementation of charts.	4
Unit 5	**Web Scraping with Python**	Web Scraping: Introduction, Web Crawling v/s Web Scraping, Uses of Web Scraping, Components of a Web Scraper, working of a Web Scraper, Crawl, Parse and Transform Store the Data	Lecture , Hands-on exercise, Demonstration, practical lab	3(1+2)	Learn to scrap the data.	5
		Beautiful Soup: Introduction to Beautiful Soup library, Accessing Tags, Navigable Strings, Navigating and searching with		3(1+2)	Demonstration of web scrapping using Beautiful Soup.	5

		Beautiful Soup, Web Scraping				
		Example: Scraping Flipkart Website		4(1+3)	Learn to scrapping of Flipkart website.	5
		Introduction to Github		2(1+1)	Implementation of Projects on Github.	5

References-

Text Books:

1. Magnus Lie Hetland, "Beginning Python-From Novice to Professional"—Third Edition, Apress
2. Peter Morgan, Data Analysis from Scratch with Python, AI Sciences
3. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016
4. Miguel Grinberg, Developing Web applications with python, OREILLY

Reference Books:

1. Dusty Phillips, Python 3 Object-oriented Programming - Second Edition, O’Reilly
2. Burkhard Meier, Python GUI Programming Cookbook - Third ,Packt
3. DOUG HELLMANN, THE PYTHON 3 STANDARD LIBRARY BY EXAMPLE, :Pyth 3 Stan Libr Exam _2 (Developer's Library) 1st Edition, Kindle Edition
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

Links:

Unit 1	https://nptel.ac.in/courses/106/106/106106145/
Unit 2	https://www.python-course.eu/python3_inheritance.php
Unit 3	https://realpython.com/courses/functional-programming-python/
Unit 4	https://realpython.com/python-gui-tkinter/
Unit 5	https://nptel.ac.in/courses/106/107/106107220/ https://nptel.ac.in/courses/106/106/106106212/

LAB:

Total No. of Practicals: 176				
List of Practicals				
Lab No.	**Unit**	**Topic**	**Program Logic Building**	**CO Mapping**
1.1	1	Class and object	Write a program illustrating class definition and accessing class members.	CO 1
1.2		Class and object	Write a program to implement default constructor, parameterized constructor, and destructor.	CO 1
1.3	1	Class and object	Create a Python class named Rectangle constructed by a length and width. a. Create a method called area which will compute the area of a rectangle.	CO 1

1.4	1	Class and object	Create a class called Numbers, which has a single class attribute called MULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers). a. Write an instance method called add which returns the sum of the attributes x and y. b. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER.	CO 1
1.5	1	Class and object	Create a class named as Student to store the name and marks in three subjects. Use List to store the marks. a. Write an instance method called compute to compute total marks and average marks of a student. b. Write a method called display to display student information.	CO 1
1.6	1	Class and object	Write a program that has a class called Fraction with attributes numerator and denominator. a. Write a method called getdata to enter the values of the attributes.	CO 1

			b. Write a method show to print the fraction in simplified form.	
1.7	1	Class and object	Write a program that has a class Numbers with a list as an instance variable. a. Write a method called insert_element that takes values from user. b. Write a class method called find_max to find and print largest value in the list.	CO 1
1.8	1	Class and object	Create a class called Complex. Write a menu driven program to read, display, add and subtract two complex numbers by creating corresponding instance methods.	CO 1
1.9	1	Class and object	Write a program that has a class Point with attributes x and y. a. Write a method called midpoint that returns a midpoint of a line joining two points. b. Write a method called length that returns the length of a line joining two points.	CO 1
1.10	1	Class and object	Write a Python program to create a class called "Rectangle" with attributes length and width. Include methods to calculate the perimeter and area of the rectangle.	CO 1

1.11	1	Class and object	Implement a Python class called "BankAccount" with attributes account number, account holder name, and balance. Include methods to deposit and withdraw money from the account.	CO 1
1.12	1	Class and object	Write a Python program to create a class called "Student" with attributes roll number, name, and marks in three subjects. Include a method to calculate the average marks of the student.	CO 1
1.13	1	Class and object	Implement a Python class called "Car" with attributes make, model, and year. Include methods to start the car, stop the car, and display its details.	CO 1
1.14	1	Magic Method	Write a program to illustrate the use of following built-in methods: a. hasattr(obj,attr) b. getattr(object, attribute_name [, default]) c. setattr(object, name, value) d. delattr(class_name, name)	CO 1
1.15	1	Inheritance	Write a program to create class Employee. Display the personal information and salary details of 5 employees using single inheritance.	CO 1
1.16	1	Inheritance	WAP that extends the class Employee. Derive two classes Manager and Team Leader from Employee class. Display all the details of the	CO 1

			employee working under a particular Manager and Team Leader.	
1.17	1	Inheritance	Write a program that has a class Point. Define another class Location which has two objects (Location and destination) of class Point. Also, define a function in Location that prints the reflection on the y-axis.	CO 1
1.18	1	Polymorphism	Write a program to overload + operator to multiply to fraction object of fraction class which contain two instance variable numerator and denominator. Also, define the instance method simplify() to simplify the fraction objects.	CO 1
1.19	1	Polymorphism	26. Write a program to compare two-person object based on their age by overloading > operator. .	CO 1
1.20	1	Polymorphism	Write a program to overload in operator.	CO 1
2.1	2	Functional Programming	WAP to Show the concept of inner function.	CO2
2.2	2	Functional Programming	WAP to create closure.	CO2

2.3	2	Functional Programming	WAP to create a decorator which will convert a string into upper case string.	CO2
2.4	2	Functional Programming	WAP to show the concept of nested decorator.	CO2
2.5	2	Functional Programming	WAP to calculate sum of 1,2,3,4,5 using reduce function.	CO2
2.6	2	Functional Programming	WAP to generate numbers from 1 to 10 using generator.	CO2
2.7	2	Functional Programming	WAP to decide number is even or odd using generator.	CO2
2.8	2	Functional Programming	WAP to generate square of 1,2,3,4,5,6,7,8,9,10 using generator.	CO2
2.9	2	Functional Programming	WAP to generate square of even number upto 10 using generator and save in list.	CO2
2.10	2	Functional Programming	WAP to make a co-routine which will print all name with prefix Dear.	CO2

2.11	2	Functional Programming	WAP to close a co-routine.	CO2
2.12	2	Functional Programming	WAP to iterate tuple using iter() and next() method.	CO2
2.13	2	Functional Programming	WAP to iterate a string using iter and next method.	CO2
2.14	2	GUI Programming	Hello World: Display a simple "Hello, World!" message box.	CO 2
2.15	2	GUI Programming	Button: Create a button that displays a message when clicked.	CO 2
2.16	2	GUI Programming	Entry: Create a text entry field and display the entered text.	CO 2
2.17	2	GUI Programming	Check button: Create a checkbox and display the selected options	CO 2
2.18	2	GUI Programming	Radio button: Create radio buttons and display the selected option.	CO 2
2.19	2	GUI Programming	List box: Create a list box and display the selected items.	CO 2

2.20	2	GUI Programming	Text: Create a text area and display the entered text.	CO 2
2.21	2	GUI Programming	Menu: Create a menu with different options.	CO 2
2.21	2	GUI Programming	Message: Display a message in a dialog box.	CO 2
2.23	2	GUI Programming	Progress bar: Create a progress bar that updates over time python	CO 2
2.24	2	GUI Programming	Scale: Create a scale widget and display the selected value.	CO 2
2.25	2	GUI Programming	Spin box: Create a spin box and display the selected value.	CO 2
2.26	2	GUI Programming	Canvas: Create a canvas and draw shapes on it.	CO 2
2.27	2	GUI Programming	Label Frame: Create a labeled frame with widgets inside.	CO 2
2.28	2	GUI Programming	Scrollbar: Add a scrollbar to a widget like a text area or list box	CO 2

2.29	2	GUI Programming	Frame: Create a frame and place widgets inside it.	CO 2
2.30	2	GUI Programming	Tree view: Create a tree view widget to display hierarchical data	CO 2
2.31	2	GUI Programming	Notebook: Create a notebook widget with tabs.	CO 2
2.32	2	GUI Programming	File Dialog: Open a file dialog to select a file.	CO 2
2.33	2	GUI Programming	Color Dialog: Open a color dialog to select a color.	CO 2
2.34	2	GUI Programming	Button Counter: Create a button that increments a counter when clicked.	CO 2
2.35	2	GUI Programming	Checkbox List: Display a list of checkboxes and show selected options.	CO 2
2.36	2	GUI Programming	Dropdown Menu: Create a dropdown menu with multiple options.	CO 2
2.37	2	GUI Programming	Slider Value Display: Display the current value of a slider widget.	CO 2
2.38	2	GUI Programming	Text Input and Button: Take user input in a text box and display it when a button is clicked.	CO 2
2.39	2	GUI Programming	Radio Buttons: Present a set of options as radio buttons and display the selected option.	CO 2
2.40	2	GUI Programming	Progress Bar: Show the progress of a task using a progress bar widget.	CO 2

