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||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

VII & VIII Semester
Scheme & Syllabus of B.E. Programme
Information Science & Engineering
(2024 Scheme)

Core Values

Spiritual, Judicious, Commitment, Integrity, Trustworthy



AICTE | NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300 | NBA | A+ NAAC | QS I-GAUGE GOLD | INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

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SCHEME OF TEACHING AND EXAMINATION – B.E. – Information Science and Engineering

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

7th Semester

Information Science and Engineering

Sl. No.	Course Code	Course Title	Course Type	TD/ PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BIS701	Advanced IoT	IPCC	TB:IS PSB:IS	3	0	2	**3**	**50**	**50**	**100**	**4**
2	BIS702	Big data Analytics	IPCC	TB:IS PSB:IS	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BIS703	Software Architecture &Design Patterns	PCC	TB:IS PSB:IS	4	0	0	**3**	**50**	**50**	**100**	**4**
4	BIS724x	Professional Elective Course – IV	PEC	TB:IS PSB:IS	3	0	0	**3**	**50**	**50**	**100**	**3**
5	BXX745x	Open Elective Course – II	OEC	Any Dept.	3	0	0	**3**	**50**	**50**	**100**	**3**
6	BIS736	Major Project Phase – II	PROJ	TB:IS PSB:IS	0	0	12	**3**	**100**	**100**	**200**	**6**
7	BCR737	Career Readiness & Industry Integration	NCMC	CDCAC	0	2	0	-	**100**	-	**100**	**0**
									450	**350**	**800**	**24**

ASC: Applied Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal

Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – IV

Course Code	Course Name	Course Code	Course Name
BIS724A	Cybersecurity and Forensics	BIS724C	Deep Learning
BIS724B	Web Development using Django	BIS724D	Advanced Cloud Computing

Open Elective Course – II

Course Code	Course Name	Course Code	Course Name
BCS745A	Introduction to DBMS	BIS745C	Software Engineering
BCS745B	Introduction to Algorithms	BIS745D	Web Technologies

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering (B.E.) 2024-25 may please be referred.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

Project Work: The objective of the Project work is to:

i) Encourage independent learning and the innovative attitude of the students.
ii) Develop interactive attitude, communication skills, organization, time management, and presentation skills.
iii) Impart flexibility and adaptability.
iv) Inspire team working.
v) Expand intellectual capacity, credibility, judgment and intuition.
vi) Adhere to punctuality, setting and meeting deadlines.
vii) Install responsibilities to oneself and others.
viii) Train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

Semester: VII					
Advanced IOT					
Course Code	**:**	BIS701	**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40L+14P	**SEE**	**:**	50 Marks
Course Type	**:**	Integrated	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Introduction to IoT
Knowledge on Fundamental Concepts	Knowledge about Data, Devices, Cloud, Analytics, Connectivity, Security
Knowledge on Connected Tools (If any)	Cisco Packet Tracer (IoT), Arduino IDE

Course Learning Objectives: This course will enable the students to	
CLO1	Describe the evolution, foundational concepts, enabling technologies, and various architectural models of the Internet of Things (IoT).
CLO2	Explain and differentiate between key IoT communication protocols across the physical, network, and application layers.
CLO3	Use design principles for developing connected devices
CLO4	Understand the ability to acquire, organize, store, and process IoT data using cloud platforms and services
CLO5	Identify and analyze common IoT security threats, architectural vulnerabilities, and necessary countermeasures,

Module – 1	**08 Hrs**
Fundamentals Of IoT: what is IoT**,** Genesis of IoT, Enabling Technologies, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, The oneM2M IoT standardized Architecture, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, IoT Data Management and Compute stack. **Text Book 1: Ch 1: 1.1 – 1.2, Ch 2**	
Module – 2	**08 Hrs**
IoT Protocols Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN. **Text Book 1: Ch 3, Ch 4.**	
Module – 3	**08 Hrs**
IP as the IoT Network Layer: The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances. **Application protocols for IOT Application**: Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT. **Design Principles for Connected Devices:** IoT/M2M systems layers and Design standardization, Communication Technologies, Data enrichment, Device consolidation and Device Management at gateway. **Text Book 1**: **Ch 5, ch 6.** **Text Book 2: Ch 2: 2.1-2.4.**	

Module – 4	08 Hrs
Data Acquiring, Organizing, Processing and Analytics: Data Acquiring and storage, organizing Data, transaction, Business processes, integration and enterprise system, analytics **Data Collection, Storage and Computing Using a Cloud Platform:** Cloud computing Paradigm for Data Collection , storage and computing , Everything as a services and cloud service models , IoT Cloud-Based Services Using the Xively, Nimbits and other platforms **Text book 2: Ch 5: 5.1-5.5 ch 6: 6.1 -6.4**	
Module – 5	**08 Hrs**
Securing The Internet Of Things & Security Architecture: Introduction, Security Requirements in IoT Architecture, Security in Enabling Technologies, Security Concerns in IoT Applications, Security Requirements in IoT, Insufficient Authentication/Authorization, Insecure Access Control, Threats to Access Control, Privacy, and Availability , Attacks Specific to IoT **Text Book 3: Ch 1: 1.1–1.4; Ch 2: 2.2–2.6**	

PRACTICAL COMPONENT

Sl.No	**Experiments** Conduct the following experiments on an **Arduino /ESP32/Raspberry Pi** evaluation board.
1	i)Write a program to 'turn ON' LED /Buzzer for 1 sec after every 2 seconds. ii)Write a program to 'turn ON' LED (Push button/Digital sensor (IR/LDR))when a push button is pressed or at sensor detection.
2	i) Develop a program to interface the Soil Moisture Sensor. ii) Develop a program to interface the LDR/Photo Sensor.
3	Develop a program to interface an Ultrasonic Sensor.
4	Interface a DHT11 sensor to a microcontroller, and implement code to display real-time measurements of temperature and humidity.
5	To interface the motor using a relay to 'turn ON' the motor when a push button is pressed.
6	To interface OLED with microcontroller and write a program to print temperature and humidity readings on it.
7	To interface Bluetooth with Microcontroller and write a program to send temperature and Humidity to smartphone using Bluetooth.
8	Develop a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
9	Develop a program to upload temperature and humidity data to thingspeak cloud.
10	Develop a program to interface LED using Telegram App.

