COURSE STRUCTURE

B.TECH. (HONORS)

COMPUTER SCIENCE & ENGINEERING

Under

Choice Based Credit System (CBCS)

Credits Distributions

Sr. No.	Category	No. of Credits
1	Humanities and Social Sciences (HS)	16
2	Basic Sciences (BS)	20
3	Engineering Sciences (ES)	11
4	Professional Core (PC)	73
5	Professional Elective (PE)	24
6	Open Elective (OE)	16
7	Project Work (PW)	40
8	Mandatory Non-Credit Courses (MNC) (4 Courses)	-
Total		**200**

First Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HRS/WK
				L	T	P		
1.	BCSC 0061	PC	Computer Programming - I	2	0	0	2	2
2.	BMAS0105	BS	Applied Mathematics - I	3	1	0	4	4
3.	BCSC 0062	PC	Web Technology - I	2	0	0	2	2
4.	BPHS1004	BS	Engineering Physics	3	1	0	4	4
5.	BELH0001	HS	English Language Skills for Communication – I	2	0	0	2	2
6.	BCSG0051	ES	Design Thinking	3	0	0	3	3
PRACTICALS								
1.	BCSC 0858	PC	Computer Programming Lab - I	0	0	4	2	4
2.	BCSC 0859	PC	Web Technology Lab - I	0	0	4	2	4
3.	BPHS0801	ES	Engineering Physics Lab	0	0	2	1	2
4.	BELH0801	HS	English Language Lab – I	0	0	2	1	2
5.	BCSJ 0060	PW	Case Study	0	0	0	2	0
6.	BCSJ 0061	PW	Certifications - I	0	0	0	2	0
			TOTAL	**15**	**2**	**12**	**27**	**29**

Second Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME			CREDITS	CONTACTS HRS/WK
				L	T	P		
1.	BCSC 0063	PC	Computer Programming - II	2	0	0	2	2
2.	BCSS0052	BS	Applied Mathematics - II	3	1	0	4	4
3.	BCSC 0064	PC	Database Technology	3	0	0	3	3
4.	BCSG 0052	ES	Introduction to AI and Analytics	2	0	0	2	2
5.	BELH0002	HS	English Language Skills for Communication – II	2	0	0	2	2
6.	BCSG 0053	ES	Digital Logic Design	3	0	0	3	3
PRACTICALS								
1.	BCSC 0860	PC	Computer Programming Lab - II	0	0	4	2	4
2.	BCSC 0861	PC	Database Technology Lab	0	0	2	1	2
3.	BCSG 0851	ES	Introduction to AI and Analytics Lab	0	0	4	2	4
4.	BELH0802	HS	English Language Lab – II	0	0	2	1	2
5.	BCSG 0852	ES	Digital Logic Design Lab	0	0	2	1	2
6.	BCSJ 0062	PW	Tiny Project	0	0	0	2	0
7.	BCSJ 0063	PW	Certifications - II	0	0	0	2	0
			TOTAL	**15**	**1**	**14**	**27**	**30**

Program Core

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE-REQUISITES
			L	T	P	J			
THEORY									
1.	BCSC 0062	Web Technology - I	2	0	0	0	2	2	
2.	BCSC 0061	Computer Programming- I	2	0	0	0	2	2	
3.	BCSC 0063	Computer Programming- II	2	0	0	0	2	2	
4.	BCSC 0064	Database Technology	3	0	0	0	3	3	
5.	BCSC 00xx	Data Structures and Algorithms	3	0	0	0	3	3	Programming
6.	BCSC 00xx	Object Oriented Programming	2	0	0	0	2	2	Programming
7.	BCSC 00xx	Web Technology - II	2	0	0	0	2	2	
8.	BCSC 00xx	Algorithms Design & Analysis	4	0	0	0	4	4	Programming, Data Structures
9.	BCSC 00xx	Operating System	3	0	0	0	3	3	
10.	BCSC 00xx	Data Communication & Network System	3	0	0	0	3	3	
11.	BCSC 00xx	Software Engineering and Project Management	3	0	0	0	3	3	
12.	BCSC 00xx	High Performance Computing	3	0	0	0	3	3	
13.	BCSC 00xx	Theory of Computation	4	0	0	0	4	4	
14.	BCSC 00xx	Emerging Technologies and Business Domains	3	0	0	0	3	3	
15.	BCSC 00xx	Machine Learning using Python	2	0	0	0	2	2	
16.	BCSC 00xx	Neural Network and Deep Learning	2	0	0	0	2	2	
17.	BCSC 00xx	Optimization Techniques	3	1	0	0	4	4	
18.	BCSC 00xx	Computer Organization & Microprocessor	3	0	0	0	3	3	
PRACTICALS									
1.	BCSC 0859	Web Technology Lab - I	0	0	4	0	2	4	
2.	BCSC 0858	Computer Programming Lab- I	0	0	4	0	2	4	
3.	BCSC 0860	Computer Programming Lab- II	0	0	4	0	2	4	
4.	BCSC 0861	Database Technology Lab	0	0	2	0	1	2	
5.	BCSC 00xx	Data Structures and Algorithms Lab	0	0	4	0	2	4	Programming Lab
6.	BCSC 00xx	Object Oriented Programming Lab	0	0	4	0	2	4	Programming Lab
7.	BCSC 00xx	Web Technology Lab - II	0	0	4	0	2	4	

8.	BCSC 00xx	Algorithms Design & Analysis Lab	0	0	2	0	1	2	Programming, Data Structures
9.	BCSC 00xx	Operating System Lab	0	0	2	0	1	2	
10.	BCSC 00xx	Data Communication & Network System Lab	0	0	2	0	1	2	
11.	BCSC 00xx	Software Engineering and Project Management Lab	0	0	2	0	1	2	
12.	BCSC 00xx	High Performance Computing Lab	0	0	2	0	1	2	
13.	BCSC 00xx	Machine Learning Using Python Lab	0	0	4	0	2	4	
14.	BCSC 00xx	Neural Network and Deep Learning Lab	0	0	4	0	2	4	
15.	BCSC 00xx	Computer Organization & Microprocessor Lab	0	0	2	0	1	2	
Total			**49**	**1**	**46**	**0**	**73**	**96**	