2.41	2	GUI Programming	Password Input: Create a password input field that hides the entered characters.	CO 2
2.42	2	GUI Programming	File Uploader: Enable users to upload files and display the selected file name.	CO 2
3.1	3	NumPy	Creating Arrays: Create NumPy arrays using various methods like np.array(), np.zeros(), np.ones(), np.arange(), etc.	CO 3
3.2	3	NumPy	Array Shape and Size: Get the shape and size of a NumPy array using the shape and size attributes.	CO 3
3.3	3	NumPy	Array Indexing: Access and modify individual elements of a NumPy array using indexing	CO 3
3.4	3	NumPy	Array Slicing: Extract a subset of elements from a NumPy array using slicing.	CO 3
3.5	3	NumPy	Array Reshaping: Change the shape of a NumPy array using the reshape() function.	CO 3
3.6	3	NumPy	Array Arithmetic: Perform basic arithmetic operations (addition, subtraction, multiplication, division) on NumPy arrays.	CO 3
3.7	3	NumPy	Array Broadcasting: Perform element-wise operations on arrays with different shapes using broadcasting rules.	CO 3
3.8	3	NumPy	Array Aggregation: Calculate aggregate values on arrays, such as sum(), min(), max(), mean(), etc. using NumPy	CO 3

3.9	3	NumPy	Array Transposition: Transpose a NumPy array using the transpose() function.	CO 3
3.10	3	NumPy	Write a program that demonstrates advanced array indexing techniques, such as indexing with boolean arrays or using fancy indexing to select specific elements or subsets of an array.	CO3
3.11	3	NumPy	Write a program using NumPy to perform data manipulation tasks, such as sorting arrays, removing duplicates, or finding unique elements in an array.	CO3
3.12	3	NumPy	Array Sorting: Sort the elements of a NumPy array using the sort() function.	CO 3
3.13	3	NumPy	Array Filtering: Filter elements in a NumPy array based on a condition using boolean indexing.	CO 3
3.14	3	NumPy	Array Statistics: Calculate statistical measures like mean, median, standard deviation using functions like np.mean(), np.median(), np.std().	CO 3
3.15	3	NumPy	Array Randomization: Generate random numbers or arrays using functions from the np.random module.	CO 3
3.16	3	NumPy	Array Dot Product: Compute the dot product of two NumPy arrays using the dot() function.	CO 3
3.17	3	NumPy	Array Matrix Operations: Perform matrix operations like matrix multiplication, matrix inverse using functions from the np.linalg module.	CO 3

3.18	3	NumPy	Array File I/O: Save and load NumPy arrays from files using functions like np.save() and np.load().	CO 3
3.19	3	NumPy	Array Masking: Create a mask array to select or manipulate specific elements of a NumPy array based on a condition.	CO 3
3.20	3	NumPy	Array Broadcasting: Understand and utilize broadcasting rules in NumPy for efficient computations.	CO 3
3.21	3	Scipy	Write a program to finds the cube root of values using scipy library.	CO 3
3.22	3	Scipy	Write a program to computes the 10**x element-wise using scipy library.	CO 3
3.23	3	Scipy	Write a SciPy program to calculate Permutations and Combinations.	CO 3
3.24	3	Scipy	Write a SciPy program to calculates the inverse of any square matrix.	CO 3
3.25	3	Scipy	Write a SciPy program to calculates the Eigenvalues and Eigenvector.	CO 3
3.26	3	Panda	Read and Load a CSV File into a Pandas DataFrame using pandas.read_csv.	CO 3
3.27	3	Panda	Access and Display the First N Rows of a DataFrame using DataFrame.head(N).	CO 3
3.28	3	Panda	Access and Display the Last N Rows of a DataFrame using DataFrame.tail(N).	CO 3
3.29	3	Panda	Retrieve Basic Information about a DataFrame using DataFrame.info.	CO 3

3.30	3	Panda	Perform Descriptive Statistics on a DataFrame using DataFrame.describe.	CO 3
3.31	3	Panda	Filter Rows of a DataFrame based on a Condition using Boolean Indexing.	CO 3
3.32	3	Panda	Rename Columns in a DataFrame using DataFrame.rename.	CO 3
3.33	3	Panda	Group Data in a DataFrame using DataFrame.groupby.	CO 3
3.34	3	Panda	Perform Aggregation on Grouped Data using GroupBy.agg.	CO 3
3.35	3	Panda	Sort a DataFrame by One or Multiple Columns using DataFrame.sort_values.	CO 3
3.36	3	Panda	Perform Basic Arithmetic Operations on Columns of a DataFrame.	CO 3
3.37	3	Panda	Apply a Function to Each Element or Column of a DataFrame using DataFrame.apply or DataFrame.applymap.	CO 3
3.38	3	Panda	Reshape Data using Pivot Tables using DataFrame.pivot_table.	CO 3
3.39	3	Panda	Perform Data Visualization using pandas.plotting or matplotlib.pyplot.	CO 3
3.40	3	Panda	Save a DataFrame to a CSV File using DataFrame.to_csv.	CO 3
3.41	3	Panda	Perform Data Sampling or Random Selection using DataFrame.sample.	CO 3

3.42	3	SciPy	Find the roots of a mathematical equation using SciPy's root-finding functions, such as scipy.optimize.root.	CO 3
3.43	3	SciPy	Fit a polynomial function to a set of data points using SciPy's curve fitting functions, such as scipy.optimize.curve_fit	CO 3
3.44	3	SciPy	Perform linear regression on a dataset using SciPy's linear regression functions, such as scipy.stats.linregress.	CO 3
3.45	3	SciPy	Calculate the Fast Fourier Transform (FFT) of a signal using SciPy's FFT functions, such as scipy.fft.fft.	CO 3
3.46	3	SciPy	Solve a system of linear equations using SciPy's linear algebra functions, such as scipy.linalg.solve.	CO 3
3.47	3	SciPy	Perform numerical integration using SciPy's integration functions such as scipy.integrate.quad.	CO 3
3.48	3	SciPy	Calculate the eigenvalues and eigenvectors of a square matrix using SciPy's linear algebra functions, such as scipy.linalg.eig.	CO 3
4.1	4	matplotlib	Create a Simple Line Plot using matplotlib.pyplot.plot.	CO 4
4.2	4	matplotlib	Create a Scatter Plot using matplotlib.pyplot.scatter.	CO 4
4.3	4	matplotlib	Create a Bar Chart using matplotlib.pyplot.bar.	CO 4

4.4	4	matplotlib	Create a Histogram using matplotlib.pyplot.hist.	CO 4
4.5	4	matplotlib	Create a Pie Chart using matplotlib.pyplot.pie.	CO 4
4.6	4	matplotlib	Create a Box Plot using matplotlib.pyplot.boxplot.	CO 4
4.7	4	matplotlib	Create a Heatmap using matplotlib.pyplot.imshow.	CO 4
4.8	4	matplotlib	Customize Plot Labels and Titles using matplotlib.pyplot.xlabel, matplotlib.pyplot.ylabel, and matplotlib.pyplot.title.	CO 4
4.9	4	matplotlib	Customize Plot Colors, Line Styles, and Marker Styles using matplotlib.pyplot.plot parameters.	CO 4
4.10	4	matplotlib	Add Gridlines to a Plot using matplotlib.pyplot.grid.	CO 4
4.11	4	matplotlib	Add Legends to a Plot using matplotlib.pyplot.legend.	CO 4
4.12	4	matplotlib	Create Subplots using matplotlib.pyplot.subplots.	CO 4
4.13	4	matplotlib	Save a Plot as an Image File using matplotlib.pyplot.savefig.	CO 4
4.14	4	matplotlib	Create 3D Plots using mpl_toolkits.mplot3d module.	CO 4
4.15	4	matplotlib	Create Error Bars on a Plot using matplotlib.pyplot.errorbar.	CO 4

4.16	4	matplotlib	Customize Axis Ticks and Tick Labels using matplotlib.pyplot.xticks and matplotlib.pyplot.yticks.	CO 4
4.17	4	matplotlib	Create a Bar Plot with Stacked Bars using matplotlib.pyplot.bar and the bottom parameter.	CO 4
4.18	4	seaborn	Create a Scatter Plot using seaborn.scatterplot.	CO 4
4.19	4	seaborn	Create a Line Plot using seaborn.lineplot.	CO 4
4.20	4	seaborn	Create a Bar Plot using seaborn.barplot.	CO 4
4.21	4	seaborn	Create a Histogram using seaborn.histplot.	CO 4
4.22	4	seaborn	Create a Box Plot using seaborn.boxplot.	CO 4
4.23	4	seaborn	Create a Violin Plot using seaborn.violinplot.	CO 4
4.24	4	seaborn	Create a Heatmap using seaborn.heatmap.	CO 4
4.25	4	seaborn	Create a Pair Plot using seaborn.pairplot.	CO 4
4.26	4	seaborn	Create a Joint Distribution Plot using seaborn.jointplot.	CO 4
4.27	4	seaborn	Create a KDE (Kernel Density Estimate) Plot using seaborn.kdeplot.	CO 4

