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)	19
2	Basic Sciences (BS)	21
3	Engineering Sciences (ES)	21
4	Professional Core (PC)	54
5	Professional Elective (PE)	26
6	Open Elective (OE)	12
7	Project Work (PW)	32
8	Mandatory Non-Credit Courses (MNC) (4 Courses)	-
Total		**185**

First Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HRS/WK
				L	T	P	J		
1.	BCSC 0071	PC	Computer Programming - I	3	0	0	0	3	3
2.	BMAS 0120	BS	Calculus	3	1	0	0	4	4
3.	BCSC 0070	PC	Web Technology - I	3	0	0	0	3	3
4.	BPHS 0100	BS	Physics for Engineers	3	0	0	0	3	3
5.	BELH 1014	HS	English For professional Communication-I	2	0	0	0	2	2
6.	BCSG 0051	ES	Designing Thinking	3	0	0	0	3	3
PRACTICALS									
1.	BCSC 0871	PC	Computer Programming Lab - I	0	0	2	0	1	2
2.	BCSC 0877	PC	Web Technology Lab - I	0	0	2	0	1	2
3.	BPHS 0801	BS	Engineering Physics Lab	0	0	2	0	1	2
4.	BELH 0807	HS	English For professional Communication Lab-I	0	0	2	0	1	2
5.	BCSJ 0060	PW	Case Study	0	0	0	0	2	0
6.	BCSJ 0061	PW	Certifications - I	0	0	0	0	2	0
			TOTAL	**17**	**1**	**8**	**0**	**26**	**26**

Second Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HRS/WK
				L	T	P	J		
1.	BCSC 0702	PC	Computer Programming - II	3	0	0	0	3	3
2.	BMAS 0121	BS	Introduction to Linear Algebra	3	1	0	0	4	4
3.	BCSC 0064	PC	Database Technology	3	0	0	0	3	3
4.	BCSG 0054	ES	Introduction to AI and Data Analytics	3	0	0	0	3	3
5.	BELH 0016	HS	English for Professional Communication II	2	1	0	0	3	3
6.	BCSG 0053	ES	Digital Logic Design	3	0	0	0	3	3
PRACTICALS									
1.	BCSC 0873	PC	Computer Programming Lab - II	0	0	2	0	2	2
2.	BCSC 0861	PC	Database Technology Lab	0	0	2	0	1	2
3.	BCSG 0852	ES	Digital Logic Design Lab	0	0	2	0	1	2
4.	BCSJ 0062	PW	Tiny Project	0	0	0	2	2	2
5.	BCSJ 0063	PW	Certifications - II	0	0	0	0	2	0
			TOTAL	**17**	**2**	**6**	**2**	**27**	**27**

Third Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HRS/WK
				L	T	P	J		
1.	BCSC 00XX	PC	Object Oriented Concepts	3	0	0	0	3	3
2.	BCSC 0068	PC	Operating Systems	3	0	0	0	3	3
3.	BCSE 0487	PE	Data Visualization	3	0	0	0	3	3
4.	BMAS XXXX	BS	Probability and Statistics	3	0	0	0	3	3
5.	BELA 0001	HS	English For Occupational Purposes –I	3	0	0	0	3	3
6.	BELH 0017	HS	Ethics & Values	2	0	0	0	2	2
PRACTICALS									
1.	BCSC 0865	PC	Object Oriented Concepts Lab	0	0	2	0	1	2
2.	BCSC 0866	PC	Operating Systems Lab	0	0	2	0	1	2
3.	BCSE 0887	PE	Data Visualization Lab	0	0	2	0	1	2
4.	BCSJ 0064	PW	Certifications -III	0	0	0	0	2	0
5.	BTDH 0301	HS	Soft Skills–I	0	0	2	0	1	2
6.	BCSJ 0037	PW	Project – I	0	0	0	0	2	0
7.	MNG	MNG	MNG-I	0	0	2	0	0	0
			TOTAL	**17**	**0**	**10**	**0**	**25**	**25**