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the fundamental concepts of IoT, its architecture (e.g., oneM2M, IoTWF), enabling technologies, and the IoT functional stack.
CO2	Analyze various IoT communication protocols and technologies across different layers
CO3	Apply design principles and communication protocols to develop connected devices and IoT/M2M systems
CO4	Evaluate data acquisition, storage, processing, and analytics strategies in IoT systems, and utilize cloud-based platforms
CO5	Analyze security requirements and vulnerabilities in IoT architectures

Text Books	
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things" Cisco Press, 1st Edition, 2017. ISBN-13: 978-1587144561.
2	Rajkamal, Internet of Things: Architecture, Design Principles and Applications, McGraw Hill Education**,** 1st Edition, 2017. ISBN-13: 9789352605224.
3	Shancang Li and Li Da Xu, "Securing the Internet of Things", Syngress, Elsevier Publishers, 1st Edition, 2017. ISBN 13: 9780128044582.

Reference Books	
1	Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", Taylor & Francis Group (CRC Press), 1st Edition, 2017. ISBN-13: 9781498761284.
2	Peter Waher, "Mastering Internet of Things: Design and Create Your Own IoT Applications Using Raspberry Pi 3", *Packt Publishing*, 1st Edition, 2018. ISBN-13: 978-1787122475**.**
3	Aditya Gupta "The IoT Hacker's Handbook: A Practical Guide to Hacking the Internet of Things" Apress Publishers, 1st Edition, 2019. ISBN 13 9781484242995.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/117/102/117102060/
2	https://nptel.ac.in/courses/108108179

CO – PO MAPPING

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

Semester:VII					
BIG DATA ANALYTICS					
Course Code	**:**	BIS702	**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	3:0:2	**CIE**	**:**	50Marks
Total Hours	**:**	40L + 14P	**SEE**	**:**	50Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Database Management System, Operating System.
Knowledge on Fundamental Concepts	Basics of Networks and Machine Learning
Knowledge on Connected Tools (If any)	Basic knowledge on AWS, Microsoft Azure, Google Cloud, Hadoop

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the concepts, characteristics, and evolution of Big Data.
CLO2	Apply Hadoop ecosystem components, including HDFS, YARN, and MapReduce.
CLO3	Implement MapReduce programs for processing big data.
CLO4	Realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
CLO5	Analyze big data using machine learning techniques.

Module – 1	**08Hrs**

Introduction: Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data,Typical data warehouse and Hadoop environment.

Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools , NoSQL, Hadoop.

Text Book 1: Ch 1: 1.1, Ch 2: 2.1-2.5,2.7,2.9-2.11, Ch 3: 3.2,3.5,3.8,3.12, Ch 4: 4.1,4.2

Module – 2	**08Hrs**

Introduction to Hadoop: Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System),Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator).

Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression

Text Book 1: Ch 5: 5.1-,5.8, 5.10-5.12, Ch 8: 8.1 - 8.8

Module – 3	**08Hrs**
Introduction to MongoDB: What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language. **Text Book 1: Ch 6: 6.1-6.5**	
Module – 4	**08Hrs**
Introduction to Hive: What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). **Introduction to Pig:** What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive. **Text Book 1: Ch 9: 9.1-9.6,9.8, Ch 10: 10.1 - 10.15, 10.22**	
Module – 5	**08Hrs**
Spark and Big Data Analytics: Spark, Introduction to Data Analysis with Spark. **Text, Web Content and Link Analytics:** Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph. **Text Book 2: Ch 5: 5.2,5.3, Ch 9: 9.1-9.4**	

PRACTICAL COMPONENT

Sl. No.	**Experiments (Java/Python/R)**
1.	Install Hadoop and Implement the following file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files and directories. **Hint:** A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
2.	Develop a MapReduce program to implement Matrix Multiplication
3.	Develop a Map Reduce program that mines weather data and displays appropriate messages indicating the weather conditions of the day.
4.	Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.
5.	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB
6.	Write Pig Latin scripts to sort, group, join, project, and filter the data.
7.	Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
8.	Implement a word count program in Hadoop and Spark.
9.	Use CDH (Cloudera Distribution for Hadoop) and HUE (Hadoop User Interface) to analyze data and generate reports for sample datasets

Course Outcomes : After completing the course, the students will be able to	
CO1	Understand Big Data concepts, characteristics, evolution, and analytics.
CO2	Interpret the Hadoop architecture, HDFS, YARN, and implement MapReduce programming.
CO3	Demonstrate MongoDB concepts and its applications.
CO4	Outline Hive and Pig architectures, query languages, and their differences.
CO5	Apply Spark for Big Data Analytics and perform text and web analytics.

TextBooks	
1	Seema Acharya and Subhashini Chellappan "Big data and Analytics" Wiley India Publishers, 2nd Edition, 2019.ISBN 13 9788126554782
2	Rajkamal and Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning", McGraw Hill Publication, 2019. ISBN 789353164973

ReferenceBooks	
1	Adam Shook and Donald Mine, "MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems" - O'Reilly 2012 ISBN: 978-1-449-32717-0
2	Tom White, "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015. ISBN: ISBN: 9781491901687
3	Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016 ISBN-13: 978-0-13-429107-9 ISBN-10: 0-13-429107-7
4	John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition ISBN: 0262537559, 9780262537551

Web links and Video Lectures (e – Resources)	
1	https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset
2	https://www.youtube.com/watch?v=bAyrObl7TYE&list=PLEiEAq2VkUUJqp1k-g5W1mo37urJQOdCZ
3	https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkUUJqp1kg5W1mo37urJQOdCZ&in dex=4
4	https://www.youtube.com/watch?v=GG-VRm6XnNk https://www.youtube.com/watch?v=JglO2Nv_92A

CO – POMAPPING

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

Semester: VII					
SOFTWARE ARCHITECTURE AND DESIGN PATTERNS					
Course Code	**:**	BIS703	**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	4:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	50L	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Object-Oriented Programming with C++
Knowledge on Fundamental Concepts	Familiarity with UML Notations and Class Diagrams
Knowledge on Connected Tools (If any)	Basic proficiency with modeling tools like StarUML**,** Enterprise Architect, or any UML-based CASE tool

Course Learning Objectives: This course will enable the students to	
CLO1	Learn How to add functionality to designs while minimizing complexity
CLO2	What code qualities are required to maintain to keep code flexible?
CLO3	Explore the common design patterns
CLO4	Explore the appropriate patterns for design problems
CLO5	Design scalable, maintainable, and distributed software systems by applying design patterns and modern software frameworks.