4.28	4	seaborn	Create a Categorical Scatter Plot using seaborn.stripplot.	CO 4
4.29	4	seaborn	Create a Categorical Bar Plot using seaborn.countplot.	CO 4
4.30	4	seaborn	Create a Facet Grid using seaborn.FacetGrid.	CO 4
4.31	4	seaborn	Customize Plot Colors and Styles using seaborn.set_palette and seaborn.set_style.	CO 4
4.32	4	seaborn	Add Error Bars to a Plot using seaborn.barplot or seaborn.pointplot with the ci parameter.	CO 4
4.33	4	seaborn	Create a Clustered Heatmap using seaborn.clustermap.	CO 4
4.34	4	seaborn	Create a Regression Plot using seaborn.regplot.	CO 4
4.35	4	seaborn	Create a Stacked Bar Plot using seaborn.barplot with the hue parameter.	CO 4
4.36	4	Plotly	Write a program to draw a line chart using Plotly	CO 4
4.37	4	Plotly	Write a program to draw a Bar chart using Plotly	CO 4
4.38	4	Plotly	Write a program to draw a scatter plot using Plotly	CO 4
4.39	4	Plotly	Write a program to draw a Bubble chart using Plotly	CO 4

4.40	4	Plotly	Write a program to draw a Violin Plots using Plotly	CO 4
4.41	4	Plotly	Write a program to draw a Gant chart using Plotly	CO 4
5.1	5	Web scrapping	Write a Python program to find the title tags from a given html document.	CO 5
5.2	5	Web scrapping	Write a Python program to retrieve all the paragraph tags from a given html document.	CO 5
5.3	5	Web scrapping	Write a Python program to get the number of paragraph tags of a given html document.	CO 5
5.4	5	Web scrapping	Write a Python program to extract the text in the first paragraph tag of a given html document.	CO 5
5.5	5	Web scrapping	Write a Python program to find the length of the text of the first <h2> tag of a given html document.	CO 5
5.6	5	Web scrapping	Write a Python program to find the text of the first <a> tag of a given html text.	CO 5
5.7	5	Web scrapping	Write a Python program to find the href of the first <a> tag of a given html document.	CO 5
5.8	5	Web scrapping	Write a Python program to a list of all the h1, h2, h3 tags from the webpage python.org.	CO 5
5.9	5	Web scrapping	Write a Python program to extract all the text from a given web page.	CO 5

5.10	5	Web scrapping	Write a Python program to print the names of all HTML tags of a given web page going through the document tree.	CO 5
5.11	5	Web scrapping	Write a Python program to retrieve children of the html tag from a given web page.	CO 5
5.12	5	Web scrapping	Write a Python program to retrieve all descendants of the body tag from a given web page.	CO 5
5.13	5	Web scrapping	Write a Python program to create a Beautiful Soup parse tree into a nicely formatted Unicode string, with a separate line for each HTML/XML tag and string.	CO 5
5.14	5	Web scrapping	Write a Python program to find the first tag with a given attribute value in an html document.	CO 5
5.15	5	Web scrapping	Write a Python program to find tag(s) beneath other tag(s) in a given html document.	CO 5
5.16	5	Web scrapping	Write a Python program to find tag(s) directly beneath other tag(s) in a given html document.	CO 5
5.17	5	Web scrapping	Write a Python program to find the siblings of tags in a given html document.	CO 5
5.18	5	Web scrapping	Write a Python program to find tags by CSS class in a given html document.	CO 5
5.19	5	Web scrapping	Write a Python program to change the tag's contents and replace with the given string.	CO 5

5.20	5	Web scrapping	Write a Python program to add to a tag's contents in a given html document.	CO 5
5.21	5	Web scrapping	Write a Python program to insert a new text within a url in a specified position.	CO 5
5.22	5	Web scrapping	Write a Python program to insert tags or strings immediately before specified tags or strings.	CO 5
5.23	5	Web scrapping	Write a Python program to insert tags or strings immediately after specified tags or strings.	CO 5
5.24	5	Web scrapping	Write a Python program to extract a tag or string from a given tree of html document.	CO 5
5.25	5	Web scrapping	Write a Python program to remove a tag from a given tree of html document and destroy it and its contents.	CO 5

LAB:

Subject Code-BAS0251B	**L T P** **0 0 2**
Subject Name- ENGINEERING PHYSICS LAB (Common for all branches except CSBS)	**No. of Hours:**
Course Objective-	

1. To provide the practical knowledge of the phenomenon of interference, diffraction and polarization.

2. To provide the practical knowledge of energy band gap and resistivity.

3. To provide the practical knowledge of the measurement techniques of magnetism.

4. To provide the practical knowledge of the flow of liquids and characteristics of photoelectric cell.

5. To provide the practical knowledge of Planck's constant and dielectric constant.

Course Outcome- After completion of this course students will be able to:

CO1- Apply the practical knowledge of the phenomenon of interference, diffraction and polarization.

CO2- Understand energy band gap and resistivity.

CO3- Develop the measurement techniques of magnetism.

CO4- Analyze the flow of liquids and characteristics of photoelectric cell.

CO5- Understand Planck's constant and dielectric constant.

Total No. of Practicals: 22(Minimum Ten experiments should be performed)

List of Practicals

Lab No.	Unit	Topic	Program Logic Building	CO Mapping
1		To determine the wavelength of monochromatic light by Newton's ring.		CO1
2		To determine the focal length of two lenses by nodal slide and to verify the formula for the focal length of combination of two lenses.		CO1

3		To determine the specific rotation of cane sugar solution using Polarimeter.		CO1
4		To determine the wavelength of spectral lines using plane transmission grating.		CO1
5		To determine the specific resistance of a given wire using Carey Foster's bridge.		CO2
6		To study the variation of magnetic field along the axis of current carrying - circular coil and then to estimate the radius of the coil.		CO3
7		To verify Stefan's Law by electrical method.		CO2
8		To study the Hall effect and determine the Hall Coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.		CO2
9		To determine the energy band gap of a given semiconductor material.		CO2
10		To determine the coefficient of viscosity of a liquid.		CO4
11		To calibrate a voltmeter using potentiometer.		CO2
12		To calibrate a ammeter using potentiometer.		CO2
13		To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.		CO3
14		To determine the magnetic susceptibility of a ferromagnetic salt ($FeCl_3$) by using Quincke's tube method.		CO3

15		To study the hysteresis curve and then to estimate the retentivity and coercivity of a given ferromagnetic material.		CO3
16		To determine the angle of divergence of laser beam using He-Ne Laser.		CO1
17		To determine the wavelength of laser using diffraction grating.		CO1
18		To determine the numerical aperture of optical fiber.		CO1
19		To determine the Planck's constant using LEDs of known wavelength.		CO5
20		To determine the resistivity of given material using four probe method.		CO2
21		To determine the dielectric constant of the material by charging and discharging of capacitor.		CO5
22		To determine the characteristics of photoelectric cell.		CO4

B. Tech. – Second Semester **Branch – CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT**	
Subject Code-BASL0251	**L - T - P** **0- 0 - 4**
Subject Name- Communication for Career Enhancement	**No. of hours- 48**

Course Objectives:

- To improve proficiency in the English language to at least the Intermediate level (B1/B2) of CEFR (Common European Framework of Reference).
- To impart business communication skills.
- To improve verbal communication skills for the workplace.
- To help acquire collaborative and critical evaluation skills.
- To train for career enhancement.

Course Outcome:

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

CO1 – Improve proficiency in English to the next level of CEFR.

CO2 - Develop business communication skills.

CO3 - Demonstrate improved verbal communication skills for the workplace.

CO4 – Acquire collaboration and critical evaluation skills.

CO5 – Participate in the placement process with confidence.

Course Content

Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping
Interactions Level 1:	• Greet and take leave of people. • Introducing oneself and others • Conversations in different situations • Telephone conversation	Includes audio-visual learning of situational interactions.	4	Incorporate video – audio. Role – play (record)	CO1

	s **Outcome:** Students will know how to meet, greet, and strike a conversation.				
	Networking and Icebreaker Activities Objective: To foster networking skills and create a comfortable environment through interactive icebreaker activities Outcome: Participants will engage in meaningful conversations, build connections, and create a positive networking atmosphere	Collaborative exercises and challenges to facilitate learning.	4	Gamification	CO2
	Play Acting Objective: To develop communication skills by engaging in spontaneous conversations and role-playing in different situations Outcome: Participants will demonstrate effective communication, active listening, and	Includes performative use of communicatio n skills through role playing.	6	Stage performance (record)	CO4

	adaptability in various scenarios				
Interactions Level 2: Introducing the vocabulary and sentence structures of polite conversations.	**Vocabulary Building** Objective: To emphasize the importance of courteous words and tone while communicating. Outcome: Students will use better vocabulary and manners in conversations	Audio-visual aid for vocabulary building and understanding of sentence structure.	4	Through audio-video clips	CO1
	Presentations (Individual/Group) on topics of choice Objective: To deliver a clear and engaging presentation. Outcome: Improved presentation skills and effective communication.	Podcast-based learning covering varied storytelling and informative narratives.	4	Group activity utilizing podcast type recording	CO5
	Group Discussion Objective: To develop effective communication, listening, and critical thinking skills through engaging in group discussions Outcome: Participants will actively contribute to discussions, express their thoughts coherently, and	Group activity to foster skills of persuasion, and discussion.	6	Group activity	CO5

	consider different perspectives				
	Debates Objective: To improve persuasive speaking, critical thinking, and argumentation skills through engaging in formal debates Outcome: Participants will articulate their viewpoints, construct logical arguments, and engage in respectful debate	Video-clip-based learning followed by practice.	6	Video clips of great debates to be shared first.	CO3
	Communication and Cinema Objective: To observe various aspects of speaking – pronunciation, tone, intonation, pitch and pauses in various movie clips Outcome: Participants will analyse to understand the articulation of various sounds and demonstrate full range of expression in communication.	Includes movies and shows to be observed and discussed.	4	Display movie clip from montage of movies like My Fair Lady, English Vinglish.	CO1
	Impromptu Speaking **Objective:** To enhance spontaneous thinking, quick decision-making, and effective communication skills	Situation-based speaking challenge	4	Trainer to share tips on how to think on one's feet. JAM sessions (to be recorded)	CO5

	through impromptu speaking exercises Outcome: Participants will deliver coherent and engaging speeches on given topics within a limited time frame				
	Mock Job Interviews Objectives: To improve interview skills, communication, and self-presentation in a simulated job interview setting Outcome: Participants will demonstrate confidence, effective communication, and interview techniques necessary for successful job interviews	Mock interview simulated sessions	6	Simulated exercise	CO5