Fourth Semester

S. NO.	CODE	CAT	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HRS/WK
				L	T	P	J		
1.	BCSC 0073	PC	Data Structures & Algorithms	3	1	0	0	4	4
2.	BCSC XXXX	PC	Computer Organization and Microprocessor	3	0	0	0	3	3
3.	BCSC 0074	PC	Software Engineering and Project Management	3	0	0	0	3	3
4.	BCSC 0058	BS	Discrete Mathematical Structures	3	1	0	0	4	4
5.	BCSC 0075	PC	Machine Learning Using Python	2	0	0	0	2	2
6.	ONLS 0001	BS	Environmental Study	2	0	0	0	2	2
7.	ONL XXXX	OE	Open Elective I	4	0	0	0	4	0
PRACTICALS									
1.	BCSC 0874	PC	Data Structures & Algorithms Lab	0	0	2	0	1	2
2.	BCSC 0875	PC	Software Engineering and Project Management Lab	0	0	2	0	1	2
3.	BCSC XXXX	PC	Computer Organization and Microprocessor Lab	0	0	2	0	1	2
4.	BCSC 0876	PC	Machine Learning Using Python Lab	0	0	4	0	2	4
5.	BCSJ 0065	PW	Certifications -IV	0	0	0	2	2	0
6.	BCSJ 0052	PW	Project – II	0	0	0	2	2	0
7.	BTDH 0302	HS	Soft Skills – II	0	0	2	0	1	2
8.	BMEM 0002	MNG	MNG – II (Waste to Energy)	0	0	2	0	0	2
			TOTAL	**20**	**2**	**14**	**4**	**32**	**32**

Program Core

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE-REQUISITES
			L	T	P	J			
THEORY									
1.	BCSC 0071	Computer Programming - I	3	0	0	0	3	3	
2.	BCSC 0070	Web Technology - I	3	0	0	0	3	3	
3.	BCSC 0702	Computer Programming - II	3	0	0	0	3	3	Programming
4.	BCSC 0064	Database Technology	3	0	0	0	3	3	
5.	BCSC 00XX	Object Oriented Concepts	3	0	0	0	3	3	
6.	BCSC 0068	Operating Systems	3	0	0	0	3	3	Programming, Data Structures
7.	BCSC 00XX	Data Structures & Algorithms	3	1	0	0	4	4	
8.	BCSC 00XX	Software Engineering and Project Management	3	0	0	0	3	3	
9.	BCSC 00xx	Machine Learning using Python	2	0	0	0	2	2	
10.	BCSC 00XX	Data Communication and Network Systems	3	0	0	0	3	3	
11.	BCSC 00XX	Algorithms Design & Analysis	3	0	0	0	3	3	
12.	BCSC 00XX	Natural Language Processing	3	0	0	0	2	3	
13.	BCSC 00XX	Theory of Computation	3	0	0	0	3	3	
14.	BCSC 00XX	Computer Organization & Microprocessor	3	0	0	0	3	3	
PRACTICALS									
1.	BCSC 0871	Computer Programming Lab - I	0	0	2	0	1	2	
2,	BCSC 0877	Web Technology Lab - I	0	0	2	0	1	2	
3.	BCSC 0873	Computer Programming Lab - II	0	0	2	0	1	2	Programming Lab
4.	BCSC 0861	Database Technology Lab	0	0	2	0	1	2	
5.	BCSC XXXX	Object Oriented Concepts Lab	0	0	2	0	1	2	
6.	BCSC 0866	Operating Systems Lab	0	0	2	0	1	2	
7.	BCSC XXXX	Data Structures & Algorithms Lab	0	0	2	0	1	2	

8.	BCSC XXXX	Software Engineering and Project Management Lab	0	0	2	0	1	2	
9.	BCSC 00xx	Machine Learning Using Python Lab	0	0	4	0	2	4	
10.	BCSC XXXX	Algorithms Design & Analysis Lab	0	0	2	0	1	2	
11.	BCSC XXXX	Natural Language Processing Lab	0	0	2	0	1	2	
12.	BCSC XXXX	Computer Organization & Microprocessor Lab	0	0	2	0	1	2	
Total			**41**	**1**	**26**	**0**	**54**	**68**	

