BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COURSE OUTCOMES

F.Y.B.SCI (CS)

SEMESTER I		
SYLLABUS	**OBJECTIVES**	**OUTCOMES**
Computer Organization and Architecture	To understand the structure and operation of modern processors and their instruction sets	1. To understand the basics of digital electronics needed for computers 2. To understand the basics of instruction set architecture for reduced and complex instruction sets 3. To understand the basics of processor structure and operation 4. To understand how data is transferred between the processor and I/O devices
Programming with Python- I	To introduce various concepts of programming to the students using Python.	1. Students should be able to understand the concepts of programming before actually starting to write programs. 2. Students should be able to develop logic for Problem Solving. 3. Students should be able to apply the problem solving skills using syntactically simple language i.e. Python (version: 3.X or higher)
Free and Open Source Software	Open Source has acquired a prominent place in software industry. Having knowledge of Open Source and its related technologies is an essential for Computer Science student. This course introduces Open Source methodologies and ecosystem to students.	1. Upon completion of this course, students should have a good working knowledge of Open Source ecosystem, its use, impact and importance. 2. This course shall help student to learn Open Source methodologies, case studies with reallife examples.
Database Management Systems	To introduce the concept of the DBMS with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases	1. Students should be able to evaluate business information problem and find the requirements of a problem in terms of data. 2. Students should be able to design the database schema with the use of appropriate data types for storage of data in database.

		3. Students should be able to create, manipulate, query and back up the databases
Discrete Mathematics	To familiarize the prospective learners with mathematical structures that are fundamentally discrete. This course introduces sets and functions, forming and solving recurrence relations and different counting principles. These concepts are useful to study or describe objects or problems in computer algorithms and programming languages.	1. To provide overview of theory of discrete objects, starting with relations and partially ordered sets. 2. Study about recurrence relations, generatingfunction and operations on them. 3. Give an understanding of graphs and trees, which are widely used in software. 4. Provide basic knowledge about models of automata theory and the corresponding formal languages
Descriptive Statistics and Introduction to Probability	To familiarize students with basics of Statistics. This will be essential for prospective researchers and professionals to know these basics.	1. Enable learners to know descriptive statistical concepts 2. Enable study of probability concept required for Computer learners
Soft Skills Development	To help learners develop their soft skills and develop their personality together with their technical skills. Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work environment and corporate life. Understand various issues in personal and profession communication and learn to overcome them	1. To know about various aspects of soft skillsand learn ways to develop personality 2. Understand the importance and type of communication in personal and professional environment. 3. To provide insight into much needed technical and non-technical qualities in careerplanning. 4. Learn about Leadership, team building, decision making and stress management
SEMESTER II		
Programming with C	To provide a comprehensive study of the C programming language, stressing upon the strengths of C, which provide the students with the means of writing modular, efficient, maintainable, andportable code	1. Students should be able to write, compile and debug programs in C language. 2. Students should be able to use different data types in a computer program. 3. Students should be able to design programs involving decision structures, loops andfunctions. 4. Students should be able to

		explain the difference between call by value and call by reference 5. Students should be able to understand the dynamics of memory by the use of pointers. Students should be able to use different data structures and create/update basic data files
Programming with Python – II	To explore the style of structured programming to give the idea to the students how programming can be used for designing real-life applications by reading/writing to files, GUI programming, interfacing database/networks and various other features.	1. Students should be able to understand how to read/write to files using python. 2. Students should be able to catch their own errors that happen during execution of programs. 3. Students should get an introduction to the concept of pattern matching. 4. Students should be made familiar with the concepts of GUI controls and designing GUI applications. 5. Students should be able to connect to the database to move the data to/from the application. Students should know how to connect to computers, read from URL and send email.
Linux	This course introduces various tools and techniques commonly used by Linux programmers, system administrators and end users to achieve their day to day work in Linux environment. It is designed for computer students who have limited or no previous exposure to Linux.	1. Upon completion of this course, students should have a good working knowledge of Linux, from both a graphical and command line perspective, allowing them to easily use any Linux distribution. 2. This course shall help student to learn advanced subjects in computer science practically. 3. Student shall be able to progress as a Developer or Linux System Administrator using the acquired skill set
Data Structures	To explore and understand the concepts of Data Structures and its significance in programming. Provide and holistic approach to design, use and implement abstract data types. Understand the commonly used data structures and various	1. Learn about Data structures, its types and significance in computing 2. Explore about Abstract Data types and its implementation 3. Ability to program various applications using different