PROGRAMME ELECTIVES

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HRS/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BCSC 00xx	Program Elective - I	3	0	0	0	3	3	
2.	BCSC 00xx	Industry Domain – I	2	0	0	0	2	2	
3.	BCSC 00xx	Program Elective – II	3	0	0	0	3	3	
4.	BCSC 00xx	Industry Domain – II	2	0	0	0	2	2	
5.	BCSC 00xx	Program Elective – III	3	0	0	0	3	3	
6.	BCSC 00xx	Industry Domain – III	2	0	0	0	2	2	
7.	BCSC 00xx	Program Elective – IV	3	0	0	0	3	3	
8.	BCSC 00xx	Industry Domain – IV	2	0	0	0	2	2	
PRACTICALS									
1.	BCSC 00xx	Program Elective Lab - I	0	0	2	0	1	2	
2.	BCSC 00xx	Program Elective Lab – II	0	0	2	0	1	2	
3.	BCSC 00xx	Program Elective Lab – III	0	0	2	0	1	2	
4.	BCSC 00xx	Program Elective Lab - IV	0	0	2	0	1	2	
Total			**20**	**0**	**8**	**0**	**24**	**28**	

Projects

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
1.	BCSJ 0060	Case Study	0	0	0	0	2	0	
2.	BCSJ 0062	Tiny Project	0	0	0	0	2	0	
3.	BCSC 00xx	Project – I	0	0	0	0	2	0	
4.	BCSC 00xx	Project – II	0	0	0	0	2	0	
5.	BCSC 00xx	Project – III	0	0	0	0	3	0	
6.	BCSC 00xx	Project – IV	0	0	0	0	3	0	
7.	BCSJ 0061	Certifications - I	0	0	0	0	2	0	
8.	BCSJ 0063	Certifications -II	0	0	0	0	2	0	
9.	BCSC 00xx	Certifications -III	0	0	0	0	2	0	
10.	BCSC 00xx	Certifications -IV	0	0	0	0	2	0	
11.	BCSC 00xx	Major Project - I	0	0	0	0	4	0	
12.	BCSC 00xx	Major Project - II	0	0	0	0	8	0	
13.	BCSC 00xx	External Participation-I	0	0	0	0	2	0	
14.	BCSC 00xx	External Participation-II	0	0	0	0	2	0	
15.	BCSC 00xx	Industrial Training	0	0	0	0	2	0	
TOTAL			**0**	**0**	**0**	**0**	**40**	**0**	

Mandatory Non Graded Course

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
1.	BCSC 00xx	MNG-I	2	0	0	0	0	2	
2.	BCSC 00xx	MNG-II	2	0	0	0	0	2	
3.	BCSC 00xx	MNG-III	2	0	0	0	0	2	
4.	BCSC 00xx	MNG-IV	2	0	0	0	0	2	
TOTAL			**8**	**0**	**0**	**0**	**0**	**8**	

Humanities and Social Sciences

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BELH 0001	English Language Skills for Communication – I	2	0	0	0	2	2	
2.	BELH 0002	English Language Skills for Communication – II	2	0	0	0	2	2	
3.	BCSC 00xx	Skill Enhancement Course- I	1	0	2	0	2	2	
4.	BCSC 00xx	Skill Enhancement Course- II	1	0	2	0	2	2	
PRACTICALS									
1.	BELH 0801	English Language Lab – I	0	0	2	0	1	2	
2.	BELH 0802	English Language Lab – II	0	0	2	0	1	2	
3.	BCSC 00xx	Soft Skills – I	0	0	2	0	1	2	
4.	BCSC 00xx	Soft Skills – II	0	0	2	0	1	2	
5.	BCSC 00xx	Soft Skills – III	0	0	4	0	2	8	
6.	BCSC 00xx	Soft Skills – IV	0	0	4	0	2	8	
TOTAL			**6**	**0**	**20**	**0**	**16**	**32**	

Basic Sciences

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BMAS 0105	Applied Mathematics - I	3	1	0	0	4	4	
2.	BCSS 0052	Applied Mathematics - II	3	1	0	0	4	4	
3.	BCSC 00xx	Applied Mathematics - III	3	1	0	0	4	4	
4.	BCSC 00xx	Applied Mathematics - IV	3	1	0	0	4	4	
5.	BPHS 1004	Engineering Physics	3	1	0	0	4	4	
PRACTICALS									
1.	BPHS 0801	Engineering Physics Lab	0	0	2	0	1	2	
TOTAL			**15**	**5**	**2**	**0**	**21**	**22**	

Engineering Sciences

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BCSG 0052	Introduction to AI and Data Analytics	2	0	0	0	2	2	
2.	BCSG 0053	Digital Logic Design	3	0	0	0	3	3	
3.	BCSG 0051	Design Thinking	3	0	0	0	3	3	
PRACTICALS									
1.	BCSG 0851	Introduction to AI and Data Analytics Lab	0	0	4	0	2	4	
2.	BCSG 0852	Digital System Design Lab	0	0	2	0	1	2	
Total			**8**	**0**	**6**	**0**	**11**	**14**	

Open Electives

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BCSC 00xx	Open Elective-I	4	0	0	0	0	4	
2.	BCSC 00xx	Open Elective -II	4	0	0	0	0	4	
3.	BCSC 00xx	Open Elective -III	4	0	0	0	0	4	
4.	BCSC 00xx	Open Elective -IV	4	0	0	0	0	4	
Total			**16**	**0**	**0**	**0**	**0**	**16**	

SEMESTER -I
SYLLABUS

BCSC 0061: COMPUTER PROGRAMMING- I

Course Objectives: *The course is designed to provide an introduction to the Computer Programming language using Python. Learning Python basics helps develop your problem-solving skills and logical thinking*