Module – 1	**10 Hrs**
Introduction: what is a design pattern? Describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. A Notation for Describing Object-Oriented Systems **Analysis a System**: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading, Brief introduction to UML diagrams as used in design patterns **Textbook 1**: **Ch-1, Ch-2:**2.7, **Ch-6**	
Module – 2	**10 Hrs**
Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy, Practical examples in Java/C++, Anti-patterns and misuse scenarios in structural design **Textbook 2**: **Ch-4**	
Module – 3	**10 Hrs**
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method, Evaluating trade-offs in behavioral pattern use, Patterns in user interaction and game development scenarios **Textbook 2**: **Ch-5**	

Module – 4	10 Hrs
Interactive systems and the MVC architecture: Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions. Integrating MVC with modern frameworks (like JavaFX or Spring MVC) **Textbook 1**: **Ch-11**	
Module – 5	**10 Hrs**
Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays, Refactoring existing code with design patterns, Role of SOLID principles in pattern selection **Textbook 1**: **Ch-12**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Design and develop low-complexity, high-performance object-oriented software
CO2	Identify core design principles and assess design quality effectively.
CO3	Apply object-oriented analysis and modeling in system architecture.
CO4	Analyze software design problems to determine appropriate design patterns for effective solutions.
CO5	Apply appropriate design patterns to solve the software design problems.

Text Books	
1	Brahma Dathan and Sarnath Ramnath, "Object-Oriented Analysis, Design and Implementation", Universities Press, 1st Edition, 2013. ISBN-13: 9788173716904.
2	Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson Education, 1st Indian Reprint, 2013. ISBN-13: 9789332555402.

Reference Books	
1	A Pattern Language for Distributed Computing, Frank Buschmann, Douglas C. Schmidt, and Michael Stal, "A Pattern Language for Distributed Computing" Volume 4, John Wiley & Sons, 2007. ISBN 13: 9780470061114.
2	Antipatterns: Managing Software Organizations and People Colin Neill, Philip Laplante, and Joanna DeFranco, "Antipatterns: Managing Software Organizations and People" CRC Press, Second Edition, 2011. ISBN 13: 9781439826539.

Web links and Video Lectures (e – Resources)	
1	https://refactoring.guru/design-patterns/what-is-pattern
2	https://sourcemaking.com/design_patterns
3	https://sourcemaking.com/design_patterns/creational_patterns
4	https://docs.spring.io/spring-framework/reference/web/webmvc.html?utm_source=chatgpt.com
5	https://www.geeksforgeeks.org/system-design/client-server-model/

CO – PO MAPPING

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

Semester: VII					
Cyber Security and Forensics					
Course Code	**:**	BIS724A	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Computer Network, Operating Systems, Programming in C/C++ or Python
Knowledge on Fundamental Concepts	TCP/IP, HTTP, DNS, file system, cryptographic techniques
Knowledge on Connected Tools (If any)	Wireshark, firewalls, web browser with developer tools

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamentals of cybercrime, classification, and global legal perspectives.
CLO2	Analyze methods of planning cyber offenses including social engineering and botnets.
CLO3	Evaluate cybersecurity issues in mobile and wireless devices and suggest preventive measures.
CLO4	Identify and assess the tools and technologies used in cybercrimes.
CLO5	Understand organizational impacts of cybersecurity incidents and handling mechanisms.

Module – 1	**08 Hrs**
Introduction to Cybercrime: Introduction, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrimes, Cyber-crime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes **Text Book 1: Ch 1: 1.1 – 1.9**	
Module – 2	**08 Hrs**
Cyber Offenses: Criminals Planning Them: Introduction, planning of Attacks, Social Engineering, Cyber stalking. Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing. **Text Book 1: Ch 2**	
Module – 3	**08 Hrs**
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organisational Measures for handling mobile, Organizational security Policies and Measures in Mobile Computing Era, Laptops. **Text Book 1: Ch 3**	

Module – 4	08 Hrs
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks. **Text Book 1: Ch 4**	
Module – 5	**08 Hrs**
Cyber Security: Organizational Implications, Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations, Incident handling: Definitions and entities involved, incident response systems, Examples of cybersecurity Incidents and ITIL Perspective **Text Book 1: Ch 9: 9.1-9.8, 9.9.1-9.9.3**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze different types of cybercrimes and their legal implications in the Indian and global context.
CO2	Analyze planning and execution strategies of cyber offenses including cyberstalking and social engineering.
CO3	Evaluate threats in mobile/wireless devices and recommend secure configuration practices.
CO4	Examine various cyberattack tools and techniques such as phishing, SQL injection, and DoS.
CO5	Assess cybersecurity risks and response strategies within an organizational framework.

Text Books	
1	Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives. Nina Godbole, Sunil Belapure , Wiley 2011, ISBN: 9788126521791
2	Introduction to Cyber Security Guide to the world of cyber security ,Anand Shinde ,Notion Press 2021, ISBN: 9781637816424.

Reference Books	
1	Cyber Law simplified, Vivek Sood, Mc-GrawHill 11 edition 2013, ISBN: 9780070435063.
2	Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, Ravindrakumar, Cengage Learning 2018, ISBN: 9789387511675.