	forms of its implementation for different applications using Python.	data structure in Python
Calculus	To have a grasp of important concepts of Calculus in a scientific way. It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way. The learner is expected to solve as many examples as possible to a get compete clarity and understanding of the topics covered.	1. Understanding of Mathematical concepts like limit, continuity, derivative, integration offunctions. 2. Ability to appreciate real world applications which uses these concepts. 3. Skill to formulate a problem through Mathematical modelling and simulation.
Statistical Methods and Testing of Hypothesis	To familiarize students with basics of Statistics. This will be essential for prospective researchers and professionals to know these basics.	1. Enable learners to know descriptive statistical concepts 2. Enable study of probability concept required for Computer learners
Green Technologies	To familiarize with the concept of Green Computing and Green IT infrastructure for making computing and information system environment sustainable. Encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services. To highlight useful approaches to embrace green IT initiatives	1. Learn about green IT can be achieved in andby hardware, software, and network communication and data centre operations. 2. Understand the strategies, frameworks, processes and management of green IT

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

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S.Y.B.SCI (CS)

SEMESTER III		
Theory of Computation	To provide the comprehensive insight into theory of computation by understanding grammar, languages and other elements of modern language design. Also to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas.	1. Understand Grammar and Languages 2. Learn about Automata theory and its application in Language Design 3. Learn about Turing Machines and Pushdown Automata Understand Linear Bound Automata and itsapplications
Core Java	To teach the learner how to use Object Oriented paradigm to develop code and understand the concepts of Core Java and to cover-up with the pre-requisites of Core java	1. Object oriented programming concepts using Java. 2. Knowledge of input, its processing and getting suitable output. 3. Understand, design, implement and evaluate classes and applets. Knowledge and implementation of AWT package.
Operating System	To understand proper working of operating system. To provide a sound understanding of Computer operating system, its structures, functioning and algorithms	1. To provide a understanding of operating system, its structures and functioning 2. Develop and master understanding of algorithms used by operating systems for various purposes
Database Management Systems	To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage.	1. Master concepts of stored procedure and triggers and its use. 2. Learn about using PL/SQL for data Management 3. Understand concepts and implementations of transaction management and crash recovery
Combinatorics and Graph Theory	To give the learner a broad exposure of combinatorial Mathematics through applications especially the Computer Science applications	1. Appreciate beauty of combinatorics and how combinatorial problems naturally arise in many settings. 2. Understand the combinatorial features in

		real world situations and Computer Science applications. 3. Apply combinatorial and graph theoretical concepts to understand Computer Science concepts and apply them to solve problems
Physical Computing and IOT Programming	To learn about SoC architectures; Learn how Raspberry Pi. Learn to program Raspberry Pi. Implementation of internet of Things and Protocols.	1. Enable learners to understand System on Chip Architectures. 2. Introduction and preparing Raspberry Pi with hardware and installation. 3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's 4. Learn how to make consumer grade IoT safe and secure with proper use of protocols.
Skill Enhancement: Web Programming	To provide insight into emerging technologies to design and develop state of - the art web applications using client- side scripting, server-side scripting, and database connectivity	1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies. 2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites 3. To develop and implement client-side and server-side scripting language programs. 4. To develop and implement Database Driven Websites. Design and apply XML to create a markup language for data and document centric applications.
SEMESTER IV		
Fundamentals of Algorithms	To understand basic principles of algorithm design and why algorithm analysis is important. To understand howto implement algorithms in Python. To understand how to transform new problems into algorithmic problems with efficient solutions. To understand algorithm design techniques for	1. Understand the concepts of algorithms for designing good program 2. Implement algorithms using Python