Credits: 02 **L–T–P-J: 2–0–0-0**

Module No.	Content	Hours
I	**Introduction:** History of Python, Features, Python Interpreters and coding standards. **Working with Python:** Basic Syntax, Variable, Identifiers, Data Types and Operators. **Input-Output:** Printing on screen, Reading data from keyboard, Inbuilt-Functions. **Control Structures:** Simple if, if-else, elif, Nested if, Iteration Control structures-break, continue & pass. **String Manipulation:** String Literals, Basic Operations, String slices and String Methods. **Lists:** Introduction, Accessing List, Operations, List Methods, List Comprehensions and nested list. **Tuple:** Introduction, Accessing tuples, Operations, Functions and Methods. **Sets:** Introduction, Methods, and Operations. **Dictionary:** Introduction, accessing values in dictionaries, working with dictionaries, Properties and methods and dictionary Comprehensions.	16
II	**Functions:** Defining & Calling a function, Passing arguments to functions – Mutable & Immutable Data Types, Different types of arguments, Scope of Variables local, global, and nonlocal, Anonymous functions. **Modules and Packages:** Standard Modules- random, math, string, date, time, os, sys. **Exception Handling:** Introduction, try-except, use of else clause, try and finally clause. **Python File Handling:** Create, Open, Append, Read, Write. **Regular Expressions**: Introduction, Regex Functions in Python3, Meta characters, sets and match objects. **Database Programming (Python):** Introduction to Databases. Understanding databases and their importance. Introduction to relational databases and SQL. Installing and setting up SQLite Basic SQL commands: CREATE, INSERT, SELECT, UPDATE, DELETE.	16

Text Books:

- Paul Barry: "Head First Python "O'Reilly Media, Inc.".
- Python Data Science Handbook: Essential Tools for Working with Data

Reference Books:

- Bret Slatkin: "Effective Python: 59 Specific ways to write better Python", Addison Wesley, 2015.

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

CO1: Understand to solve problems with Code using Python as compared to other programming languages.
CO2: Apply the concepts of control structures and string manipulations of python programming.
CO3: Use in-built packages defined in Python.
CO4: Experiment user-defined functions and access built-in functions.
CO5: Develop the programs using the concept of File Handling.
CO6: Develop the programs using the concept of Exceptional Handling.

BMAS 0107: APPLIED MATHEMATICS-I

Course Objectives: *The aim of the course is to build knowledge and understanding of Linear Algebra among the students. The course seeks to give detailed knowledge about the applications in various fields by instilling them basic ideas about Linear Algebra.*

Credits: 04 **L–T–P-J: 3–1–0-0**

Module No.	Contents	Teaching Hours (Approx.)
I	**Vector Space:** Vector equations, Geometrical description of $\mathbb{R}^2$, $\mathbb{R}^3$, $\mathbb{R}^n$, Vector spaces and Subspaces, Null spaces, Column spaces, Linear combination of vectors, Linear independence and dependence of vectors, Basis and dimension of a vector space. **Linear transformations:** Introduction, Kernel and range of a linear transformation, Rank-Nullity theorem (without proof), Matrix of a linear transformation, Change of basis, Types of matrices, Operations on matrices, Inverse and Rank of a matrix by elementary transformations. **Linear Equations:** Systems of linear equations, Row reduction and Echelon forms, Solution sets of linear systems.	20
II	Norm of a matrix, condition number of a square matrix, sensitivity analysis of a linear system. **Applications of linear systems**: Applications in Economics, balancing chemical equations and network flow. **Partitioned matrices:** Addition, Scalar multiplication, Multiplication and inverse of partitioned matrices. **Matrix Factorization:** LU factorization, Applications in Electrical Engineering and Computer Graphics. **Eigen value and Eigen vectors:** Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix.	20

Focus: This course focuses on employability and skill development aligned with all CO's.
Learning Outcomes: After completion of the course, student will be able to:

CO1: Know the different types of vector spaces.
CO2: Find the basis and dimension of a vector space.
CO3: Understand the linear transformation and its properties.
CO4: Form a matrix of a linear transformation.
CO5: Calculate the inverse and rank of a matrix by elementary transformations.
CO6: Solve the linear system and carry out its sensitivity analysis.
CO7: Handle the problems related to linear systems in different fields of Engineering and Sciences.
CO8: Partition as well as Factorize a matrix and apply operations.
CO9: Identify Eigen values, Eigen vectors and diagonalize a matrix.
CO10: Use Cayley-Hamilton theorem in finding inverse of a matrix.

Text Books:

- D. C. Lay, Linear Algebra and its applications, Pearson Education, 2014.
- S. Lipschutz, Schaum's Outline of Linear Algebra, Schaum's Outline Series, 1997.
- S. Kumaresan, Linear Algebra – A Geometric Approach, PHI,

Reference Books:

- K. Hoffman and R. Kunj, Linear Algebra, Pearson, 2018.
- C. D. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2000.
- K. M. Abadir, R. Magnus, Matrix Algebra, Cambridge University Press, 2006.

BCSC 0062: WEB TECHNOLOGY- I

Objective: *This course introduces the building of dynamic web solutions using PHP programming and its connectivity with database.*