Web links and Video Lectures (e – Resources)	
1	Cyber Security and Privacy, NPTEL 2025 https://onlinecourses.nptel.ac.in/noc25_cs116/preview
2	Introduction To Cyber Security,swayam 2019 https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

CO – PO MAPPING

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

Semester: VII					
Web Development Using Django					
Course Code	**:**	BIS724B	**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Python Programming, Database Management Systems, **Basic Web Development** (HTML, CSS, JavaScript)
Knowledge on Fundamental Concepts	Object-Oriented Programming (OOP) principles Web client-server architecture (HTTP request/response flow) MVC/MVT architectural patterns Basic CRUD operations (Create, Read, Update, Delete)
Knowledge on Connected Tools (If any)	**Django Framework,** Python 3.x ,**SQLite or PostgreSQL, VS Code / PyCharm,** Browser Developer Tools

Course Learning Objectives: This course will enable the students to	
CLO1	Explain the use of learning full stack web development.
CLO2	Make use of rapid application development in the design of responsive web pages
CLO3	Illustrate Models, Views and Templates with their connectivity in Django for full stack web development.
CLO4	Demonstrate the use of state management and admin interfaces automation in Django
CLO5	Design and implement Django apps containing dynamic pages with SQL databases.

Module – 1	**08 Hrs**
Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS. **Textbook 1: Chapter 1 and Chapter 3**	
Module – 2	**08 Hrs**
Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String. Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution. **Textbook 1: Chapter 4 and Chapter 5**	
Module – 3	**08 Hrs**
Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs. **Textbook 1: Chapters 6, 7 and 8**	

Module – 4	08 Hrs
Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic. Views. MIME Types, Generating Non-HTML contents like CSV and PDF, Syndication Feed Framework, Sitemap framework, Cookies, Sessions, Users and Authentication. **Textbook 1: Chapters 9, 11 and 12**	
Module – 5	**08 Hrs**
Ajax Solution, Java Script, XHTML Http Request and Response, HTML, CSS, JSON, iFrames, Settings of JavaScript in Django, jQuery and Basic AJAX, jQuery AJAX Facilities, Using jQuery UI Autocomplete in Django. **Textbook 2: Chapters 1, 2 and 7**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Implement the working of MVT based full stack web development with Django.
CO2	Design of Models and Forms for rapid development of web pages.
CO3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
CO4	Apply the Django framework libraries to render non HTML contents like CSV and PDF.
CO5	Develop jQuery based AJAX integration to Django Apps to build responsive full stack web applications.

Text Books	
1	Adrian Holovaty, Jacob Kaplan Moss, The Definitive Guide to Django: Web Development Done Right, Second Edition, Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers, 2009, ISBN-13 (pbk): 978-1-59059-725-5
2	Jonathan Hayward, Django Java Script Integration: AJAX and jQuery, First Edition, Pack Publishing, 2011, ISBN 978-1-849510-34-9

Reference Books	
1	Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020, ISBN-13: 978-1838987428
2	William Vincent, Django for Beginners: Build websites with Python and Django, First Edition,Amazon Digital Services, 2018, ISBN-13 : 978-1735467207
3	Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020, ISBN-13 : 978-1838981952

Web links and Video Lectures (e – Resources)	
1	MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials
2	Using Python in Django: https://www.youtube.com/watch?v=2BqoLiMT3Ao
3	Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE

CO – PO MAPPING

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

Semester: VII					
Deep Learning					
Course Code	**:**	BIS724C	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Programming for Problem Solving (C Programming/Python), Data Structures and Applications, Design and Analysis of Algorithms, Probability and Statistics, Linear Algebra and Calculus (Engineering Mathematics
Knowledge on Fundamental Concepts	Basic concepts of Artificial Intelligence and Machine Learning, Mathematical foundations including matrices, vectors, derivatives, gradients, and probability distributions, Fundamentals of Neural Networks (Perceptron, Activation Functions, Feedforward Networks)
Knowledge on Connected Tools (If any)	Python Programming, Jupyter Notebook or Google Colab,NumPy and Pandas for numerical computing and data manipulation, Matplotlib/Seaborn for visualization

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basic concepts of deep learning.
CLO2	Know the basic working model of Convolutional Neural Networks and RNN in decision making).
CLO3	Illustrate the strength and weaknesses of many popular deep learning approaches
CLO4	Apply major deep learning algorithms and techniques to address real-world problems in domains such as computer vision, natural language processing, healthcare, and speech recognition.
CLO5	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems

Module – 1	**8 Hrs**

Introducing Deep Learning: Biological and Machine Vision: Biological Vision, Machine Vision: The Neocognitron, LeNet-5, The Traditional Machine Learning Approach, ImageNet and the ILSVRC, AlexNet, TensorFlow Playground. **Human and Machine Language**: Deep Learning for Natural Language Processing: Deep Learning Networks Learn Representations Automatically, Natural Language Processing, A Brief History of Deep Learning for NLP, Computational Representations of Language: One-Hot Representations of Words, Word Vectors, Word-Vector Arithmetic, word2viz, Localist Versus Distributed Representations, Elements of Natural Human Language.

Text book 2: Chapter 1, 2

Module – 2	**8 Hrs**

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi- Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

Text book 1 : Ch7: 7.1 -7.10, Ch 8 :8.1,8.3-8.5

Module – 3	8 Hrs
Convolution neural networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Convolutional Networks and the History of Deep Learning. **Text book 1: Ch 9 :9.1 -9.8, 9.11**	
Module – 4	**8 Hrs**
Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory. **Text book 1: Ch 10 :10.1 -10.6, 10.10**	
Module – 5	**8 Hrs**
Interactive Applications of Deep Learning: Natural Language Processing: Preprocessing Natural Language Data: Tokenization, Converting All Characters to Lowercase, Removing Stop Words and Punctuation, Stemming, Handling n-grams, Preprocessing the Full Corpus, Creating Word Embeddings with word2vec: The Essential Theory Behind word2vec, Evaluating Word Vectors, Running word2vec, Plotting Word Vectors, The Area under the ROC Curve: The Confusion Matrix, Calculating the ROC AUC Metric, Natural Language Classification with Familiar Networks: Loading the IMDb Film Reviews, Examining the IMDb Data, Standardizing the Length of the Reviews, Dense Network, Convolutional Networks, Networks Designed for Sequential Data: Recurrent Neural Networks, Long Short-Term Memory Units, Bidirectional LSTMs, Stacked Recurrent Models, Seq2seq and Attention, Transfer Learning in NLP. **Text book 2: Chapter-8**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret the concepts of neural networks learning processes.
CO2	Illustrate deep learning methods using regularization and Optimization process
CO3	Design deep learning models using convolutional operations.
CO4	Analyze sequential data to build recurrent and recursive models.
CO5	Demonstrate the different interactive applications of deep learning.