Program Electives

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BCSE 0487	Data Visualization	3	0	0	0	3	3	
2.	BCSE XXXXX	Program Elective-II	2	0	0	0	2	2	
3.	BCSE XXXXX	Program Elective-III	3	0	0	0	3	3	
4.	BCSE XXXXX	Program Elective-IV	3	0	0	0	3	3	
5.	BCSE XXXXX	Program Elective-V	2	0	0	0	2	2	
6.	BCSE XXXXX	Program Elective-VI	3	0	0	0	3	3	
7.	BCSE XXXXX	Program Elective-VII	3	0	0	0	3	3	
PRACTICALS									
1.	BCSC 0887	Data Visualization Lab	0	0	2	0	1	2	
2,	BCSE XXXXX	Program Elective-II Lab	0	0	2	0	1	2	
3.	BCSE XXXXX	Program Elective-III Lab	0	0	2	0	1	2	
4.	BCSE XXXXX	Program Elective-IV Lab	0	0	2	0	1	2	
5.	BCSE XXXXX	Program Elective-V Lab	0	0	2	0	1	2	
6.	BCSE XXXXX	Program Elective-VI Lab	0	0	2	0	1	2	
7.	BCSE XXXXX	Program Elective-VII Lab	0	0	2	0	1	2	
Total			**19**	**0**	**14**	**0**	**26**	**33**	

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 0061	Certifications - I	0	0	0	0	2	0	
3.	BCSJ 0062	Tiny Project	0	0	0	0	2	0	
4.	BCSJ 0063	Certifications - II	0	0	0	0	2	0	
5.	BCSJ 0037	Project – I	0	0	0	0	2	0	
6.	BCSJ 0052	Project – II	0	0	0	0	2	0	
7.	BCSJ 00XX	Industrial Training	0	0	0	0	2	0	
8.	BCSJ 0053	Project-III	0	0	0	0	2	0	
9.	BCSJ 0054	Project-IV	0	0	0	0	2	0	
10.	BCSJ 0055	Project-V	0	0	0	0	4	0	
11.	BCSJ00XX	Capstone Project	0	0	0	0	10	0	
Total			**0**	**0**	**0**	**0**	**32**	0	

Mandatory Non Graded Course

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BMEM0002	MNG-I (Rashtriya Gaurav)	2	0	0	0	0	2	
2.	BMEMXXXX	MNG-II	2	0	0	0	0	2	
3.	BMEMXXXX	MNG-III	2	0	0	0	0	2	
4.	BMEMXXXX	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 1014	English For professional Communication-I	2	0	0	0	2	2	
2.	BELH 0016	English for Professional Communication -II	2	1	0	0	3	3	
3.	BELH 00XX	English for Occupational Purpose -I	3	0	0	0	3	3	
4.	BELH 0017	Ethics & Values	2	0	0	0	2	2	
PRACTICALS									
1.	BELH 0807	English For professional Communication Lab-I	0	0	2	0	1	2	
2.	BTDH 0301	Soft Skills- I	0	0	2	0	1	2	
3.	BTDH 0302	Soft Skills- II	0	0	2	0	1	2	
4.	BELH00XX	Soft Skills- III	0	0	4	0	2	4	
5.	BELH00XX	Soft Skills- IV	0	0	8	0	4	8	
TOTAL			**9**	**1**	**18**	**0**	**19**	**28**	

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	4	4	
2.	BCSC 00xx	Open Elective -II	4	0	0	0	4	4	
3.	BCSC 00xx	Open Elective -III	4	0	0	0	4	4	
Total			**12**	**0**	**0**	**0**	**12**	**12**	