Credits: 02 **L–T–P-J: 2–0–0-0**

Module No.	Content	Hours
I	**Introduction to Client Server Architecture**: Components of Client-Server Application, Client-Server Models and their Benefits, Static V/s Dynamic Websites. **Client-Side Implementation**: Introduction to HTML, formatting tags, Meta, Anchor, List, Table, Headers, Frames and iframes, Image, Form and other tags, their usage and implementation, Introduction to HTML5, Validations using HTML5. **CSS**: Introduction of Formatting using CSS, Introduction to CSS3. **Client-side scripting**: Basics of JavaScript, Statements, Functions in JavaScript, Integrating Javascript with Various Elements of HTML, Validating a form using Javascript. **Web Servers:** Introduction to prominent Web Servers, Installation of WAMP/XAMPP, Uploading Web applications on Web Server. **Amazon Web Services**: Introduction to AWS, Uploading Web applications in AWS. **PHP Basics**: Introduction to PHP, Basic Syntax of PHP, Embedding PHP in HTML, Comments, Variables, Constants, Managing Variables, isset() and unset() functions, Operators and Operator Precedence and String Manipulation functions. **Conditional Control Structures:** If statement, If- else statement, If- else if statement, Nested if, Switch statement. **Looping Control Structures:** For loop, While loop, Do- While loop, For-each, Break and Continue.	**20**
II	**Arrays**: Arrays and its types in PHP, Accessing Elements of an Array, Modifying Elements of an Array, Functions in array, Array Sorting, Multidimensional Array. **Functions in PHP**: Functions, User-Defined function, Understanding variable scope, Global Variables, Static Variables, Built-in functions in PHP. **Form Handling and Session Management in PHP**: Accessing and displaying Form data from different Form components, Differences among $_GET, $_POST and $_REQUEST variables, PHP super globals, Session management, Session operations, Session tracking mechanism, Clearing/Modifying data from session, Destroying a session. **PHP File Handling:** Introduction, File Open, File Creation, writing to files, reading from File, searching a record from a file, Closing a File. **Database Connectivity:** Storing data from a web application to a database, retrieving data from the database to use and display on a webpage. **Introduction to other Server-side Programming Languages**	**20**

Reference Books:

- Chris Bates: “Web Programming-Building Internet Application”, “Wiley, India”, 2008.
- Black Book: “HTML5, CSS3, JAVASCRIPT, XML, XHTML, AJAX, PHP AND JQUERY”, “Wiley, India”, 2ED, 2016
- Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre: “Programming PHP”, “O’Reilly Media, Inc.", Feb 2013
- Robin Nixon: “Learning PHP, MySQL and Javascript” “O’Reilly Media, Inc.", July 2009, Reprint 2015.

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

- CO1: Understand the basics of client server architecture and its components.
- CO2: Explain the basics of web development using PHP and HTML.
- CO3: Develop a program using functions, control structures and array.
- CO4: Demonstrate the concepts of object and exception handling in PHP.
- CO5: Demonstrate web application using PHP, XML and MYSQL.
- CO6: Develop a dynamic/static website with server side programming.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	**POs/PSOs**
CO1	PO1, PSO1
CO2	PO1, PSO2
CO3	PO3, PSO2
CO4	PO4, PO2, PSO4
CO5	PO4, PO5, PSO4
CO6	PO3, PSO4

BPHS 1004: ENGINEERING PHYSICS

OBJECTIVE: *The Syllabus is designed and styled especially to give B. Tech (Hons.) I year students a sound base in fundamental physics as well as to give their exposure to a wide range of its utility in engineering and technology.*

Credits: 04

L – T – P- J: 3 – 1– 0 - 0

Module No.	Content	Teaching Hours (Approx.)
I	**Physical Optics:** Principle of superposition and coherence of light, Fresnel biprism experiment, Thin films, Newton's rings. Applications: Determination of wavelength and refractive index of medium, Antireflection coatings. Fraunhofer diffraction at a single slit and N-slits, Plane diffraction grating, Spread of Central diffraction maximum. Application: dispersive power of grating, Rayleigh's criterion and Resolving power of grating. Phenomenon of double refraction, Production and analysis of plane, circularly and elliptically polarized light, Quarter and half wave plates, Optical activity, Biquartz Polarimeter. Application: Specific rotation determination. **Quantum Mechanics:** Wave - particle duality, wave packet, Wave function and its Significance, Schrödinger's wave equation, Application: Particle in one dimensional potential box, Eigen values and Eigen function.	20
II	**Electromagnetics:** Maxwell's equations in integral and Differential forms, Equation of continuity, Inconsistency in Ampere's law: Displacement current, Propagation of E-M waves in free space and conducting medium, Application: Skin Depth. **Laser:** Principle, Spontaneous emission, Stimulated emission, Population inversion, Relation between Einstein Coefficients, Construction and working of Ruby Laser, Application: Holography **Fiber Optics:** Principle of communication through optical fiber, Classification of fibers, acceptance angle and acceptance cone, Numerical aperture, Propagation mechanism and attenuation in optical fiber.	20

Reference Books/ Text Books / Cases:

1. Optics - Ajoy Ghatak (TMH).
2. Optics-Brijlal & Subramaniam (S. Chand).
3. Optical Fibre & Laser - Anuradha De. (New Age).
4. Fundamental of Physics - Resnick, Halliday & Walker (Wiely).
5. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill).

Course Outcomes: At the end of the course, a student will be able to**:**

- CO1: Understand phenomena of Interference, Diffraction, Variation of intensities in them, and their applications in daily life.
- CO2 Discuss polarization of Light wave, double refraction, production and analysis of different polarized light waves and optical activity.
- CO3: Understand fundamentals of Quantum mechanics, Schrodinger's wave equations to deal with physics problem.
- CO4: Familiar with Maxwell equations and use them to study the Propagation of E-M waves in free space and conducting medium.
- CO5: Understand the principle and working of Lasers.
- CO6: Familiar with mechanism of communication through Optical Fiber Cables and signal losses.

BCSC0051: DESIGN THINKING

Objective: *The objectives of this course are to:*

1. *To impart knowledge on design thinking process for understanding complex designs.*
2. *To provide design skills to analyze design thinking issues and apply the tools and techniques of design.*
3. *To use design thinking concept in product development.*

Credits: 03 **L–T–P-J: 3–0–0-0**

Module No.	Content	Hours
I	**INTRODUCTION TO DESIGN THINKING (5)** Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools. **EMPATHIZE (7)** Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas. **IDEATION (8)** Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Ideation Tools: How Might We? (HMW), Story board, Brainstorming, MOM Test	20
II	**Implementation of Design Thinking in Problem Solving & Product Development:** Methodology in Product Development: Agile Vs Waterfall, Understanding AARRR Framework in Product Development, Root cause Analysis **Case Study:** 1. Spotify Social: https://medium.muz.li/what-if-you-can-create-listening-sessions-on-spotify-a-user-experience-design-case-study-fb8d20dd0e18 2. Product management Case Study on Notion, Medium, Slack https://zeda.io/blog/product-management-case-studies **Case Study Assignment:** 1. Improve the UI of PayTM for increasing user engagement 2. Suggest a new feature in Amazon app to increase user engagement 3. Suggest improvement in Instagram Threads to compete with its rival Twitter OR vice-verce *Case Study Competition*: Pick any one of the following for Case Study: Spotify, Threads, Instagram, Zepto, Meesho, Zomato, PolicyBazar, Groww, BigBasket, Zomato, Dunzo, Blinkit, PayTM, PhonePe	20