Text Books	
1	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016, ISBN-13: 978-0262035613. https://www.deeplearningbook.org/lecture_slides.html
2	John Krohn, Grant Beyleveld, Aglae Bassens, Deep Learning Illustrated, A Visual, Interactive Guide to Artificial Intelligence, Pearson, 2022, ISBN-13: 9789353945466

Reference Books	
1	Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press,2016, ISBN-10**:** 0262035618
2	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms" Nikhil Buduma O'Reilly publications2010, ISBN-10: 1491925612

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=VyWAvY2CF9c
2	https://www.youtube.com/watch?v=7sB052Pz0sQ
3	https://www.youtube.com/watch?v=Mubj_fqiAv8
4	https://www.coursera.org/learn/neural-networks-deep-learning

CO – PO MAPPING

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

Semester: VII					
Advanced Cloud Computing					
Course Code	**:**	BIS724D	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Computer Networks, Operating Systems, Introduction to IOT
Knowledge on Fundamental Concepts	Basic understanding of networking protocols, virtualization, and system architecture
Knowledge on Connected Tools (If any)	Familiarity with virtualization platforms (e.g., VMware, Virtual Box), cloud platforms (e.g., AWS, Azure), and basic command-line tools

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the foundational principles, models, and benefits of cloud computing, along with virtualization technologies and pre-cloud considerations.
CLO2	Explore cloud computing architectures, service delivery models, and deployment types, addressing scalability, economics, and interoperability.
CLO3	Examine the structure, deployment, and monitoring of core AWS services such as EC2, EBS, ELB, S3, and CloudWatch.
CLO4	Understand and apply secure cloud architecture principles including IAM, federated access, data governance, and security best practices.
CLO5	Design and implement resilient cloud-native applications using serverless computing, messaging systems, load balancing, and managed databases.

Module – 1	**08 Hrs**
Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments. Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Before the Move into the Cloud: Know Your Software Licenses, The Shift to a Cloud Cost Model, and Service Levels for Cloud Applications**.** **Text Book 1: Ch-1, Ch-3**	
Module – 2	**08 Hrs**
Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance **Text Book 1 : Ch-4**	
Module – 3	**08 Hrs**
AWS Services: Introduction to EC2, EC2 instance lifecycle, AMI, Elastic Block Store (EBS), Types of EBS, Snapshots, Introduction to Elastic Load Balancer (ELB), Types of ELB, Features of ELB, creating a Classic Load Balancer, How ELB works, Monitoring with CloudWatch, How Amazon CloudWatch works, Amazon S3, S3 Storage Classes. **Text Book 2: Ch -5, Ch-6, Ch-7, Ch-8**	

Module – 4	08 Hrs
Introduction to Secure Architecture: Access controls and management across multiple accounts, AWS federated access and identity services (for example, AWS Identity & Access Management [IAM], AWS Single Sign-On [AWS SSO]), AWS security best practices (for example, the principle of least privilege), and The AWS shared responsibility model. Data access and governance: Data recovery, Data retention and classification, Encryption and appropriate key management **Text Book 3: Ch-12**	

Module – 5	08 Hrs
Resilient architectures: Load balancing concepts (for example, Application Load Balancer), Queuing and messaging concepts (for example, publish/subscribe), Serverless technologies and patterns (for example AWS Fargate, AWS Lambda), AWS database application (ex: dynamo db). **Text Book 3: Ch-10**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the foundational concepts of cloud computing, including virtualization, cloud service models, deployment models, and licensing practices.
CO2	Analyze various cloud architectures and deployment models for scalability, reliability, and standardization.
CO3	Apply AWS services such as EC2, ELB, S3, and CloudWatch to deploy, configure, and monitor cloud resources.
CO4	Analyze cloud security models and implement identity and access management (IAM) and data governance techniques.
CO5	Design and build resilient cloud applications using serverless architecture, messaging, and AWS-managed databases.

Text Books	
1	Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, first edtion,2013, ISBN: 978-0-12-411454-8.
2	AWS Certified Developer – Associate Guide: Vipul Tankariya and Bhavin Parmar, 1st Edition, Packt Publishing, 2017, ISBN: 978-1-78712-214-7.
3	AWS Certified Solutions Architect Study Guide: Ben Piper and David Clinton, 4th Edition, Sybex – A Wiley Brand, October 2022, ISBN: 978-1-119-98735-8.

Reference Books	
1	Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide: David S. Linthicum, 1st Edition, Addison-Wesley Professional (Pearson), 2010, ISBN: 978-0-13-600922-1.
2	Cloud Computing: Dr. Kumar Saurabh, 2nd Edition, Wiley India, 2012, ISBN: 978-81-265-2951-7.
3	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online: Michael Miller, 1st Edition, Pearson Education, 2008, ISBN: 978-81-317-2533-7.