Suggested Readings:

1. Rizvi, M. Ashraf. *Resumes and Interviews: The Art of Winning.* Tata McGraw Hill. New Delhi. 2008
2. Lesikar and Flatley. *Basic Business Communication: Skills for Empowering the Internet Generation.* 10th Edition. Tata McGraw-Hill.2005.
3. McGrath, E. H. and S. J. *Basic Managerial Skills for All.* Ninth Edition. PHI Learning Pvt. Ltd. New Delhi. 2012.
4. Thill, J. V. & Bovee, G. L. (1993). Excellence in Business Communication. McGraw Hill, New York.
5. Bowman, J.P. & Branchaw, P.P. (1987). Business Communications: From Process to Product. Dryden Press, Chicago.

Free Apps to Practice English:

11. Memrise - https://www.memrise.com
12. Open Language - https://open-language.en.uptodown.com
13. Duolingo - https://englishtest.duolingo.com/applicants
14. Rosetta Stone - https://www.rosettastone.com/product/mobile-apps/
15. FluentU - https://www.rosettastone.com/product/mobile-apps/

B. Tech.-Second Semester

Branch- CS/ CSE/CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI)/ ME/M. Tech (Integrated)/ BT

Subject Code-BCSE0251	**L - T - P** **0 – 0 - 6**
Subject Name- C Programming	**No. of hours-60**

Course Objective-The objective of a C programming course is to provide students with a solid foundation in the C programming language. The course aims to familiarize students with the syntax, concepts, and principles of C programming, as well as develop their ability to write efficient and effective C code. They will be able to develop complex real-world applications.

Course outcomes:	
CO 1: Implement and trace the execution of conditional and iteration programs.	**K1**
CO 2: Implement and trace the execution of conditional and iteration programs.da	**K3**
CO 3: Acquire the knowledge of memory allocation and binding, array, structure t o solve complex problems	**K3**
CO 4: Compare and contrast between Structure and union along with their applications	**K3** **K4**
CO5: Develop Complex real-world applications	

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assta ignment/Lab	CO Mapping
I	Introduction to Algorithm and C Program	Programming using C: Concepts of Algorithm and Flowchart, Translator and its types, Applications of C programming, Structure of C program, Overview of compilation and execution process in an IDE, transition from algorithm to program, Syntax, logical errors and Run time errors, object and executable code,	T3, R1, Chalk & Duster/PPT/Online Programs	2+2	Basic Program in C	CO1

	Tokens & Operators	Keywords, identifiers, constant, data types. Operators and their types, Arithmetic expressions and precedence: Operators, operator precedence and associativity, type conversion, mixed operands	T3, R1, Chalk & Duster/PPT/Online Programs	3+3	Basic Program in C	CO1
	Conditional Branching	if, else-if, nested if - else, switch statements, use of break, and default with switch	T3, R1, Chalk & Duster/PPT/Online Programs	1+2	Programs using Conditional Statement	CO1
	Iteration and loops:	Concept of loops, for, while and do-while, multiple loop variables, use of break and continue statements, nested loop.	T3, R1, Chalk & Duster/PPT/Online Programs	1+2	Programs using Looping Statement	CO1

II	Functions:	Concept of Sub-programming, function, types of functions, passing parameters to functions: call by value Definition,	T3, R1, Chalk & Duster/PPT/Online Programs	3+3	Function Programs	CO2
	Recursion	Definition, Types of recursive functions, Tower of Hanoi problem,	T3, R1, Chalk & Duster/PPT/Online Programs	1+2	Recursion Programs	CO2
	Storage:	scope of variable, local and global variables, Nesting of Scope, Storage classes: Auto, Register, Static and Extern	T3, R1, Chalk & Duster/PPT/Online Programs	1+1	Programs showing use of Storage	CO2
	Pointers:	defining and declaring pointer, pointer arithmetic and scaling, Pointer Aliasing. call by reference	R1, R3, R4 Chalk & Duster/PPT/ Labs	2+2	Programs illustrating use of Pointers Arithmetic/Addressing/ Call by Reference	CO2

III	Arraya:	Array notation and representation (one and two dimensional), array using pointers, manipulating array elements,2-D array s used in matrix computation.	R1, R3, R4 Chalk & Duster/PPT/ Labs	2+2	Programs illustrating use of Pointers Arithmetic/Addressing/ Call by Reference	CO3
	Strings:	Introduction, initializing strings, accessing string elements, Array of strings, Passing strings to functions, String functions like Strcat, strcmp, strcpy and any other functions	R1, R3, R4 Chalk & Duster/PPT/ Labs	2+3	Use of Arrays both Single and Multi-Dimensional.	CO3
IV	Structure:	Introduction, Initializing, defining and declaring	T1, T2, R1, R2 Chalk & Duster/PPT/	2+2	Program Based on structure implementation	CO4

		structure, accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure	Labs			
	Union:	Introduction , Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on Union, Difference between Structure and Union	T1, T2, R1, R2 Chalk & Duster/PPT/ Labs	1+1		CO4
	Dynamic Memory Allocation	Introduction, Library functions– malloc, calloc, realloc and free.	T1, T2, R1, R2 Chalk & Duster/PPT/ Labs	1+1	Programs allocating memory during run time and manipulations	CO4
V	File Handling	Basics, File Types, File operations, File pointer,	T1, T2, R1, R2 Chalk & Duster/PPT/	2+4	Implementation of Data Files and Command Line Arguments	CO5

		File opening modes, File handling functions, Command Line Arguments, File handling through command line argument, Record I/O in files	Labs			
	Introduction to Embedded Programming	Introduction to Embedded System, Factors for Selecting the Embedded Programming Language, Difference Between C and Embedded C, Keyword, Datatypes, Components of Embedded Program, Program Structure, Basic concepts of Embedded Programming, Defining Macros, Types & File Inclusion,	T1, T2, R1, R2 Chalk & Duster/PPT/ Labs	2+4	Example on Embedded Programs	CO5

		Pre-processor directives implementation				

References-

Textbooks:

(T1) Herbert Schildt,"C: The Complete Reference", Osbourne McGrawHill,4thEdition,2002.

(T2) Computer Concepts and Programming in C, E Balaguruswami, McGrawHill

(T3) Let Us C by Yashwant P.Kanetkar. BPB publication

(T4) K.R Venugopal, "Mastering C", TMH

(T5) Yashwant P. Kanetkar, "Working with C", BPB publication

Reference Books:

(R1) The C programming by Kernighan Brain W.and Ritchie Dennis M.,Pearson Education.

(R2) Computer Science-A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition, Cengage Learning-2007.

(R3) Computer Basics and C Programming by V.Rajaraman, PHI Learning pvt. Limited,2015.