Basic Sciences

S. NO.	CODE	SUBJECT	TEACHING SCHEME				CREDITS	CONTACTS HR/WK	PRE- REQUISITES
			L	T	P	J			
THEORY									
1.	BMAS 0120	Calculus	3	1	0	0	4	4	
2.	BPHS 0100	Physics for Engineers	3	0	0	0	3	3	
3.	BMAS 0121	Introduction to Linear Algebra	3	1	0	0	4	4	
4.	BCSC 0058	Discrete Mathematical Structures	3	1	0	0	4	4	
5.	BMAS XXXX	Probability and Statistics	3	0	0	0	3	3	
6.	ONLS0001/ 0002	Environmental Study	2	0	0	0	2	2	
PRACTICALS									
1.	BPHS 0801	Engineering Physics Lab	0	0	2	0	1	2	
Total			**17**	**3**	**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 0051	Design Thinking	3	0	0	0	3	3	
2.	BCSG 0054	Introduction to AI and Data Analytics	3	0	0	0	3	3	
3.	BCSG 0053	Digital Logic Design	3	0	0	0	3	3	
4.	BCSG XXXX	Creativity and Innovation	3	0	0	0	3	3	
5.	BCSG XXXX	Data Engineering	3	0	0	0	3	3	
6.	BCSG XXXX	Interdisciplinary I	3	1	0	0	4	4	
PRACTICALS									
1.	BCSG 0852	Digital Logic Design Lab	0	0	2	0	1	2	
2.	BCSG XXXX	Interdisciplinary I Lab	0	0	2	0	1	2	
		Total	**18**	**1**	**4**	**0**	**21**	**23**	

SEMESTER -I
SYLLABUS

BCSC 0071: COMPUTER PROGRAMMING- I

Course Objectives: *The course is designed to provide an introduction to the Computer Programming language using Python*

Credits: 03 **L–T–P-J: 3–0–0-0**

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.	20
II	**Sets:** Introduction, Methods, and Operations. **Dictionary:** Introduction, Accessing values in dictionaries, working with dictionaries, Properties and methods and dictionary Comprehensions. **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.	20

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 0120: CALCULUS

Course Objectives: *To make the students understand the concepts of calculus, ordinary differential equations and difference equations by giving more emphasis to their applications in engineering fields.*

Credits: 04 **L–T–P-J: 3–1–0-0**

Module No.	Contents	Teaching Hours (Approx.)
I	**Differential Calculus:** Introduction to partial Derivatives, Euler's theorem for homogeneous functions, Composite functions, Total derivatives, Expansion of function of several variables by Taylor's series, Jacobian and its applications, Functional dependence, Extrema of functions of several variables, Lagrange's method of multipliers. **Vector Calculus:** Introduction, Scalar and vector point functions, Gradient of a scalar field, Directional derivative, divergence and curl of vector field, Physical interpretation of gradient, divergence and curl, Vector Identities, Applications.	20
II	**Integral Calculus:** Beta and Gamma functions, Double Integral, Change of order of integration, Triple integral, Errors and their analysis, Types of error, Numerical integration by Trapezoidal and Simpson's rules (without proof). **Ordinary Differential Equations:** Linear differential equation of nth order with constant coefficients, Euler-Cauchy Equations, Simultaneous differential equations, Numerical solution of first order initial value problems by Runge-Kutta IV order method. Applications to Engineering problems. **Difference Equation:** Finite difference operators, relation between operators, Introduction to difference equation, Solution of difference equation, Complementary function and particular integral.	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: Understand partial differentiation and its applications
CO2: Expand a real valued function of several variables in Taylor's series
CO3: Calculate Jacobian and know its applications
CO4: Use Lagrange's method of multipliers in determining the extrema of functions
CO5: Find gradient, divergence and curl of a field and know their applications
CO6: Evaluate double & triple integrals and study their applications
CO7: Apply numerical integration to solve definite integrals
CO8: Solve ordinary differential equations of higher order
CO9: Numerically solve the first order IVP by Runge-Kutta IV order method
CO10: Solve a difference equation.