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=ZHCtVZ6cjdg
2	https://learn.microsoft.com/training/modules/describe-cloud-compute/?utm_source=chatgpt.com
3	https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-instance-lifecycle.html?utm_source=chatgpt.com
4	https://docs.aws.amazon.com/security/?utm_source=chatgpt.com
5	https://docs.aws.amazon.com/wellarchitected/latest/reliability-pillar/welcome.html?utm_source=chatgpt.com

CO – PO MAPPING

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

Semester: VII					
Introduction to Database Management System					
Course Code	**:**	BCS745A	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	OEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Programming in C/Python, Mathematics, Data Structures, Discrete Mathematics
Knowledge on Fundamental Concepts	Basic Programming Knowledge, Arrays, Set Operations, Access Methods.
Knowledge on Connected Tools (If any)	MySQL, PostgreSQL, SQLite, Microsoft SQL Server, Oracle Database

Course Learning Objectives: This course will enable the students to	
CLO1	Comprehend the basic concepts and definitions of databases and database users, including their roles in a database system.
CLO2	Construct ER diagrams using real-world scenarios to model data requirements.
CLO3	Develop and manipulate relational databases using SQL.
CLO4	Design efficient relational schemas using normalization and functional dependencies.
CLO5	Understand and apply transaction processing, concurrency control, and recovery mechanisms in databases.

Module – 1	**08Hrs**
Introduction to Databases and database users: Introduction to DBMS, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment **Textbook 1:Ch. 1:** 1.1 – 1.6, **Ch. 2:** 2.1 to 2.4	
Module – 2	**08Hrs**
Data Modeling Using the Entity–Relationship (ER) Model : A Sample Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions **Relational Algebra:** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra. **Textbook 1: Ch. 3:** 3.1 to 3.7, **Ch. 8:** 8.1 to 8.5	
Module – 3	**08Hrs**
Basic Structured Query Language (SQL): SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL; Insert, Delete and Update Statements in SQL; Schema Change Statements in SQL; Aggregate Functions and GROUP BY; Joins in SQL, Views (Virtual Tables) in SQL. **Textbook 1: Ch. 6:** 6.1 to 6.4, **Ch. 7:** 7.3 to 7.4	
Module – 4	**08Hrs**

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form **Textbook 1: Ch. 14:** 14.1 to 14.7
Module – 5 **08Hrs**
Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing; transaction and system concepts; desirable properties of transactions, transaction support in SQL **Concurrency Control & Database Recovery Techniques:** Two phase locking techniques, Concurrency control based on Timestamp ordering; Recovery concepts; NO-UNDO/REDO Recovery Based on Deferred Update **Textbook 1: Ch. 20:** 20.1 to 20.3,20.6 **Ch. 21:** 21.1 – 21.2, **Ch. 22:** 21.1 to 22.2

Course Outcomes: After completing the course, the students will be able to	
CO1	Articulate the core concepts of DBMS including data models, architecture, and database languages.
CO2	Apply ER modeling and relational algebra to represent and manipulate real-world data.
CO3	Apply SQL to create schemas, manipulate data, enforce constraints, perform joins and aggregation, and implement views in relational databases.
CO4	Design efficient relational schemas by applying normalization techniques, functional dependencies, and decomposition principles to reduce redundancy and maintain data integrity.
CO5	Develop reliable databases by analyzing transaction management, concurrency control, and recovery techniques.

Textbook	
1	"Fundamentals of Database Systems", Elmasri and Navathe Pearson Education, 7th,Edition,2017, ISBN-13: 978-0-13-397077-7

Reference Books	
1	"Database System Concepts", Silberschatz, Korth and Sudharshan. McGraw-Hill 6th Edition,2016, ISBN 978-0-07-352332-3
2	"Database Management Systems", Raghu Ramakrishnan and Johannes Gehrke McGraw-Hill. 3rd Edition, 2003, ISBN-13: 9780072465631

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=IoL9Ve2SRwQ&list=PLIwC9bZ0rmjSkm1VRJROX4vP2YMIf4Ebh
2	https://www.youtube.com/watch?v=sEaYXwmsLw0&list=PLyqSpQzTE6MxymXgqewlzcC3U4cdRoSu
3	https://www.w3schools.com/sql/default.asp

CO – PO – PSO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2					1		1		2	1	1
CO2	3	2	3		2		1		1	1	2	1	1
CO3	2	3	2		3		1		1	1	2	1	1
CO4	3	3	2		2		1		1	1	2	1	1
CO5	3	3	2	2	3		1		1	1	2	1	1

Semester: VII					
Introduction to Algorithms					
Course Code	**:**	BCS745B	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40Hrs	**SEE**	**:**	50 Marks
Course Type	**:**	OEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Programming Fundamentals, Mathematics
Knowledge on Fundamental Concepts	Arrays, Strings, Structures, Pointers
Knowledge on Connected Tools (If any)	GCC, Code Blocks

Course Learning Objectives: This course will enable the students to	
CLO1	Understand algorithm design principles and analyze algorithm performance using asymptotic notations.
CLO2	Apply brute-force and divide-and-conquer techniques to solve sorting and searching problems.
CLO3	Utilize decrease-and-conquer, transform-and-conquer, and space-time tradeoff techniques for efficient problem solving.
CLO4	Apply dynamic programming and greedy methods to solve optimization and graph problems
CLO5	Explore computational complexity concepts and utilize backtracking and branch-and-bound methods for solving combinatorial problems.

Module – 1	**08Hrs**
Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving. **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis frame work, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms. **Textbook 1: Ch 1:** 1.1-1.2**, Ch 2:** 2.1- 2.4	
Module – 2	**08Hrs**
Brute Force: Selection Sort, Bubble sort, Sequential Search and Brute-Force String Matching **Divide and Conquer:** Merge sort, Quick sort. **Textbook 1: Ch 3:** 3.1-3.2, **Ch 5:** 5.1,5.2,	
Module – 3	**08Hrs**
Decrease-and-Conquer: Insertion Sort, Topological Sorting. Decrease-by-a-Constant-Factor Algorithm: Binary Search. **Transform-and-Conquer:** Balanced Search Trees, Heaps and Heapsort. **Space-Time Tradeoffs:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm. **Textbook 1: Ch 4:** 4.1,4.2,4.4, **Ch 6:** 6.3,6.4**, Ch 7:** 7.1,7.2	
Module – 4	**08Hrs**
Dynamic Programming: Warshall's and Floyd's Algorithms, Knapsack Problem. **Greedy Technique:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes. **Textbook 1: Ch 8:** 8.2,8.4 **Ch 9:** 9.1-9.4	