Text Book:

- Karmic Design Thinking by Prof. Bala Ramadurai, available at Amazon (paperback), Flipkart, halfpricebooks.in
- S. Salivahanan, S.Suresh Kumar, D.Praveen Sam, "Introduction to Design Thinking", Tata Mc Graw Hill, First Edition, 2019.
- Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly, 2017.

Reference Books:

- Michael G. Luchs, Scott Swan, Abbie Griffin, "Design Thinking –New Product Essentials from PDMA", Wiley, 2015.
- Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

- The Design of Everyday Things by Don Norman, 2013 Available on Amazon.
- The Mom Test: How to talk to customers & learn if your business is a good idea when everyone is lying to you, Rob Fitzpatrik.

Outcome: After completion of course, student will be able to:

- CO1: Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.
- CO2: Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.
- CO3: Develop innovative products or services for a customer base using ideation techniques.
- CO4: Build & improve product by implementing concept of design thinking.
- CO5: Apply different methodology & framework for product development.
- CO6: Improve product features, UI/UX to increase user retention and engagement.

ADDITIONAL LEARNING RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit3
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and-preserves-the-status-quo
5. https://hbr.org/2018/09/why-design-thinking-works
6. https://hbr.org/2015/09/design-thinking-comes-of-age
7. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
8. https://nptel.ac.in/courses/109/104/109104109/
9. https://nptel.ac.in/courses/110106124/
10. **Swayam Course:** https://onlinecourses.nptel.ac.in/noc22_mg32/preview
11. Course Book by Dr. Bala, IIT-Madras
    https://drive.google.com/file/d/1O34NfmtQHJgRBGXuXn4cvwDsqVvpV76X/view

BCSC 0858: COMPUTER PROGRAMMING LAB-I

Objective: *The course is designed to provide an introduction to the Python Programming language.*

Credits: 02 **L–T–P: 0–0–4**

Module No.	Content	Teaching Hours
I, II	**Programs based on the concepts of:** • Building Python Modules • Obtaining user Data • Printing desired output **Programs based on the concepts of:** • Conditional if statements • Nested if statements • Using else if and elif **Programs based on the concepts of Iteration using different kinds of loops** **Usage of Data Structures** • Strings • Lists • Tuples • Sets • Dictionary **Program based on the concepts of User-defined modules and Standard Library (** **Random, numpy, matplotlib, pandas, sys, math module, string module, list module etc.).** Program based on Input Output. Program based on exception Handling. Program based on Simple Data analysis. Program based on Pandas. Data Visualization graph plotting Create the GUIs using OO programming	28 hours

Text Books:

- Paul Barry: "Head First Python "O'Reilly Media, Inc.".
- Python Data Science Handbook: Essential Tools for Working with Data.

Reference Books:

- Bret Slatkin: "Effective Python: 59 Specific ways to write better Python", Addison Wesley, 2015.

Outcome: After completion of course, the student will be able to:

- CO1: Understand to solve problems with smaller Lines of Code using Python as compared to other programming languages.
- CO2: Use Object-Oriented Programming concepts while programming in Python.
- CO3: Gain knowledge of Python visualization libraries.
- CO4: Create a plot of retrieved data.
- CO5: Work with Python using GUI.

BCSC 0859: WEB TECHNOLOGY LAB-I

Objective: *This course introduces the building of dynamic web solutions using PHP programming and OO concepts and its connectivity with database.*

Credits: 01 **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	Static web applications using HTML/CSS, Web applications using HTML & JavaScript, Programs using Decision Control Structures, Programs using Loop Control Structures, Programs using user defined functions, Programs of Array handling and manipulation, Programs of File handling and manipulation, Web applications with Form handling at server, Web applications for managing sessions, Web application for uploading a file on Server	24

Reference Books:

- Chris Bates: "Web programming-Building Internet Application", "Wiley, India", May 2006.
- Black Book: "HTML5, CSS3, JAVASCRIPT, XML, XHTML, AJAX, PHP AND JQUERY", "Wiley, India", 2ED
- Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre: "Programming PHP", "O'Reilly Media, Inc.", Feb 2013
- Robin Nixon: "Learning PHP, MySQL and Javascript" "O'Reilly Media, Inc.", July 2009.

Outcome: By the end of the class, students will learn to:

- CO1: Understand to solve problems with smaller Lines of Code using PHP as compared to other programming languages.
- CO2: Build dynamic web-pages with the help of PHP programming.

BPHS0801: ENGINEERING PHYSICS LAB

Credit 01 **L–T–P: 0–0-2**

Objective: *14 no. of experiments based on theoretical aspects are set in laboratory to give B.Tech Students a sound practical knowledge in fundamental and applied physics.*

Note: Any twelve experiments at least five from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's rings.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the wavelength of spectral lines using plane transmission /diffraction grating.
5. To determine the wavelength of laser light by diffraction grating method.
6. To verify Stefan's law by electrical method.
7. To determine high resistance by leakage method using digital D.C. micro voltmeter.

Group – B

8. To determine the specific resistance of the material of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying circular coil and then to estimate the radius of the coil.
10. To calibrate the given ammeter by potentiometer.
11. To calibrate the given voltmeter by potentiometer.

1	To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor.

13. To determine the energy band gap of a given semiconductor material.
14. Measurement of resistivity of semiconductor by four probe method at different temperatures and determination of the band gap.