(R4) Schrum's Outline of Programming with C by Byron Gottfried, McGraw-Hill

(R5) Computer Fundamentals and Programming in C.Reema Thareja, Oxford Publication

Links:

E-Book Links:

(E1)https://en.wikibooks.org/wiki/C_Programming

(E2)https://en.wikibooks.org/wiki/A_Little_C_Primer

(E3) https://www.goodreads.com/book/show/6968572-ansi-c-programming

LAB:

List of Practical				
Lab No.	**Unit**	**Topic**	**Program Logic Building**	**CO Mapping**
1.1	1	Pattern Printing	Half pyramid of *	CO1
1.2	1	Pattern Printing	Half pyramid of numbers	CO1
1.3	1	Pattern Printing	Half pyramid of alphabets	CO1
1.4	1	Pattern Printing	Inverted half pyramid of *	CO1
1.5	1	Pattern Printing	Inverted half pyramid of numbers	CO1
1.6	1	Pattern Printing	Full pyramid of *	CO1
1.7	1	Pattern Printing	Full pyramid of numbers	CO1
1.8	1	Pattern Printing	Inverted full pyramid of *	CO1
1.9	1	Pattern Printing	Pascal's triangle	CO1
1.10	1	Pattern Printing	Floyd's triangle	CO1
1.11	1	Pattern Printing	Half pyramid of *	CO1
1.12	1	Pattern Printing	Half pyramid of numbers	CO1
1.13	1	Pattern Printing	Half pyramid of alphabets	CO1
1.14	1	Pattern Printing	C Program to Print Diamond Pattern	CO1
1.15	1	Pattern Printing	C Program to Print Floyd's Triangle	CO1
1.16	1	Pattern Printing	C Program to Print Pascal Triangle	CO1
1.17	1	Pattern Printing	Star Pattern Programs in C	CO1
1.18	1	Pattern Printing	Pyramid Patterns in C	CO1
1.19	1	Decision Making and Iterative	Write a C program for a matchstick game being played between the computer and a user. Your program should	CO1

		programming using screen design	ensure that the computer always wins. Rules for the game are as follows: – There are 21 matchsticks. – The computer asks the player to pick 1, 2, 3 or 4 matchsticks. – After the person picks, the computer does its picking. – Whoever is forced to pick up the last matchstick loses the game.	
1.20	1	Decision Making and Iterative programming using screen design	Write a program that plays tic-tac-toe. The tic-tac-toe game is played on a 3x3 grid the game is played by two players, who take turns. The first player marks move with a circle, the second with a cross. The player who has formed a horizontal, vertical, or diagonal sequence of three marks wins. Your program should draw the game board, ask the user for the coordinates of the next mark, change the players after every successful move, and pronounce the winner.	CO1
1.21	1	Decision Making and Iterative programming	Design a Calculator which performs Number system conversion	CO1
1.22	1	Decision Making and Iterative programming	C Program to Simulate a Simple arithmetic Calculator	CO1
1.23	1	Decision Making and Iterative programming	C Program to Evaluate the Given Polynomial Equation	CO1
1.24	1	Decision Making and Iterative programming	C Program to Find Mean, Variance and Standard Deviation	CO1
1.25	1	Decision Making and Iterative programming	C Program to Add Two Complex Numbers	CO1
1.26	1	Decision Making and Iterative programming	C Program to Find Power of a Number	CO1

1.27	1	Decision Making and Iterative programming	C Program to Calculate Pow (x,n)	CO1
1.28	1	Decision Making and Iterative programming	C program to Find the Sum of Arithmetic Progression Series	CO1
1.29	1	Decision Making and Iterative programming	C program to Find the Sum of Geometric Progression Series	CO1
1.30	1	Decision Making and Iterative programming	C program to Find the Sum of Harmonic Progression Series	CO1
1.31	1	Decision Making and Iterative programming	C Program to Find Sum of Series 1 + 1/2 + 1/3 + 1/4 + ……. + 1/N	CO1
1.32	1	Decision Making and Iterative programming	C Program to Find Sum of Series 1^2 + 2^2 + …. + n^2	CO1
1.33	1	Decision Making and Iterative programming	C Program to Find Sum of Series 1^3 + 2^3 + 3^3 + … + n^3	CO1
1.34	1	Decision Making and Iterative programming	C Program to Find Sum of the Series 1/1! + 2/2! + 3/3! + ……1/N!	CO1
1.35	1	Decision Making and Iterative programming	Accept five subject marks of the student. Calculate his percentage. If his percentage is below 35 mark him “fail”. If between 35to 45 “Third Div”, 45-60 Second and above 60 then first. Do this process till the user wishes. No field should be left blank.	CO1

1.36	1		Design a program which displays following options on screen 1. Figure 2. Exit 3. Enter Choice Once valid choice is entered it executes further. If choice one is entered, then it should display 1.TRAINGLE 2.SQUARE 3.RHOMBUS 4. TRAPEZIUM 5. RETURN TO PREVIOUS MENU ENTER CHOICE Once valid choice is entered it executes further. After that it ask for specific data and prints the area and volume and perimeter/circumference of the respective figure. After that a choice is to be asked for Do you wish to continue (Y/N)? And should work accordingly.	CO1

			Before Every Menu the screen should be cleared,	
1.37	1	Decision Making and Iterative programming	C Program to Find the Largest Number Among Three Numbers	CO1
1.38	1	Decision Making and Iterative programming	C Program to Find the Roots of a Quadratic Equation	CO1
1.39	1	Decision Making and Iterative programming	C Program to Check Leap Year. Evaluate all the cases.	CO1
1.40	1	Decision Making and Iterative programming	C Program to Check Whether a Number is Positive or Negative	CO1
1.41	1	Decision Making and Iterative programming	C Program to Check Whether a Character is an Alphabet or not	CO1
1.42	1	Decision Making and Iterative programming	C Program to Calculate the Sum of Natural Numbers	CO1
1.43	1	Decision Making and Iterative programming	C Program to Find Factorial of a Number	CO1

1.44	1	Decision Making and Iterative programming	C Program to Generate Multiplication Table	CO1
1.45	1	Decision Making and Iterative programming	C Program to Display Fibonacci Sequence	CO1
1.46	1	Decision Making and Iterative programming	C Program to Find GCD of two Numbers	CO1
1.47	1	Decision Making and Iterative programming	C Program to Find LCM of two Numbers	CO1
1.48	1	Decision Making and Iterative programming	C Program to Display Characters from A to Z Using Loop	CO1
1.49	1	Decision Making and Iterative programming	C Program to Reverse a Number using looping concepts	CO1
1.50	1	Decision Making and Iterative programming	C Program to Check Whether a Number is Palindrome or Not	CO1
1.51	1	Decision Making and Iterative programming	C Program to Check Whether a Number is Prime or Not	CO1
1.52	1	Decision Making and Iterative programming	C Program to Check Armstrong Number	CO1
1.53	1	Decision Making and Iterative programming	C Program to Display Armstrong Number Between Two Intervals	CO1
1.54	1	Decision Making and Iterative programming	C Program to Display Factors of a Number	CO1

1.55	1	Decision Making and Iterative programming	C Program to Make a Simple Calculator Using switch...case	CO1
1.56	1	Decision Making and Iterative programming	C Program to Check Whether a Number is Even or Odd	CO1
1.57	1	Decision Making and Iterative programming	C Program to Check Whether a Character is a Vowel or Consonant	CO1
1.58	1	Decision Making and Iterative programming	C Program to Find the Largest Number Among Three Numbers	CO1
1.59	1	Decision Making and Iterative programming	C Program to Check Whether a Number is Positive or Negative	CO1
1.60	1	Decision Making and Iterative programming	C Program to Calculate the Sum of Natural Numbers	CO1
1.61	1	Decision Making and Iterative programming	C Program to Find Factorial of a Number	CO1
1.62	1	Decision Making and Iterative programming	C Program to Generate Multiplication Table	CO1
1.63	1	Decision Making and Iterative programming	C Program to Display Fibonacci Sequence	CO1
1.64	1	Decision Making and Iterative programming	C Program to Display Prime Numbers Between Intervals Using Function	CO1
1.65	1	Decision Making and Iterative programming	C Program to Check Prime or Armstrong Number Using User-defined Function	CO1

1.66	1	Decision Making and Iterative programming	C Program to Check Whether a Number can be Expressed as Sum of Two Prime Numbers	CO1
1.67	1	Decision Making and Iterative programming	C Program to Find the Sum of Natural Numbers using Recursion	CO1
2.1	2	Recursion	C Program to Find Factorial of a Number Using Recursion	CO2
2.2	2	Recursion	C Program to Find G.C.D Using Recursion	CO2
2.3	2	Function	C Program to Convert Binary Number to Decimal and vice-versa	CO2
2.4	2	Recursion	C program to calculate the power using recursion	CO2
2.5	2	Function	C Program to Check Prime or Armstrong Number Using User-defined Function	CO2
2.6	2	Recursion	C Program to Find the Sum of Natural Numbers using Recursion	CO2
2.7	2	Case Study	Design a calculator	CO2
2.8	2	Case Study	Design a Menu Driven program which performs the functions as per the menu 1. Add Details of students 2. Search the student data 3. Display the records 4. Exit Enter the Choice: Note: Choice must be between 1-4 Only. Other than that, an error message must be displayed and entry should be done again	

			Name must not be blank, and first letter should be alphabet Student details should contain Name. Age, Class, Roll-No	
2.9	2	Recursion	C Program to add two number using recursion.	CO2
2.10	2	Recursion	C Program to find sum of digit of number using recursion.	CO2
2.11	2	Recursion	Write a method in C which will remove any given character from a String.	CO2
3.1	3	Array	C Program to Calculate Average Using Arrays	CO3
3.2	3	Array	C Program to Find Largest Element in an Array	CO3
3.3	3	Array	C Program to search an element	CO3
3.4	3	Array	C Program to Add Two Matrices Using Multi-dimensional Arrays	CO3
3.5	3	Array	C Program to Multiply Two Matrices Using Multi-dimensional Arrays	CO3
3.6	3	Array	C Program to Find Transpose of a Matrix	CO3
3.7	3	Array	C program to illustrate Point Arithmetic	CO3
3.8	3	Array	C Program to Access Array Elements Using Pointer	CO3
3.9	3	Array	C Program to Find Largest Number Using Dynamic Memory Allocation	CO3
3.10	3	Array	C Program to Calculate Average Using Arrays	CO3
3.11	3	Array	C Program to Find Largest Element in an Array	CO3
3.12	3	Array	C Program to Calculate Standard Deviation	CO3
3.13	3	String Handling	C Program to Find the Frequency of Characters in a String	CO3
3.14	3	String Handling	C Program to Count the Number of Vowels, Consonants and so on	CO3