Module – 5	08Hrs
Limitations of Algorithmic Power: Decision Trees: Comparison of three variables, Selection Sort, P, NP, and NP-Complete Problems. **Coping With Limitations of Algorithmic Power:** Backtracking: n-Queens problem, Subset-sum problem, Branch-and-Bound: Knapsack problem. **Textbook 1: Ch 11:** 11.2,11.3, **Ch 12:** 12.1,12.2	

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret algorithmic problem-solving concepts and analyze algorithm performance using asymptotic analysis.
CO2	Apply brute-force and divide-and-conquer strategies to solve sorting and searching problems.
CO3	Utilize decrease-and-conquer, transform-and-conquer, and space-time tradeoff techniques in algorithm design.
CO4	Apply dynamic programming and greedy techniques to solve optimization problems.
CO5	Analyze computational complexity and apply backtracking and branch-and-bound methods to solve combinatorial problems.

Textbook	
1	"Introduction to the Design and Analysis of Algorithms", Anany Levitin, 3rd Edition (Indian), 2021, Pearson, ISBN-13: 978-0137541133.

Reference Books	
1	"Computer Algorithms/C++", Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press, ISBN-13: 978-8173716119.
2	"Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI 4th Edition 2022, ISBN 978-0-262-03384-8.
3	"Design and Analysis of Algorithms", S. Sridhar, Oxford (Higher Education), 2nd Edition, 2023, ISBN-13: 978-9354977886.

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc23_cs88/preview
2	https://www.geeksforgeeks.org/introduction-to-algorithms/
3	https://www.naukri.com/code360/library/types-of-algorithms-and-their-uses
4	https://topperworld.in/daa-tutorial-2/
5	https://www.youtube.com/watch?v=0IAPZzGSbME&list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O

CO – PO – PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	-					1	1	3	1
CO2	3	3	3	2	1					1	1	3	3
CO3	3	3	2	2	1					1	1	3	2
CO4	3	3	3	2	2					1	1	2	3
CO5	3	3	2	3	2					1	2	2	2

Semester VII					
Software Engineering					
Course Code	**:**	BIS745C	**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	OEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Programming Fundamentals, Database Structures, Object Oriented Programming with C++
Knowledge on Fundamental Concepts	Software Development Life Cycle (SDLC), Modularity and Reusability, Basic UML Diagrams
Knowledge on Connected Tools (If any)	IDS, GCC

Course Learning Objectives: This course will enable the students to	
CLO1	Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issue.
CLO2	Distinguish between various software process models and apply them to real-world scenarios.
CLO3	Infer the fundamentals of object-oriented concepts, differentiate system models, use UML diagrams
CLO4	Discuss various types of software testing practices and software evolution processes
CLO5	Recognize the importance of Project Management with its methods and methodologies

Module – 1	**08 Hrs**
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes:** Models: Waterfall Model, Incremental Model and Spiral Model Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis, Functional and non-functional requirements, The software Requirements Document, Requirements Specification Requirements validation, Requirements Management. **Textbook 1: Ch1, Ch 2, Ch 4**	
Module – 2	**08 Hrs**
Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. **Modelling as a Design technique:** Modelling; Abstraction; The Three models. **Class Modelling:** Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models. **Textbook 2: Ch 1 - 1.1-1.5, Ch 2 - 2.1-2.3 and Ch 3 - 3.1-3.5**	
Module – 3	**08 Hrs**
System Models: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering, **Design and Implementation:** Object-oriented design using the UML, Design patterns, Implementation issues, Open source development **Textbook 1: Ch 5, Ch 7**	

Module – 4	08 Hrs
Software Testing: Development testing, Test-driven development, Release testing, User testing. **Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management **Textbook 1 : Ch 8, Ch 9**	
Module – 5	**08 Hrs**
Project Planning: Software pricing, Plan-driven development, Project scheduling, Agile Planning. Estimation techniques. **Quality management:** Software quality, Software standards, Reviews and inspections, Software measurement and metrics **Textbook 1: Ch 23, Ch 24**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Examine the importance of ethics and professionalism in software engineering
CO2	Utilize software engineering techniques to create software components that address specified requirements.
CO3	Evaluate the suitability of object-oriented models and UML diagrams for representing different software system requirements.
CO4	Analyze software testing strategies and software evolution processes to improve software reliability and performance.
CO5	Examine project planning, scheduling, and resource management techniques to support successful project execution.

Text Books	
1	Software Engineering, Ian Sommerville, 9th Edition, 2012, Pearson Education, ISBN-13: 978-0-13-703515-1 ISBN-10: 0-13-703515-2
2	Michael Blaha and James Rumbaugh, *Object-Oriented Modeling and Design with UML*, 2nd Edition, Pearson Education, 2012 (Updated Edition), ISBN-13: 978-0133002171

Reference Books	
1	Software Engineering-A Practitioners approach, Roger S. Pressman, 7th Edition, 2010, Global Publisher, ISBN 978-0-07-337597-7
2	An Integrated Approach to Software Engineering, Pankaj Jalote, 3rd Edition, 2005, Wiley India, ISBN-10: 0-387-28132-0 (eBook)

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in/courses/106/101/106101061/
2	https://archive.nptel.ac.in/courses/106/105/106105182/

CO – PO MAPPING

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

Semester: VII					
Web Technologies					
Course Code	:	BIS745D	**Credits**	:	03
Hours/Week (L:T:P)	:	3:0:0	**CIE**	:	50 Marks
Total Hours	:	40L	**SEE**	:	50 Marks
Course Type	:	OEC	**SEE Duration**	:	3 Hours

Prerequisites:	
Courses	Introduction to Programming, Problem Solving and Algorithms
Knowledge on Fundamental Concepts	Computer Basics, Basic Logic Building, Text Editing Tools, Web and Internet Basics
Knowledge on Connected Tools (If any)	XAMPP/WAMP, Visual Studio Code, Notepad++

Course Level Objectives: Student able to	
CLO1	Understand web programming fundamentals, HTTP, security, and HTML structure.
CLO2	Illustrate HTML and XHTML syntax, structure, elements, and differences.
CLO3	Design web pages using CSS for styling, layout, and structure.
CLO4	Apply JavaScript and DOM techniques to manipulate web page elements and handle user interactions.
CLO5	Design server-side applications using PHP and web server functionalities.