Outcomes: After completing the lab exercise:

- CO1: B.Tech. Students learn about the applications of basic-laws, principles and concepts of Engineering Physics in the various fields of science and technology.
- CO2: Practical training of a student reinforces his/her theoretical knowledge adequately and make him confident in subject.

SEMESTER -II
SYLLABUS

BCSC 0063: COMPUTER PROGRAMMING- II

Course Objectives: *The course is designed to provide advance concepts of OOPS, GUI and Network Programming.*

Credits: 02 **L–T–P: 2–0–0**

Module No.	Content	Hours
I	**Introduction to Object-Oriented Programming:** Understanding the basics of OOP, Key concepts: classes, objects, attributes, methods, Benefits of OOP and its importance. **Classes and Objects:** Defining classes and creating objects, Instance variables and instance methods, Constructors and destructors, Class attributes and methods. **Inheritance and Polymorphism: Inheritance:** creating subclasses and superclasses, Overriding methods in subclasses, Understanding method resolution order (MRO), Polymorphism and its use cases. **Encapsulation and Abstraction:** Encapsulation: data hiding and access modifiers. Creating getter and setter methods**.** Abstraction: defining abstract classes and methods**,** Implementing interfaces and abstract classes **Introduction to GUI Programming:** Understanding the importance of GUI in software development, Overview of GUI frameworks available in Python (Tkinter, PyQt, wxPython, etc.), Setting up the development environment.	16
II	**Multithreading:** Thread, Starting a thread, Threading module. **Data Visualization in Python:** statistics, numpy, matplotlib and pandas. **Socket Programming Basics:** Introduction to socket programming in Python**,** creating client-server communication using sockets**,** setting up server and client sockets**,** Sending and receiving data over sockets. **Introduction selenium with Python:** Chrome WebDriver, Web Element, Locating Elements, Locating by Id, Locating by Name, Locating by XPath, Locating Hyperlinks by Link Text, Locating Elements by Tag Name, Locating Elements by Class Name, CSS Selectors.	16

Text Books:

- Irv Kalb: Object Oriented Python “O’Reilly".
- Python 3 Object Oriented Programming.

Reference Books:

- Python GUI Programming with Tkinter: Develop Responsive and Powerful GUI Applications with Tkinter.

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

- CO1: Understand to solve problems with OOP concepts.
- CO2: Apply the concepts of Function Decorators.
- CO3: Use in-built packages (numpy, pandas and matplotlib) defined in Python.
- CO4: Develop the programs using GUI Programming.
- CO5: Develop the programs using Network Programming.
- CO6: Web automation using selenium

BCSS 0052: PROBABILITY AND APPLIED STATISTICS

Objective: *The objective of this course to introduce the application of statistics in the field of data science and how businesses are using these concepts to attain their objective and getting the growth in the business.*

Credits: 04 **L-T-P-J:3-1-0-0**

Module No.	Content	Teaching Hours
I	1. Various Research Methods 1. Introduction to Several Statistical Study Materials 2. Learn the positives and negatives of each 2. Visualizing Data a. Take your data and display it to the world b. Create the interpret histograms, bar charts, and frequency plots 3. Central Tendency a. Create and Interpret the 3 measures of center for distributions: the mean, median, and mode 4. Variability a. Quantify the spread of data using the range and standard deviation b. Identify outliers in data sets using the concept of the interquartile range 5. Standardizing a. Convert distributions into the standard normal distribution using the Z-Score b. Compute proportions using standardized distributions 6. Normal Distribution a. Use normalized distributions to compute probabilities b. Use the Z-table to look up the proportions of observations above, below, or in between values 7. Sampling Distributions a. Apply the concepts of probability and normalization to sample data sets.	20
II	1. Estimation a. Estimate population parameters from sample statistics using confidence intervals b. Estimate the effect of a treatment 2. Hypothesis Testing a. How to determine is treatment has changed the value of a population parameter. 3. T-tests a. How to test the effect of a treatment b. Compare the difference in means for two groups when there are small sample sizes. 4. ANOVA a. Learn how to test whether or not there are differences between three or more groups 5. Correlation a. Learn how to describe and test the strength of a relationship between two variables 6. Regression a. How changes in one variable are related to changes in a second variable 7. Chi-Squared Tests a. Learn how to compare and test frequencies for categorical data.	20

Text Books:

- Allen B. Downey, **Think Stats**. 'O' Reilly
- Peter Bruce and Andrew Bruce, **Practical Statistics for Data Scientists**, 'O' Reilly

Reference Books

Ken Black, Business Statistics: For Contemporary Decision Making,

Outcome: After completion of Lab, student will be able to:

- CO1: List different kind of statistics for data analysis.
- CO2: Differentiate measure of central tendency and measure of variability.
- CO3: Define Normalization and Standardization.
- CO4: Conceptualize Probability distribution
- CO5: Apply statistics in various research methods.

BCSC 0064: DATABASE TECHNOLOGY

Objective: *The objective of the course is to enable students to understand and use a relational database & NoSQL system. Students learn how to design and create a good database.*

Credits: 03 **L-T-P: 3-0-0**

Module No.	Content	Teaching Hours
I	**Introduction:** An Overview of Database Management System, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence, Database Language and Interfaces (DDL, DML, DCL), Database Development Life Cycle (DDLC) with case studies. **Data Modeling Using the Entity-Relationship Model:** ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Specialization, Generalization, Aggregation, Reduction of an ER Diagram to Tables. **Relational Data Model and Language:** Relational Data Model Concepts, Integrity Constraints: Entity Integrity, Referential Integrity, Key Constraints, Domain Constraints, **Relational Algebra:** Selection, Projection, Union, Intersection, Set Difference, Cross Product, Joins: Inner Join (Theta Join, Equi Join, Natural Join), Outer join (Left, Right, Full Outer Join), Division. **Database Design & Normalization:** Functional Dependencies, Primary Key, Foreign Key, Candidate Key, Super Key, Normal Forms, First, Second, Third Normal Forms, BCNF, 4th Normal Form, 5th Normal Form	26
II	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Deadlock Handling. **Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, 2PL, Time Stamping Protocols for Concurrency Control, Validation Based Protocol. **Distributed Database:** Introduction of Distributed Database, Data Fragmentation and Replication. **Database Programming using Python**: Database connectivity, Retrieving Data from Database, Parameters Passing, Execute many Methods, Cursor Attributes, Invoke Stored Procedures, Invoke Stored Functions.	26

Text Books:

- Elmasri and Navathe, "Fundamentals of Database Systems", 6th Edition, Addison Wesley, 2010.
- Sadalage, P. & Fowler , "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Pearson Education, 2012.