Text Books:

- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2011.
- M. K. Jain, S. R. K. Iyengar and R. K. Jain, Advanced Engineering Mathematics, Narosa Publishing House, New Delhi, 2002.
- W. E. Boyce and R. D. Prima, Elementary Differential Equations, John Wiley & Sons, 2009.
- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 2014.
- S. S. Sastry, Introductory Methods of Numerical Analysis, PHI, 2012.

Reference Books:

- T. M. Apostol, Calculus, Volume I, John Wiley & Sons, Inc., USA, 1967.
- T. M. Apostol, Calculus, Volume II, Xerox Corporation, USA, 1969.
- N. P. Bali and M. Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Delhi, 2014.
- G. B. Thomas and R. Finney, Calculus and Analytic geometry, Addison Wesley, USA, 1995.

BCSC 0070: WEB TECHNOLOGY- I

Objective: *This course introduces the building of front end of viewing page using HTML, CSS and JavaScript*

Credits: 03 **L–T–P-J: 3–0–0-0**

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. **HTML** : 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**: Introducing CSS and understanding the role of CSS, Adding CSS to our HTML Page, learning all about selectors, Learning about CSS Colors and various Color formats (hexadecimal, RGB, RGBA, and HSL format), Learning about box models in CSS and various box-model properties. Understanding CSS Units, working with layout and changing the normal flow and default layout using display, positions, and flexboxes, using Media Queries to create a responsive layout **Bootstrap :** Overview of Bootstrap , Importance and benefits of using Bootstrap, Setting up the development environment, Including Bootstrap in your project and various Bootstrap component like (Alerts , Badge , Buttons , Carousel , dropdowns , Navbar)	**20**
II	**JAVASCRIPT** : Introducing JS, Various features - Compile-Interpreted-JIT languages, Dynamically vs Statically Typed, learning all about Math objects and generating random numbers in a given range, Understanding if-else if-else if-else, Understanding while, for, for of, and for loops in JS, Ternary operator, Binary operator, Logical and Bitwise Operators Logical AND and OR operators, Functions, Learning the first data structure - Array, and Various Array methods, Learning all about JS Objects and string **DOM**: Understanding what DOM is and how to manipulate DOM using JS, Selecting elements in a DOM tree using various selectors and Modifying the DOM **API :-** Introducing modern way of making a request using fetch web API	**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:** Explain components, models, and benefits of client-server applications and static vs. dynamic websites.
- **CO2:** Create structured web pages using HTML5 tags, forms, and validation.
- **CO3:** Apply CSS for styling, layout, and responsive design using flexbox and media queries.
- **CO4:** Implement Bootstrap components for responsive and modern web designs.
- **CO5:** Write JavaScript for dynamic web pages and manipulate the DOM.
- **CO6:** Use JavaScript Fetch API for web requests and data handling.

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

COs	**POs/PSOs**
CO1	PO1, PO2,PO5
CO2	PO1, PO3,PO5,PO9/PSO4
CO3	PO1, PO3,PO5,PO7/PSO4
CO4	PO3, PO5,PO9/PSO4
CO5	PO1, PO2,PO3,PO5/PSO3
CO6	PO1, PO4, PO5,PO6/PSO2