Module 1	**8 Hrs**
Introduction to WEB Programming: Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security. Introduction to HTML, what is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements. **Textbook 1:** Ch 1 :1.1 to 1.8	
Module 2	**8 Hrs**
HTML and XHTML: Origins of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, and Tables. Forms, Syntactic differences between HTML and XHTML. **Textbook 1:** Ch 2: 2.1 to 2.10	
Module 3	**8 Hrs**
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box Model, Background images, tags. **Textbook 1:** Ch 3: 3.1 to 3.12	
Module 4	**8 Hrs**
What is JavaScript and What can it do? JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM),JavaScript Events. **Textbook 2:** Ch 6: 6.1 to 6.7	

Module 5	8 Hrs
Introduction to Server-Side Development with PHP: What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions, PHP Arrays and Super globals: Arrays, $_GET and $_POST Super global Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files. **Textbook 2:** Ch 8: 8.1 to 8.5, Ch 9: 9.1 to 9.5	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply web programming concepts to build structured web pages.
CO2	Illustrate HTML and XHTML to design interactive pages.
CO3	Design responsive web pages using CSS.
CO4	Apply JavaScript for dynamic and interactive content.
CO5	Develop server-side applications using PHP.

Text Books	
1	"Programming the World Wide Web", Robert W Sebesta, 6th Edition, Pearson Education, 2022. ISBN: 978-0137618149
2	"Fundamentals of Web Development", Randy Connolly and Ricardo Hoar, 3rd Edition, Pearson, 2022. ISBN: 978-0135863336

Reference Books	
1	"Internet & World Wide Web How to program", M.Deitel, P.J.Deitel, A.B.Goldberg, 3rd Edition, Pearson Education / PHI, 2004. ISBN: 978-0131450912
2	"Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5", Robin Nixon, 4th Edition, O"Reilly Publications, 2015. ISBN:978-9352130153
3	"PHP and MySQL Web Development", Luke Welling, Laura Thomson, 5th Edition, Pearson Education, 2016. ISBN:978-9332582736
4	"Professional JavaScript for Web Developers", Nicholas C Zakas, 3rd Edition, Wrox/Wiley India, 2012. ISBN:978-8126535088

Web links and Video Lectures (e – Resources)	
1	Fundamentals of WEB Programming: https://www.youtube.com/watch?v=DR9dr6gxhDM
2	HTML and XHTML: https://www.youtube.com/watch?v=A1XlIDDXgwg
3	CSS: https://www.youtube.com/watch?v=J35jug1uHzE
4	Java Script and HTML Documents: https://www.youtube.com/watch?v=Gd0RBdFRvF0
5	Dynamic Documents with JavaScript: https://www.youtube.com/watch?v=HTFSIJALNKc

CO – PO MAPPING

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

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV, AE) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

SCHEME OF TEACHING AND EXAMINATION – B.E. – Information Science and Engineering

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

8th Semester

Information Science and Engineering												
Sl. No.	**Course Code**	**Course Title**	**Course Type**	**TD/ PSB**	**Teaching Hours / Week**			**Examination**				
					L	**T**	**P**	**SEE Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
1	BXX821x	Professional Elective Course - IV (Online Course) only through NPTEL / VTU MOOC / Centre Of Excellence of the concerned department	PEC		3	0	0	**3**	**50**	**50**	**100**	**3**
2	BXX842x	Open Elective Course - III (Online Course) only through NPTEL / VTU MOOC / Centre Of Excellence of the concerned department	OEC		3	0	0	**3**	**50**	**50**	**100**	**3**
3	BXX833	Internship (Industry / Research / Rural) (14 – 20 weeks)	INT		0	0	12	**3**	**100**	**100**	**200**	**8**
									200	**200**	**400**	**14**

PEC: Professional Elective Course, OEC: Open Elective Course, INT: Industry Internship / Research Internship, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – IV (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name
BXX821A	Human Computer Interaction	BXX821C	Privacy and Security in online social media
BXX821B	Introduction to Large Language Models	BXX821D	Getting started with competitive programming

Open Elective Course – III (Online Course – only through NPTEL, suggested by BoS)

Course Code	Course Name	Course Code	Course Name
BXX842A	Machine Learning for Engineering and Science Applications	BXX842C	Fundamentals of Object Oriented Programming
BXX842B	Programming in Java	BXX842D	Cloud computing

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.
Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.
Elucidation: At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester Research Internship /Industrial Internship / Rural Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Research Internship or Industrial Internship or Rural Internship. Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes. The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements. **Research internship:** A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research. **Industry internship:** Is an extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints. **Rural Internship:** Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

Credit Definition

1-hour Lecture (L) per week=1Credit	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial(T) per week=1Credit	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2-hours Practical / Drawing (P) per week=1Credit	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives (SDA) per week = 1 Credit	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions



Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas.
- Imparting Value based Professional Education with a sense of Social Responsibility.

Department Vision

Educating Students to Engineer Information Science and Technology for Advancing the Knowledge as to Best Serve the Real World.

Department Mission

- Focusing on Fundamentals and Applied aspects in both InformationScience Theory and Programming practices.
- Training comprehensively and encouraging R&D culture in trending areas of Information Technology.
- Collaborating with premier Institutes and Industries to nurture Innovation and learning, in cutting edge Information Technology.
- Preparing the students who are much Sought-after, Productive and Well-respected for their work culture having Lifelong Learning practice.
- Promoting ethical and moral values among the students so as to enable them emerge as responsible professionals.

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P.B. No.20, B.B Road,

Chikkaballapur - 562 101, Karnataka