References Books:

- Date C J, " An Introduction to Database Systems", 8th Edition, Addison Wesley.
- Korth, Silbertz and Sudarshan, "Database Concepts", 5th Edition, TMH, 1998.
- Redmond, E. &Wilson, "Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", 1st Edition.

Course Outcome: After completion of course, student will be able to:

- CO1: Understand the concept of database management systems and Relational database.
- CO2: Identify the various data model used in database design.
- CO3: Design conceptual models of a database using ER modeling for real life applications and construct queries in Relational Algebra.
- CO4: Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
- CO5: Select the information from a database by formulating complex queries in SQL.

- CO6: Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
- CO7: Discuss recovery system and be familiar with introduction to web database, distributed databases.
- CO8:Design and implement the database system with the fundamental concepts of DBMS using Python.

BCSG 0052: INTRODUCTION TO AI AND ANALYTICS

Objective:. *The objective of the course is to enable students to understand and use AI for real world problem solving.*

Credit: 2 **L–T–P: 2–0–0**

Module No.	Content	Teaching Hours
I	Introduction to Artificial Intelligence, Search in AI, Agents, state, actions, transition model, state space, goal test, path cost, depth-first search, breadth-first search, Greedy best-first, A* Search, Adversarial Search, Alpha-Beta Pruning, Depth-Limited Minimax. **Knowledge**-Based Agents, Propositional Logic, Inference, First Order Predicate Logic, Prolog Programming, Unification, Forward Chaining-Backward knowledge engineering, Inference rules, Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information	20
II	Probability, conditional probability, random variable, Bayes' rule, Joint probability, Probability Rules, Bayesian networks, Dempster Shafer theory, Probabilistic Reasoning over time: Hidden Markov Models, Kalman Filters. Uninformed search and Informed search based on heuristics, Local search algorithms and optimization problems, Hill Climbing, Simulated Annealing, Linear programming, Constraint Satisfaction, Arc consistency, Backtracking. Machine learning, Nearest-Neighbor Classification, Perceptron Learning, Support Vector Machines, Reinforcement learning, Markov decision processes **APPLICATIONS:** AI applications – Language Models – Information Retrieval-Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware –Perception – Planning – Moving	20

Text Books:

- Artificial Intelligence: A Modern Approach, S Russel and P Norvig, 3rd Edition, 2015 Prentice Hall

References Books:

- Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, Pearson Education.
- Artificial Intelligence and Expert Systems — Patterson PHI.

Outcome: After the completion of the course, the student will:

- CO1: Understand the concepts of Artificial Intelligence and intelligent agents.
- CO2: Understand and learn knowledge representation and reasoning for the problem-solving solving.
- CO3: Apply basic search techniques for problem-solving.
- CO4: Understand and apply learning techniques.
- CO5: Apply and utilize AI knowledge for application in the real world.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs/PSOs
CO1	PO1 /PSO1
CO2	PO2, PO3/ PSO2
CO3	PO2,PO3,PO6,PO11/PSO1,PSO2,PSO4
CO4	PO1,PO3/PSO1
CO5	PO1,PO5/PSO1
CO6	PO2,PO3,PO9/ PSO2

BCSG 0053: DIGITAL LOGIC DESIGN

Objective: *This course enables the students:*

- *To learn the fundamental concepts of digital logic design.*
- *To study methods of logic expression simplification.*
- *To understand the procedure for the analysis of combinational and sequential logic circuits.*
- *To understand terms used in the designing of a memory and programmable logic devices.*

Credits: 03 **L–T–P-J: 3–0-0-0**

Module No.	Contents	Teaching Hours
I	Introduction to digital systems, number system conversion, signed number representation, floating-point number representation, weighted (8421), non-weighted binary codes (excess-3 and gray code), error detection/correction code, and Hamming code. Basic and universal logic gates, realization of Boolean expressions using logic diagram, minterms, maxterms, SoP and PoS forms, simplification of Boolean function using two variables, three variables, and four variables K-Map, conversion from SoP to PoS and vice-versa. **Design and analysis of combinational circuits:** half adder, half subtractor, full adder, full subtractor, 4-bit parallel binary adder-subtractor, binary multiplier, magnitude comparator, multiplexer, implementation of a Boolean function using a multiplexer, implementation of higher-order multiplexers using lower order multiplexers, demultiplexer.	**21**
II	Encoder, priority encoder, decoder, implementation of Boolean functions using a decoder. Introduction to sequential circuits, SR latch, SR flip-flop, JK flip-flop, D flip-flop, T flip-flop, PS-NS table, excitation table, characteristic equation of flip-flops. Analysis of clocked sequential circuits, Mealy and Moore state machines, state table, and state diagram. Shift register, SISO, SIPO, PISO, PIPO, and universal shift register. Binary counter, ripple MOD-N (up/down) and MOD<N binary counter, synchronous binary counter, ring counter, Johnson's counter. Introduction to memory, RAM, ROM, and implementation of Boolean functions using ROM. Programmable logic: PAL architecture, PLA architecture, System on Chip (SoC) design.	**21**

Text Book:

- 1. S. Salivahanan& S. Asivazhagan, "Digital Circuit & Design", IInd Edition.
- 2. M. Morris Mano and M. D. Ciletti, "Digital Design" 4th Edition, Pearson Education.