3.15	3	String Handling	C Program to Remove all Characters in a String Except Alphabets	CO3
3.16	3	String Handling	C Program to Find the Length of a String	CO3
3.17	3	String Handling	C Program to Concatenate Two Strings	CO3
3.18	3	String Handling	C Program to Copy String Without Using strcpy()	CO3
3.19	3	String Handling	C Program to Sort Elements in Lexicographical Order (Dictionary Order)	CO3
3.20	3	String Handling	C Program to Find the Frequency of Characters in a String	CO3
3.21	3	String Handling	Write a method in C which will remove any given character from a String.	CO3
3.22	3	String Handling	Write a program in C to count occurrence of a given character in a String.	CO3
3.23	3	String Handling	Write a program in C to check if two Strings are Anagram.	CO3
3.24	3	String Handling	Write a program in C to check a String is palindrome or not.	CO3
3.25	3	String Handling	C program to check given character is vowel or consonant.	CO3
3.26	3	String Handling	C program to check given character is digit or not.	CO3
3.27	3	String Handling	C program to replace the string space with a given character.	CO3
3.28	3	String Handling	C program to convert lowercase char to uppercase of string.	CO3
3.29	3	String Handling	C program to convert lowercase vowel to uppercase in string.	CO3
3.30	3	String Handling	C program to delete vowels in a given string.	CO3
3.31	3	String Handling	C program to count Occurrence Of Vowels & Consonants in a String.	CO3
3.32	3	String Handling	C program to print the highest frequency character in a String.	CO3

3.33	3	String Handling	C program to Replace First Occurrence Of Vowel With '-' in String.	CO3
3.34	3	String Handling	C program to count alphabets, digits and special characters.	CO3
3.35	3	String Handling	C program to separate characters in a given string.	CO3
3.36	3	String Handling	C program to remove blank space from string.	CO3
3.37	3	String Handling	C program to count blank space from string.	CO3
3.38	3	String Handling	C program to concatenate two strings.	CO3
3.39	3	String Handling	C program to remove repeated character from string.	CO3
3.40	3	String Handling	C program to calculate sum of integers in string.	CO3
3.41	3	String Handling	C program to print all non-repeating character in string.	CO3
3.42	3	String Handling	C program to copy one string to another string.	CO3
3.43	3	String Handling	C Program to sort characters of string.	CO3
3.44	3	String Handling	C Program to sort character of string in descending order.	CO3
3.45	3	Arrays	Write a program in C for, In array 1-100 numbers are stored, one number is missing how do you find it.	CO3
3.46	3	Arrays	Write a program in C for, In a array 1-100 multiple numbers are duplicates, how do you find it.	CO3
3.47	3	Arrays	Write a program in C to find first duplicate number in a given array.	CO3
3.48	3	Arrays	Write a program in C to remove duplicate elements form array in C.	CO3
3.49	3	Arrays	Write a program in C for, Given two arrays 1,2,3,4,5 and 2,3,1,0,5 find which number is not present in the second array.	CO3
3.50	3	Arrays	Write a program in C for, How to compare two array is equal in size or not.	CO3

3.51	3	Arrays	Write a program in C to find largest and smallest number in array.	CO3
3.52	3	Arrays	Write a program in C to find second highest number in an integer array.	CO3
3.53	3	Arrays	Write a program in C to find top two maximum number in array?	CO3
3.54	3	Arrays	C program to print array in reverse Order.	CO3
3.55	3	Arrays	C program to reverse an Array in two ways.	CO3
3.56	3	Arrays	C Program to calculate length of an array.	CO3
3.57	3	Arrays	C program to insert an element at end of an Array.	CO3
3.58	3	Arrays	C program to insert element at a given location in Array.	CO3
3.59	3	Arrays	C Program to delete element at end of Array.	CO3
3.60	3	Arrays	C Program to delete given element from Array.	CO3
3.61	3	Arrays	C Program to delete element from array at given index.	CO3
3.62	3	Arrays	C Program to find sum of array elements.	CO3
3.63	3	Arrays	C Program to print all even numbers in array.	CO3
3.64	3	Arrays	C Program to print all odd numbers in array.	CO3
3.65	3	Arrays	C program to perform left rotation of array elements by two positions.	CO3
3.66	3	Arrays	C program to perform right rotation in array by 2 positions.	CO3
3.67	3	Arrays	C Program to merge two arrays.	CO3
3.68	3	Arrays	C Program to find highest frequency element in array.	CO3
4.1	4	Structure	C Program to Store Information of a Student Using Structure	CO4

4.2	4	Structure	C Program to Store Information of Students Using Structure	CO4
4.3	4	Structure	C Program to Store Data in Structures Dynamically	CO4
4.4	4	Structure	C Program to Store Information of a Student Using Structure	CO4
4.5	4	Structure	C Program to Add Two Distances (in inch-feet system) using Structures	CO4
4.6	4	Mini Project	Snake Game Mini Project in C is a basic console program with no graphics. You may play the famous "Snake Game" in this project exactly as you would anywhere else. To move the snake, use the up, down, right, and left arrows. Food is placed at various co-ordinates on the screen for the snake to consume. The snake's length and score will both rise by one element each time it consumes the food.	CO4
5.1	5	File Handling	C Program to Write a Sentence to a File	CO5
5.2	5	File Handling	C Program to Read the First Line From a File	CO5
5.3	5	File Handling	C Program to showcase use of DMA	CO5
5.4	5	File Handling	C Program to Write a record to a File	CO5
5.5	5	File Handling	C Program to Read the last Line From a File	CO5
5.6	5	Command Line Argument	Program to create a file using command line argument	CO5
5.7	5	File Handling	Program to copy one file into another	CO5
5.8	5	Macros	Implement macro handling	CO5
5.9	5	File Handling	Program to write a structure into a file and display its content	CO5
5.10	5	File Handling	Program to search a record in a file	CO5
5.11	5	Macro	Program to implement multi line macro and Conditional Macros	CO5

5.12	5	Graphics	Program to draw Circle/Rectangle/Triangle/ A Hut/with colors in it	CO5
5.13	5	Hardware	Program to shut down/ sleep a system if not component is being touched	CO5
5.14	5	File Handling	Write a program in C to create and store information in a text file.	CO5
5.15	5	File Handling	Write a program in C to read an existing file.:	CO5
5.16	5	File Handling	Write a program in C to write multiple lines to a text file.:	CO5
5.17	5	File Handling	Write a program in C to read the file and store the lines in an array.	CO5
5.18	5	File Handling	Write a program in C to find the number of lines in a text file.	CO5
5.19	5	File Handling	Write a program in C to find the content of a file and the number of lines in a text file.	CO5
5.20	5	File Handling	Write a program in C to count the number of words and characters in a file.	CO5
5.21	5	File Handling	C Program to list all files and sub-directories in a directory	CO5
5.22	5	File Handling	C Program to count number of lines in a file	CO5
5.23	5	File Handling	C Program to print contents of file	CO5
5.24	5	File Handling	C Program to copy contents of one file to another file	CO5
5.25	5	File Handling	C Program to merge contents of two files into a third file	CO5
5.26	5	File Handling	C Program to read records from a data file	CO5

5.27	5	File Handling	C Program to count number of lines, words, characters, blank space in a file	CO5
5.28	5	File Handling	C Program to Illustrate how User Authentication is Done	CO5
5.29	5	File Handling	C Program to Shutdown Computer in Linux	CO5
5.30	5	File Handling	C Program to Compute First N Fibonacci Numbers using Command Line Arguments	CO5
5.31	5	File Handling	C Program to Generate Fibonacci Series using Command Line Argument	CO5
5.32	5	Case Study	Design an ATM Simulation using C	CO5
5.33	5	Case Study	manage the information of workers working in a firm or organization using this Employee Management System. The file handling technique is used here to save the data in a particular file, and you get the notion of this project as soon as you hear the name. This project uses the Insert, Edit, and Delete file actions, but the sole constraint is that you can only display the data, not search for any data item in particular. If you have more experience with C, you may alter this program by using the searching strategies. The following modules are included in this project. Add Employee Details • Edit Employee details • Modify Employee • Delete Employee Create a Database using C file structure	
5.34	5		A Library in charge is facing problems in handling books and customers. Design a solution using C regarding his problem	CO5
5.35	5		• Design a Simple Result System in the C programming language. You can keep track of the pupils' grades and update them at any time. Students might be given marks based on their performance in each subject. The project is straightforward and straightforward to use. The	CO5

			system is written entirely in the C programming language. • You will be greeted with a "Welcome Screen" when you build and execute the project. Following that, many choices will appear on your computer screen. Select the required project modification function from the drop-down menu. The admin is in charge of the majority of the system. He has the ability to add and remove teachers. He can also add students. Following the addition of instructors, the administrator may finally assign grades to the pupils. All of the data has been preserved.	