	solving different problems	
Advanced Java	To explore advanced topic of Java programming for solving problems.	1. Understand the concepts related to JavaTechnology 2. Explore and understand use of Java ServerProgramming
Computer Networks	To conceptualize and understand the framework and working of communication networks. And on completion, be able to have a firm grip over this very important segment of Internet.	1. Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'. 2. Useful to proceed with industrial requirements and International vendor certifications.
Software Engineering	Software engineering is the systematic approach to the development, operation, maintenance and retirement of software. The objective is to apply science and mathematics by which the capabilities of computer equipment are made useful to man via computer programs, procedures, and associated documentations.	The practical knowledge provides anunderstanding of how hardware functions, howto utilize the power of programming languages and tools while developing software.
Linear Algebra using Python	To offer the learner the relevant linear algebra concepts through computerscience applications.	1. Appreciate the relevance of linear algebra in the field of computer science. 2. Understand the concepts through program implementation 3. Instil a computational thinking while learning linear algebra
.NET Technologies	To explore .NET technologies for designing and developing dynamic, interactive and responsive web applications	1. Understand the .NET framework 2. Develop a proficiency in the C# programminglanguage 3. Proficiently develop ASP.NET web applications using C# 4. Use ADO.NET for data persistence in a web application
Skill Enhancement: Android Developer Fundamentals	To provide the comprehensive insight into developing applications running on smart mobile devices and demonstrate programming skills for managing task on mobile. To provide systematic approach for studying definition, methods and its applications for	1. Understand the requirements of Mobile programming environment. 2. Learn about basic methods, tools and techniques for developing Apps 3. Explore and practice App development on Android Platform

	Mobile-Appdevelopment	4. Develop working prototypes of working systems for various uses in daily lives

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T.Y.B.SCI (CS)

SEMESTER V		
Linux Server Administration	To demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. Effectively operate a Linux system inside of a network environment to integrate with existing service solutions.	1. Learner will be able to develop Linux basedsystems and maintain. 2. Learner will be able to install appropriateservice on Linux server as per requirement. 3. Learner will have proficiency in Linux server administration.
Software Testing and Quality Assurance	To provide learner with knowledge in Software Testing techniques. To understand how testing methods can be used as an effective tools in providing quality assurance concerning for software. To provide skills to design test case plan for testing software	1. Understand various software testing methods and strategies. 2. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. 3. Design SQA activities, SQA strategy, formal technical review report for software qualitycontrol and assurance
Information and Network Security	To provide students with knowledge of basic concepts of computer security including network security and cryptography	1. Understand the principles and practices of cryptographic techniques. 2. Understand a variety of generic security threats and vulnerabilities, and identify & analyse particular security problems for a given application. 3. Understand various protocols for network security to protect against the threats in anetwork
Web Services	To understand the details of web services technologies like SOAP, WSDL, and UDDI. To learn how to implement and deploy web service client and server. To understand the design principles and application of SOAP and REST based web services (JAX-Ws and JAX-	1. Emphasis on SOAP based web services and associated standards such as WSDL. 2. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues ofWeb Services

	RS).To understand WCF service. To design secure web services and QoS of Web Services	
Game Programming	To understand computer Graphics programming using Directx or Opengl. Along with the VR and AR they should also aware of GPU, newer technologies and programming using most important API for windows	Learner should study Graphics and gamming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn.
Project Implementation	To provide hands-on experience in making Live project.	The aim of the Project work is to acquire practical knowledge on the implementation of the programming concepts studied.
SEMESTER VI		
Cloud Computing	To provide learners with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture, implantations and applications. To expose the learners to frontier areas of Cloud Computing, while providing sufficient foundations to enable further study and research.	After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing using open source technology. Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. They should explain the core issues of cloud computing such as security, privacy, and interoperability
Cyber Forensics	To understand the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered	The student will be able to plan and prepare for all stages of an investigation - detection, initial response and management interaction, investigate various media to collect evidence, report them in a way that would be acceptable in the court of law.
Information Retrieval	To provide an overview of the important issues in classical and web information retrieval. The focus is to give an up-to- date treatment of all aspects of the design and implementation of	After completion of this course, learner should get an understanding of the field of information retrieval and its relationship to search engines. It will give the learner an

	systems for gathering, indexing, and searching documents and of methods for evaluating systems.	understanding to apply information retrieval models.
Data Science	To Understand basic data science concepts. Learning to detectanddiagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. Making aware of how to address advanced statistical situations, Modelling and Machine Learning.	After completion of this course, the students should be able to understand & comprehend the problem; and should be able to define suitable statistical method to be adopted.
Ethical Hacking	To understand the ethics, legality, methodologies and techniques ofhacking.	Learner will know to identify security vulnerabilities and weaknesses in the target applications. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines
Project Implementation	To provide hands-on experience in making Live project.	The aim of the Project work is to acquire practical knowledge on the implementation of the programming concepts studied.

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