BPHS 0100: PHYSICS FOR ENGINEERS

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: 03

L – T – P- J: 3 – 0– 0 - 0

Module No.	Content	Teaching Hours (Approx.)
I	**Physical Optics:** Qualitative description of superposition of waves, Interference by division of amplitude, Interference in thin films, Newton's rings, Applications: Antireflection coatings and filters. Diffraction: Diffraction due to single slit, Qualitative description of N slit diffraction. Basic concepts of polarization, Optical activity and Specific rotation. **Quantum Mechanics:** Wave - particle duality, De- Broglie Hypothesis, Concept of wave packet, Phase & Group velocity, Heisensberg's Uncertainty principle & its application (Nonexistence of electron in the nucleus of atom), Wave function and its significance, Schrodinger's wave equation (Time independent), Application: Particle in one dimensional infinite potential box.	20
II	**Electromagnetics:** Maxwell's equations in differential and integral forms, Physical significance of Maxwell's equations, Concept of displacement current, Equation of continuity, Propagation of Electromagnetic waves in free space. **Laser & Fiber Optics:** Spontaneous and stimulated emissions, Population inversion, Principle of laser, Ruby laser, Application: Holography, Principle of optical fiber, Single and multi-mode fibers, Acceptance angle, Acceptance cone, Numerical aperture, Application of optical fiber in communication. **Introduction to Quantum Computing:** Basics of quantum computing, Limitations of classical computing. Difference between classical and quantum computing, Concept of Qubit and its properties, Representation of qubit by Bloch sphere, Single and two qubits & applications.	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.

BELH 1014: ENGLISH FOR PROFESSIONAL COMMUNICATION-I

Objective: *English for Professional Communication (EPC) aims to facilitate experiential training sessions and encourage participants to develop their communication skills and sustain high-quality working relationships. In addition, this course aims to assist students develop their English language skills, prepare and present messages, stimulate critical thinking, learn organizational communication, boost confidence and overcome communication barriers. Further, each session will establish a vision for resolving key issues in communication, identify students 'potential outputs and suggest remedies for the exceptional growth.*

Credits: 02 **L-T-P-J: 2-0-0-0**

Module No.	Content	Teaching Hours
I	**Grammar:** Sentences and its types Parts of Speech – Noun, Pronoun, Adjective, Verb, Adverb **Reading and Writing:** Reading Unseen Passages Reading Strategies Write Short Texts using EngagingWords	16
II	**Grammar:** Tenses- Past and Present Voice - Active and Passive **Reading and Writing:** Writing Description of Gadgets and Processes, Preparing Checklist and Questionnaire, Writing Survey Report	16

Text Books:

- Raman Meenakshi and Sharma Sangeeta, "Professional Communication" (2 nd eds.). Oxford
- University Press, 2011
- Sharma S. & Binod B., "Communication Skills for Engineers and Scientists" PHI Publications, 2015
- Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python", 2nd edition., Open Book Project, 2012.

Reference Books:

- Leech Geoffre & Svartvik Jan. (2013). "A Communicative Grammar of English". (3 rd Eds.). Routledge Publications, 2013
- Rizvi Ashraf, "Effective Technical Communication". McGraw Hill Pvt Limited. 2015

Focus: This Course focuses on Employability under CO1,CO3.

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

- CO1.Demonstrate critical and innovative thinking
- CO2. Display competence in Listening, Speaking, Reading and Writing
- CO3. Show an understanding of opportunities in the field of communication
- CO4. Demonstrate positive group communication exchanges

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

COs	POs/ PSOs
CO1	PO1 /PSO1
CO2	PO1,PO3/PSO1
CO3	PO2/PSO2
CO4	PO3/PSO1, PSO2

BCSG 0051: 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.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3	2								
CO2	1	3										
CO3	1			3	1							
CO4		3		3								
CO5					1	2	3					
CO6	1	3	1				1	1				

CO: Course Outcome; PO: Program Outcome
3-High mapping 2-Medium Mapping 1-Low Mapping

BCSC 0871: COMPUTER PROGRAMMING LAB-I

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

Credits: 01 **L–T–P: 0–0–2**

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 0877: 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, designing web page with the help of CSS. Web applications using HTML CSS & JavaScript, Programs using Decision Control Structures, Programs using Loop Control Structures, Programs using user defined functions, Programs of Array handling and manipulation, Fetching the Real world API and manipulation in DOM tree.	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.