B. Tech.-Second Semester
Branch- CS/CSE/ CSE (R)/ IT/CSE(DS)/CSE(IOT)/CSE(AIML)/CSE(AI)/CYS/ ECE/ECE(VLSI) /ME/M. Tech (Int.)/BT

Subject Code-BME0251	**L - T - P** **0 – 0 - 6**
Subject Name- Computer Aided Design (CAD) and Digital Manufacturing	**No. of hours-**

Course Objective- To Impart and familiarize the concepts of engineering graphics using CAD Software's. To impart knowledge of 2-Dimensional Drawing and 3-Dimensional Drawing Commands. To make the students to experience digital manufacturing processes. To explain current and emerging digital technologies in industries.

Course outcome:	**At the end of course, the students will be able to**
CO1	Understand the importance of drawing in engineering.
CO2	Draw in 2-Dimensional spaces.
CO3	Create models in 3-Dimensional spaces.
CO4	Understand the concept of digital manufacturing.
CO5	Apply the knowledge of digital manufacturing in industries.

Course Content

Unit	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assignment/Lab	CO Mapping

1	**Introduction to CAD**	Introduction to Engineering Drawings, Scale, Coordinate System, Types of View: Orthographic, Isometric & Perspective, Type of Projection, Sections of solids and Development of surfaces, Introduction to CAD Software such as AutoCAD/PTC Creo/CATIA/Fusion 360/Solid Works etc., Exploring GUI, Workspaces, Co-ordinate systems, File Management, Display Control.	PPT/Animated Videos/ Experiment based learning/ Activity based learning	8=2+6	CAD Lab (AutoCAD, PTC CREO)	CO-1
2	**Working on CAD in 2D environment**	Starting with Sketching, Working with Drawing Aids, Editing Sketched Objects, Layers, Creating Text and Tables, Dimensioning and Detailing of Drawings, Editing Dimensions, Dimension Styles, Adding Constraints to Sketches, Hatching Drawings, Paper Layout, Plotting Drawings in AutoCAD, Template Drawings.	PPT/Animated Videos/ Experiment based learning/ Activity based learning/ Software based	8=2+6	CAD Lab (AutoCAD)	CO-2
3	**Working on CAD in 3D environment**	Introduction to 3D Modeling, 3D Environment and Drawing, Modeling Workflow, Editing Models, Sectioning a Model and Creating Drawings, Visualization, Downstream, Rectangular 3D coordinates, 3D Construction techniques, Constructing wireframe objects, Constructing solid primitives, dynamically changing a 3D view, and shading a 3D model,	PPT/Animated Videos/ Experiment based learning/ Activity based learning/ Software based	8=2+6	CAD Lab (AutoCAD)	CO-3

		Blueprint Drawing, Uses of Digital Prototype.				
4	**Introduction to Digital Manufacturing**	Introduction to workshop layout, engineering materials, Fitting, Carpentry, Forging, Casting, Welding, Forming. Basic Machining Tools- Lathe, Milling, Drilling, Shaper, Grinding. Introduction to Digital Manufacturing: - additive manufacturing, basics of automation & robotics; Concepts of Industry 5.0 (Videos & Quizzes)	PPT/Animated Videos/ Experiment based learning/ Activity based learning/ Simulation/ Virtual Labs	8=2+6	Workshop, CAD Lab	CO-4
5	**Applications of Digital Manufacturing**	3D Modelling and simulation of- various Forming, Machining in CAD Basic introduction to 3D Printing & Technologies (FDM, LDM, SLA)- Slicing software, Types of Production, Various types of Industries, Introduction to Smart Factory.	PPT/Animated Videos/ Experiment based learning/ Activity based learning/ Simulation/ Virtual Labs	8=2+6	CAD Lab (AutoCAD)	CO-5

References- NIT Patna, Amity University, SRM University, VIT Vellore, IMT Pune, Central Tool Room Training Centre Ahmadabad.

Text Books:

1. A Hand book on AUTOCAD tool practice by SSR Krishna
2. Engg. Graphics, by Agrawal B. & Agrawal CM., TMH Publication
3. Engg. Drawing by Bhatt ND.
4. CAD by CAM by M.P. Grover.
5. A course in Workshop technology by B.S. Raghuwanshi, Vol I & II, Dhanpat Rai & sons, New Delhi
6. Industrial automation and Robotics by A.K. Gupta., S K Arora, Laxmi publication
7. CNC Fundamentals and Programming by P.M Agarwal, V.J Patel, Charotar Publication

Reference Books:

1. Engg. Drawing +AUTOCAD 6th Edition by K Venugopal & V Prabhu Raja, New Age International Publishers
2. Computer Aided Engineering Drawing - S. Triyambaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition-2006
3. Advance CAD Modelling by Nicola & Duhovnik

4. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002
5. Rapid Product Development, Kimura Fumihiko
6. CNC Machines by M.Adhitan, B.S Pabla; New age international.
7. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd

Links:

https://www.youtube.com/watch?v=9YxK7TuEKfE&list=PLMtzJAOD3B7Z0kAGbqdVPZuT91pNIsF-R

https://www.youtube.com/watch?v=pvKVy-eMDYc

Lab No.	UNIT	Topic	Simulator/ Software	CO Mapping
1	1	To create design of a robotic Arm model on CAD	AutoCAD	CO1
2		To draw & design a Cell phone adapter in CAD Software.	AutoCAD	CO1
3		To create layout of job shop, batch shop and continuous manufacturing on CAD	AutoCAD	CO1
4		To draw the orthographic projection view of Hub, Arms, and Face of a Pulley	AutoCAD	CO1
5		To draw the isometric projection view of Pipe, 90 degree elbow and 180 degree bend of a piping system	AutoCAD	CO1
6		To draw the isometric projection view of motor coupling in CAD Software	AutoCAD	CO1
7		To draw the orthographic projection view of a Study Chair.	AutoCAD	CO1
8		To draw the isometric projection view of one way mobile connector	AutoCAD	CO1
9		Two dimensional drawings of Cam and Rocker Arm on AutoCAD.	AutoCAD	CO1
10		To create a design of a Soap Case on CAD software.	AutoCAD	CO1
11		To draw a two way cable connector on CAD software.	AutoCAD	CO1
12		To draw orthographic projections of hexagonal bolt in CAD Software.	AutoCAD	CO1
13		Two dimensional drawings of washer on AutoCAD.	AutoCAD	CO1
14		Two dimensional drawings of Gaskets of a vacuum pump on AutoCAD.	AutoCAD	CO1

15		To create 2D Drawings of Ring and Pinion Gear in CAD Software.	AutoCAD	CO1
16		To draw and design a phone stand/tripod in CAD software	AutoCAD	CO1
17		To draw an orthographic projection view of Edge Flange in CAD Software	AutoCAD	CO1
18		To draw the orthographic projection view of Fork End of a Knuckle Shaft	AutoCAD	CO1
19		To draw an orthographic projection view of Roller Stud in CAD Software	AutoCAD	CO1
20	2	To design a quadcopter drone on CAD	AutoCAD	CO2
21		To design a digital camera on CAD	AutoCAD	CO2
22		To design the layout of intent device connector on CAD	AutoCAD	CO2
23		To model & design a motor coupling in CAD Software.	AutoCAD	CO2
24		To design a 3D Model of a one way mobile connector.	AutoCAD	CO2
25		To create 2D drawings of Helical Gear in AutoCAD Software.	AutoCAD	CO2
26		To draw & design a socket welded produced elbow in CAD Software.	AutoCAD	CO2
27		To create 2D model of crane hook	AutoCAD	CO2
28		Two dimensional drawing of seal cover on AutoCAD software.	AutoCAD	CO2
29		Two dimensional drawings of a Friction plate on AutoCAD.	AutoCAD	CO2
30		To create 2D drawing of a threaded rod using AutoCAD Software.	AutoCAD	CO2
31		Create 2D drawings of Cam and camshaft bearings in AutoCAD	AutoCAD	CO2
32		To design a socket weld cross fitting model in CAD Software.	AutoCAD	CO2
33		To draw orthographic view of engine cylinder head in CAD software	AutoCAD	CO2
34		To demonstrate & draw a threaded rod using AutoCAD Software.	AutoCAD	CO2
35		To design a wrench in AutoCAD Software.	AutoCAD	CO2
36		To design a wrist watch in AutoCAD Software.	AutoCAD	CO2
37		To design a slip-on flange in AutoCAD Software.	AutoCAD	CO2