Reference Books:

- John F Wakerly, Digital Design, Fourth Edition, Pearson/PHI,2006
- John M Yarbrough, Digital Logic Applications and Design, Thomas Learning,2002
- Charles H Roth, Fundamentals of Logic Design, Thomson Learning , 2003
- Donald P Leach and Albert Paul Malvino, Digital Principals and Applications, 6th
- Edition, TMH,2003.
- William H Gothmann, Digital Electronocs, 2nd Edition, PHI, 1982

Course Outcomes (CO): Upon completion of this course students will be able to:

- CO1: Understand number system conversion, signed numbers, and floating-point number representation.
- CO2: Understand 8421 weighted, non-weighted binary codes including excess-3 and gray code, and Hamming code.

- CO3: Understand basic and universal logic gates, SoP and PoS forms, and simplification of Boolean functions using K-Map.
- CO4: Construct combinational circuits including adder, subtractor, adder-subtractor, multiplier, comparator, encoder, decoder, multiplexer, and demultiplexer.
- CO5: Construct sequential circuits which include flip-flop, shift register, ripple counter, synchronous counters, Johnson counter, ring counter.
- CO6: Analyse clocked sequential circuits using state table and state diagram.
- CO7: Understand memory, programmable logic device including PAL and PLA, and SoC design.

BCSC 0860: COMPUTER PROGRAMMING LAB - II

Objective: *The lab aims to develop an understanding of different applications OOPs, GUI and Socket Programming..*

Credits:01 **L-T-P-J:0-0-2-0**

Module No.	Content	Teaching Hours
I & II	Programs based on the concepts of: • Classes, Objects, Data Encapsulation • Constructors • Static and Class Method Programs based on the concepts of: • Inheritance • Polymorphism Programs based on GUI programming: • Labels, Buttons, Text Box, Text Area, Image, Checkbox, Radio Button • Event Handling Program based on Socket Programming- send() and recv() method Program based on the following modules:- • numpy • pandas • matplotlib	24

Text Books:

- Irv Kalb: Object Oriented Python "O'Reilly".
- Dusty Phillips: Python 3 Object Oriented Programming.

References Books:

- Python GUI Programming with Tkinter: Develop Responsive and Powerful GUI Applications with Tkinter

Outcome: After the completion of the course, the student will be able to:

- CO1: Understand to solve problems with OOP concepts.
- CO2: Use in-built packages (numpy, pandas and matplotlib) defined in Python.
- CO3: Develop the programs using GUI Programming and Network Programming.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs/PSOs
CO1	PO2/PSO1
CO2	PO3/PSO4
CO3	PO5/PSO2

BCSC 0861: DATABASE TECHNOLOGY LAB

Objective: *The lab aims to develop an understanding of different applications and constructs of SQL, PL/SQL.*

Credits:01 **L-T-P-J:0-0-2-0**

Module No.	Content	Teaching Hours
I & II	• Write the SQL queries for data definition and data manipulation language. • To implement various operations on a table. • To implement various functions in SQL. • To implement restrictions on the table. • To implement the concept of the grouping of Data. • To implement the concept of Joins in SQL. • To implement the concept of sub-queries. • To implement the concept of views, sequence. • To implement the concept of Procedure function and Triggers.	24

References Books:

- Date C J, " An Introduction to Database Systems", 8th Edition, Addison Wesley.
- Korth, Silbertz and Sudarshan, "Database Concepts", 5th Edition, TMH, 1998.
- Majumdar& Bhattacharya, "Database Management System", TMH

Outcome: After the completion of the course, the student will be able to:

- CO1: Apply SQL queries for DML and DDL.
- CO2: Develop the SQL queries for real life scenarios.
- CO3: Implement the procedural language (PL/SQL) and Triggers.

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs/PSOs
CO1	PO1, PO2/PSO1, PSO4
CO2	PO1, PO2/PSO1, PSO4
CO3	PO2, PO3, PO5/PSO2, PSO3

BCSG 0851: INTORODUCTION TO AI AND ANALYTICS LAB

Objective: *The lab aims to develop an understanding of different applications.*

Credits:02 **L-T-P-J:0-0-4-0**

Module No.	Content	Teaching Hours
I & II	• Implement Breadth First Search Traversal? • Implement Water Jug Problem? • Remove punctuations from the given string? • Sort the sentence in alphabetical order? • Implement Hangman game using python. • Implement Tic-Tac-Toe game using python. • Remove stop words for a given passage from a text file using NLTK? • Implement stemming for a given sentence using NLTK? • POS (Parts of Speech) tagging for the give sentence using NLTK? • Implement Lemmatization using NLTK? • Text Classification for the give sentence using NLTK	24

Text Book:

- Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning

Reference Books:

- Life 3.0 Being Human in the Age of Artificial Intelligence
- Artificial Intelligence- A Modern Approach (3rd edition)
- Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning

Outcome:

- CO1: Use of python to understand the concept of AI
- CO2: Implementation of Different AI Techniques
- CO3: Application of AI techniques in practical Life
- CO4: Understanding of Natural Language Tool Kit.
- CO5: Practical Application of Natural Language Tool Kit

BCSG 0852: DIGITAL SYSTEM DESIGN LAB

Objective: *The main aim of the lab is to better understand the design of combinational and sequential circuits.*

Credits: 01 **L–T–P: 0–0–2**

Module No.	Content	Lab Hours
I	1. Introduction to the lab and testing of logic gate IC's. 2. Realization of Half Adder and Half Subtractor using logic gates. 3. Realization of full-adder & full subtractor using logic gates. 4. Realization of a 4-bit binary decoder/ demultiplexer. 5. Realization of decimal to BCD encoder using IC 74147. 6. Realization of a 4x1 multiplexer. 7. Implementation of SR, JK, T, and D flip-flops using logic gates. 8. Realization and implementation of serial in parallel out and parallel in serial out shift register. 9. Realization and implementation of a 2-bit up/down binary synchronous counter. 10. Realization and implementation of a 4-bit binary ripple counter using JK flip-flop. 11. A project based on combinational and sequential circuit.	32

Outcome: By the end of the class, students will learn to:

- Implement combinational and sequential circuits using ICs.
- Understand the working of various building blocks present in an Arithmetic Logic Unit (ALU) in a computer system.