BELH 0807: ENGLISH FOR PROFESSIONAL COMMUNICATION LAB-I

Objective: *The objective of this course is to give students exposure of listening and speaking English in various communicative contexts. The course provides them with an opportunity to form their opinion, develop their thinking skills, analyze their thoughts and express themselves in an effective way and to equip them with the ability to communicate effectively in English.*

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

Module No.	Content	Teaching Hours
I	Introducing oneself: Salutation, information, change in content according to context Reading Practice to Improve Pronunciation: English Pronunciation Training, Reading newspaper articles Conducting Interviews - De Grasse Tyson: we have to believe science on climate change Relevance of Intonation : Role Play	16
II	Interpreting Visual Information: "An Irish Goodbye" Tom Berkley& Ross White Process Description: Website Design and Development Process Presenting Ideas: The Curious Effects of AI on the Artist, How AI could save (not destroy) Education by Sal Khan Drafting Advertisement: Teacher by 7-Eleven, Unsung Hero, British Airways: Fueled by Love	16

Audio-Visual Material: ***itell:*** **Study Material of 'Orell' Digital Language Lab.**

Text Books:

- Norman Lewis, Word Power Made Easy, Goyal Publications & Distributers, Delhi.
- Mohan, Krishan & N.P. Singh, Speaking English Effectively, Macmillan India Ltd., New Delhi
- Cambridge English Pronouncing Dictionary by Daniel Jones

Outcome: After the completion of the course students will be able to:

- Listen, understand and analyse a variety of speeches, documentaries and interviews.
- Express themselves with correct pronunciation and fluency.
- Use appropriate vocabulary.
- Participate in discussions on social and professional issues.

BPHS 0801: 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 XXXX: COMPUTER PROGRAMMING- II

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

Credits: 03 **L–T–P: 3–0–0**

Module No.	Content	Hours
I	**Introduction to OOP concepts:** Object Oriented Concepts- Class, Instance, Object, Attribute, Method, Class variables and Instance Variables, Super class and Subclass, Data Encapsulation, Data Abstraction, Constructors- __init__ () method, self-keyword, class method, static method, instance method, I**nheritance**- Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hybrid Inheritance, Method Overloading and Method Overriding, MRO, Duck-typing **Comparison Methods-__**eq__(self, other), Numeric Methods-__abs__(self) Function and Class Decorators, Abstract Classes and Abstract Methods.	**16**
II	**GUI Programming-** Widgets/Controls, windows, title and title bars, buttons, icons, labels etc., Event-driven programming, binding methods using bind() method, managing widgets with the grid and place managers. **Network Programming:-** Understand and explain the basic concepts of network programming, Domains, addresses, ports, protocols, and services, socket module, socket programming, sending requests to servers, the send() method, receiving responses from servers, the recv() method **Modules –** numpy, pandas and matplotlib	**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.

BMAS 0121: INTRODUCTION TO LINEAR ALGEBRA

Objective: *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	[Course Outcome(s) No.: 1, 2, 3, 4 and 5] Introduction to matrices, Inverse of a matrix by elementary transformations, Rank of a matrix by reduction to echelon form. **Vector Space:** Vector equations, Geometrical description of $\mathbb{R}2$, $\mathbb{R}3$, $\mathbb{R}n$, Vector spaces and Subspaces, 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. **Partitioned Matrices:** Addition, scalar multiplication, multiplication and inverse of partitioned matrices. Applications.	20
II	[Course Outcome(s) No.: 6, 7, 8, 9, and 10] **Inner Product Space:** Introduction, Orthogonal and orthonormal vectors, Norm of a vector and a matrix, condition number of a matrix. Orthogonal projection, Gram-Schmidt orthogonalization process, QR factorization of a matrix. **Linear Systems:** Systems of linear equations, Solution sets of linear systems, Sensitivity analysis. Applications in network flow. Eigen values and Eigen vectors: Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof), Diagonalization of a matrix. **Matrix Factorization:** LU factorization, Applications in Computer Graphics.	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: Calculate the inverse and rank of a matrix by elementary transformations.
CO2: Know the different types of vector spaces and subspaces.
CO3: Find the basis and dimension of a vector space.
CO4: Understand the linear transformation and form a matrix of linear transformation.
CO5: Partition a large matrix and apply operations.
CO6: Know Inner product space and Gram-Schmidt orthogonalization process
CO7: Solve a linear system and carry out its sensitivity analysis.
CO8: Identify Eigen values, Eigen vectors and diagonalize a matrix.
CO9: Use Cayley-Hamilton theorem.
CO10: Factorize a matrix and know its applications.