38		To design a CAR Wheel in CAD Software.	AutoCAD	CO2
39		Modelling and designing of steering wheel of a car in CAD software	AutoCAD	CO2
40		To create drawings of a Connecting Rod and Gudgeon pin on CAD software.	AutoCAD	CO2
41		To demonstrate a Butt-weld Straight Pipe Tee fitting and design it in CAD Software.	AutoCAD	CO2
42		To create a 2D drawing of Cotter and Sleeve	AutoCAD	CO2
43		To create 2D drawing of Knuckle Pin, Taper Pin and Collar in CAD Software	AutoCAD	CO2
44		To design a digital X-ray Machine on CAD	AutoCAD	CO2
45		To design & assemble a 3D pipe routing in CAD Software.	AutoCAD	CO2
46		To design an electric motor on CAD	AutoCAD	CO2
47		To create design of a CNC Lathe on CAD	AutoCAD	CO2
48		To create design of a Shaper Machine on CAD	AutoCAD	CO2
49		To create design of a Milling Machine on CAD	AutoCAD	CO2
50		To create design of a drilling Machine on CAD	AutoCAD	CO2
51		To create design of carpentry joints on CAD	AutoCAD	CO2
52		To create 2D drawings of Cam and followers on CAD	AutoCAD	CO2
53		To create design of a 3D printer machine on CAD	AutoCAD	CO2
54		To create layout of workshop on CAD	AutoCAD	CO2
55	3	To design & assemble a 3d model of Cotter and Sleeve Joint with all dimensions and allowances	AutoCAD	CO3
56		To design & assemble a 3d model of knuckle joint with dimensions and allowances in CAD Software.	AutoCAD	CO3
57		To draw & model a spiral spring in AutoCAD Software.	AutoCAD	CO3
58		To design an edge flange on base flange using CAD Software.	AutoCAD	CO3
59		To model & design a Roller Stud in CAD Software.	AutoCAD	CO3
60		To model & design a Pulley used to transmit power.	AutoCAD	CO3

61		To model & design a 3D Model of a Study Chair in AutoCAD Software.	AutoCAD	CO3
62		To design the 3D assembly of Cam and Rocker Arm on AutoCAD.	AutoCAD	CO3
63		To create a 3D model of water bottle in CAD Software.	AutoCAD	CO3
64		To create the 3D drawing of Differential on AutoCAD.	AutoCAD	CO3
65		Modelling and designing of door lock handle in CAD software	AutoCAD	CO3
66		To design & model a chain ring in CAD Software.	AutoCAD	CO3
67		To create 3D model of crane hook	AutoCAD	CO3
68		Modelling and designing of a fry pan used in kitchen	AutoCAD	CO3
69		To draw and modelling of Camshaft assembly used in multicylinder engines.	AutoCAD	CO3
70		Modelling and designing of a rotor of turbine	AutoCAD	CO3
71		3D modelling of a kitchen sink in CAD Software.	AutoCAD	CO3
72		To create 3D design of Auto headlight reflector on AutoCAD software.	AutoCAD	CO3
73		To design a 3d design of water pump fan in CAD Software.	AutoCAD	CO3
74		To design a wrist watch in AutoCAD Software.	AutoCAD	CO3
75		Designing and modelling of wardrobe in CAD Software	AutoCAD	CO3
76		Modelling and designing of English toilet seat in CAD software	AutoCAD	CO3
77		Modelling and designing of steering wheel of a car in CAD software	AutoCAD	CO3
78		Modelling and designing of a computer mouse by mesh modelling in CAD software	AutoCAD	CO3
79		Modelling and designing of a chair wheel of revolving chair	AutoCAD	CO3
80		Modelling and designing of transition duct in CAD software	AutoCAD	CO3
81		Modelling and designing of exhaust manifold of engine	AutoCAD	CO3
82		To design a 3D Model of a bike suspension in CAD Software.	AutoCAD	CO3
83		To model & design of a Drone Fan in CAD Software.	AutoCAD	CO3

84		To demonstrate & design a Motorcycle front sprocket in CAD Software.	AutoCAD	CO3
85		To draw elevation and plan of a home on CAD.	AutoCAD	CO3
86		To draw elevation and plan of a town on CAD.	AutoCAD	CO3
87		To create an assembly of a Connecting Rod on CAD software.	AutoCAD	CO3
88		To design a water tap in AutoCAD Software.	AutoCAD	CO3
89		To design a Foot Step Power Generator in Designing Software.	AutoCAD	CO3
90		To create an Cam Follower assembly on CAD software.	AutoCAD	CO3
91	4	Introduction and demonstration of manufacturing processes- Fitting, Carpentry	Virtual Simulator	CO4
92		To simulate different fitting operations through simulation	Process Simulator	CO4
93		To Introduce students to basic wood carving techniques using carving chisels and gouges	Process Simulator	CO4
94		To practice carving simple designs or patterns on wooden blocks.		CO4
95		Introduction and demonstration of manufacturing Processes- Forging, Casting	Virtual Simulator	CO4
96		To teach students basic hammering techniques used in forging, such as drawing out, upsetting, bending.		CO4
97		Demonstrate the process of punching holes or slots in a forged work piece using a punch and drift		CO4
98		To simulate forging process like punching, upsetting using process simulator	Process Simulator	CO4
99		To perform casting experiments using materials like aluminium or bronze.	Process Simulator	CO4
100		To investigate the effect of mold temperature on cast parts.	Process Simulator	CO4
101		To investigate the effect of pouring temperature on cast parts	Process Simulator	CO4
102		To investigate the effect of cooling rate on cast parts	Process Simulator	CO4

103		Introduction and demonstration of manufacturing Processes- Welding, Forming.	Virtual Simulator	CO4
104		To study different welded joints using different welding techniques.	Virtual Simulator	CO4
105		To simulate Electric arc welding through different welding techniques	Process Simulator	CO4
106		To simulate MIG welding with the help of the processes simulator	Process Simulator	CO4
107		To simulate TIG welding with the help of the processes simulator	Process Simulator	CO4
108		To study basic metal forming techniques(rolling, extrusion, wire drawing)	Virtual Simulator	CO4
109		To simulate rolling process using virtual simulator	Virtual Simulator	CO4
110		To simulate extrusion process using virtual simulator	Virtual Simulator	CO4
111		To simulate wire drawing process using virtual simulator	Virtual Simulator	CO4
112		Study of Machining Tools- Lathe, Milling	Virtual Simulator	CO4
113		Study of Machining Tools- Drilling, Shaper, Grinding	Virtual Simulator	CO4
114		To simulate lathe machine to obtain desired shape and size.	Process Simulator	CO4
115		To simulate drill machine to obtain holes of different diameter.	Process Simulator	CO4
116		To simulate lathe machine to obtain desired shape and size.	Process Simulator	CO4
117		Study and demonstration of automation & robotics	Construction Equipment	CO4

			Simulator	
118		To study the concepts of Industry 4.0		CO4
119	5	3D Modelling and simulation of Machining in CAD	Construction Equipment Simulator	CO5
120		3D Modelling and simulation of sheet bending in CAD	Construction Equipment Simulator	CO5
121		Setting up of work piece zero position and tool adjustment in CNC Turning machine	Process Simulator	CO5
122		To write and simulate CNC Part program for turning operation as per drawing	Control System Simulator	CO5
123		To write and simulate CNC Part program for facing operation as per drawing	Control System Simulator	CO5
124		To write and simulate CNC Part program for drilling operation as per drawing	Control System Simulator	CO5
125		To write and simulate CNC Part program for milling operations.	Control System Simulator	CO5
126		Study of FDM 3D Printing Technology.	Process Simulator	CO5
127		Study of LDM 3D Printing Technology.	Process Simulator	CO5
128		Study of SLA 3D Printing Technology.	Process Simulator	CO5
129		Visualization and conversion of CAD model on a slicing software.	Process Simulator	CO5

130		Create a product using a 3D printer machine tool through different 3D printing techniques	Robotics Simulator	CO5
131		Study of different type of production systems used in industry- Job, Batch, Mass, Continuous (Case Studies and Examples)	Process Simulator	CO5
132		Study of different types of industries (Case Studies and Examples)	Process Simulator	CO5
133		Design and implementation of Smart factory for Industry Revolution 4.2	Robotics Simulator	CO5
134		To create digital twins of given parts using smart manufacturing simulation software	Smart manufacturing simulator	CO5
135		Objective is to familiarize students with the operation of CNC machines, including their components, controls, and functionalities. Through hands-on experiments, students gain practical knowledge of setting up work pieces, tooling, and executing machining operations.	Robotics Simulator	CO5
136		Objective is to enhance students' programming skills for CNC machines. By designing and executing different machining operations, students learn to write and debug CNC programs, understand G-code instructions, and create efficient tool paths.	Robotics Simulator	CO5
137		Objective is to teach students how to optimize machining processes using CNC machines. Through experiments, students learn to analyse different parameters such as cutting speed, feed rate, and tool path strategies to achieve desired machining results, including surface finish, accuracy, and cycle time reduction	Robotics Simulator	CO5
138		Objective is to expose students to advanced CNC techniques and capabilities. Through experiments, students can explore topics such as multi-axis machining, high-speed machining, tool change management, and complex part production to expand their knowledge and skills in CNC machining.	Robotics Simulator	CO5
139		Objective is to help students understand the impact of machining variables on the quality of machined parts. Through experiments, students can explore variables like tool geometry, tool material, cutting parameters, and machining strategies to analyse their effects on surface finish, dimensional accuracy, and tool life.	Robotics Simulator	CO5
140		Objective is to teach students how to use simulation and verification tools to validate and optimize CNC programs before executing them on the machine. Through experiments, students can understand the importance of simulation in preventing collisions, verifying tool paths, and optimizing machining processes.	Robotics Simulator	CO5
141		Objective is to develop students' problem-solving and troubleshooting skills in CNC machining. Through experiments, students encounter and resolve issues such as tool breakage, incorrect tool paths, or machine errors, helping them develop critical thinking and decision-making abilities.	Robotics Simulator	CO5