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, 2022.
- C. D. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2023.
- K. M. Abadir, R. Magnus, Matrix Algebra, Cambridge University Press, 2012.

BCSC 0064: DATABASE TECHNOLOGY

Objective: *The objective of the course is to enable students to understand and use a relational database 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 0054: INTRODUCTION TO AI AND DATA ANALYTICS

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

Credit: 3 **L–T–P: 3–0–0**

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, Knowledge Representation, Uninformed search and Informed search based on heuristics, Local search algorithms and optimization problems, Hill Climbing, Simulated Annealing, Linear programming, Backtracking. AI Applications Machine Learning Concepts, Regression and Classification and Training-Testing, Overfitting-Underfitting.	20
II	Introduction to Data Analytics, History and Evolution of data analytics. The role of data in modern decision making. Converting data into insights, Types of data- Structured, Semi-structured, Unstructured. Stages of data analytics- Acquisition, preparation, exploration, analysis, visualization, decision-making. Exploratory Data analysis (EDA) Statistical data analytics- t-test, ANOVA, Chi-square, Mean, Median, Mode, Variance, Correlation Introduction to Algorithms: Regression, Classification, Clustering and Association Rule mining. Case Studies: Use of data analytics in Business, Healthcare, Finance, Manufacturing & Logistics, Industry	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.

BELH 0016: ENGLISH FOR PROFESSIONAL COMMUNICATION - II

Objectives: *English for Professional Communication (EPC) aims to facilitate experiential training sessions and encourage participants to develop their communication skills and sustain high- quality working relationships. In addition, this course aims to assist students develop their English language skills, prepare and present messages, stimulate critical thinking, learn organizational communication, boost confidence and overcome communication barriers. Further, each session will establish a vision for resolving key issues in communication, identify students' potential outputs and suggest remedies for the exceptional growth.*

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

Module No.	Content	Teaching Hours
I	**Listening and Speaking** : Listening Two TED Talks, Extempore, Parliamentary Debate, Sounds of the English language not found in the Indian languages **Grammar:** Determiners, Prepositions **Reading and Writing:** Reading a Short Text (Water by C..V. Raman), Writing an Application and Email	20
II	**Listening and Speaking:** Group Discussion, Presentation Skills, Interview Skills, Aspects of Effective Speech **Grammar:** Direct and Indirect Narration, Punctuation **Reading and Writing:** Comprehension of Unseen Texts, Paraphrasing, Writing Cover Letter and Curriculum Vitae	20

Text Books:

- Raman Meenakshi and Sharma Sangeeta, "Professional Communication" (2 nd eds.). Oxford
- University Press, 2011
- Sharma S. & Binod B., "Communication Skills for Engineers and Scientists" PHI Publications, 2015
- Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python", 2nd edition., Open Book Project, 2012.

Reference Books:

- Leech Geoffre & Svartvik Jan. (2013). "A Communicative Grammar of English". (3 rd Eds.). Routledge Publications, 2013
- Rizvi Ashraf, "Effective Technical Communication". McGraw Hill Pvt Limited. 2015

Focus: This Course focuses on Employability under CO1,CO3.

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

- CO1. Demonstrate critical and innovative thinking
- CO2. Display competence in Listening, Speaking, Reading and Writing
- CO3. Show an understanding of opportunities in the field of communication
- CO4. Demonstrate positive group communication exchanges

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

COs	POs/ PSOs
CO1	PO1 /PSO1
CO2	PO1,PO3/PSO1
CO3	PO2/PSO2
CO4	PO3/PSO1, PSO2

BCSC XXXX: 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 0852: DIGITAL LOGIC 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.