

**DEPARTMENT OF COMPUTER
SCIENCE**

At the end of three year Bachelor of Computer Science, the students will be able:

PSO 1: To formulate, to model, to design solutions, procedure and to use software tools to solve real world problems.

PSO 2: To design and develop computer programs/computer -based systems in the areas such as networking, web design, security, cloud computing, IoT, data science and other emerging technologies.

PSO 3: To familiarize with the modern-day trends in industry and research based settings and thereby innovate novel solutions to existing problems.

PSO 4: To apply concepts, principles, and theories relating to computer science to new situations.

PSO 5: To use current techniques, skills, and tools necessary for computing practice

PSO 6: To apply standard Software Engineering practices and strategies in real-time software project development

PSO 7: To pursue higher studies of specialization and to take up technical employment.

PSO 8: To work independently or collaboratively as an effective team member on a substantial software project.

PSO 9: To communicate and present their work effectively and coherently.

PSO 10: To display ethical code of conduct in usage of Internet and Cyber systems.

PSO 11: To engage in independent and life-long learning in the background of rapid changing IT industry.

Course Outcomes:

F.Y.B.Sc. C.S. Semester I		
Course Name	Course Number	Course Outcomes
Digital Systems & Architecture	CO1	To learn about how computer systems work and underlying principles To understand the basics of digital electronics needed for computers
	CO2	To understand the basics of instruction set architecture for reduced and complex instruction sets To understand the basics of processor structure and operation
	CO3	To understand how data is transferred between the processor and I/O devices
Introduction to Programming with Python	CO1	Ability to store, manipulate and access data in Python Ability to implement basic Input / Output operations in Python
	CO2	Ability to define the structure and components of a Python program. Ability to learn how to write loops and decision statements in Python.
	CO3	Ability to learn how to write functions and pass arguments in Python. Ability to create and use Compound data types in Python
LINUX Operating System	CO1	Work with Linux file system structure, Linux Environment Handle shell commands for scripting, with features of regular expressions, redirections
	CO2	Implement file security permissions Work with vi, sed and awk editors for shell scripting using various control structures
	CO3	Install software like compilers and develop programs in C and Python programming languages on Linux Platform

Open Source Technologies	CO1	Differentiate between Open Source and Proprietary software and Licensing.
	CO2	Recognize the applications, benefits and features of Open-Source Technologies
	CO3	Gain knowledge to start, manage open-source projects.
Discrete Mathematics	CO1	Define mathematical structures (relations, functions, graphs) and use them to model real life situations. Understand, construct and solve simple mathematical problems.
	CO2	Solve puzzles based on counting principles. Provide basic knowledge about models of automata theory and the corresponding formal languages.
	CO3	Develop an attitude to solve problems based on graphs and trees, which are widely used in software.
Descriptive Statistics	CO1	Organize, manage and present data.
	CO2	Analyze Statistical data using measures of central tendency and dispersion. Analyze Statistical data using basics techniques of R.
	CO3	4. Study the relationship between variables using techniques of correlation and regression.
Soft Skills	CO1	Learners will be able to understand the importance and types soft skills
	CO2	Learners will develop skills for Academic and Professional Presentations. Learners will able to understand Leadership Qualities and Ethics.
	CO3	Ability to understand the importance of stress management in their academic & professional life.
F.Y.B.Sc. C.S. Semester II		
Design & Analysis of Algorithms	CO1	Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used.
	CO2	Students should be able to appreciate the use of various data structures as per need
	CO3	To select, decide and apply appropriate design principle by understanding the requirements of any real life problems
Advanced Python Programming	CO1	Ability to implement OOP concepts in Python including Inheritance and Polymorphism Ability to work with files and perform operations on it using Python.
	CO2	Ability to implement regular expression and concept of threads for developing efficient program Ability to implement exception handling in Python applications for error handling.
	CO3	Knowledge of working with databases, designing GUI in Python and implement networking in Python
Introduction to OOPs using C++	CO1	Work with numeric, character and textual data and arrays.
	CO2	Understand the importance of OOP approach over procedural language. Understand how to model classes and relationships using UML.
	CO3	Apply the concepts of OOPS like encapsulation, inheritance and polymorphism.

		Handle basic file operations.
Database Systems	CO1	To appreciate the importance of database design. Analyze database requirements and determine the entities involved in the system and their relationship to one another.
	CO2	Write simple queries to MySQL related to String, Maths and Date Functions. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands
	CO3	Understand the normalization and its role in the database design process. Handle data permissions. Create indexes and understands the role of Indexes in optimization search.
Calculus	CO1	Develop mathematical skills and enhance thinking power of learners.
	CO2	Understand mathematical concepts like limit, continuity, derivative, integration of functions, partial derivatives. Appreciate real world applications which uses the learned concepts.
	CO3	Skill to formulate a problem through Mathematical modelling and simulation.
Statistical Methods	CO1	Calculate probability, conditional probability and independence. Apply the given discrete and continuous distributions whenever necessary.
	CO2	Define null hypothesis, alternative hypothesis, level of significance, test statistic and p value. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.
	CO3	Apply non-parametric test whenever necessary. Conduct and interpret one-way and two-way ANOVA.
E-Commerce & Digital Marketing	CO1	Understand the core concepts of E-Commerce. Understand the various online payment techniques
	CO2	Understand the core concepts of digital marketing and the role of digital marketing in business. Apply digital marketing strategies to increase sales and growth of business
	CO3	Apply digital marketing through different channels and platforms Understand the significance of Web Analytics and Google Analytics and apply the same.

S.Y.B.Sc. C.S. Semester III		
Theory of Computation	CO1	Understand Grammar and Languages
	CO2	Learn about Automata theory and its application in Language Design
	CO3	Learn about Turing Machines and Pushdown Automata Understand Linear Bound Automata and its applications
Core Java	CO1	Object oriented programming concepts using Java.
	CO2	Knowledge of input, its processing and getting suitable output.
	CO3	Understand, design, implement and evaluate classes and applets. Knowledge and implementation of AWT package.
Operating System	CO1	To provide a understanding of operating system, its structures and functioning
	CO2	Develop and master understanding of algorithms used by operating systems for various purposes.
	CO3	Understanding of algorithms used by operating systems for various purposes.
Database Management Systems	CO1	Master concepts of stored procedure and triggers and its use.
	CO2	Learn about using PL/SQL for data management
	CO3	Understand concepts and implementations of transaction management and crash recovery
Combinatorics and Graph Theory	CO1	Appreciate beauty of combinatorics and how combinatorial problems naturally arise in many settings.
	CO2	Understand the combinatorial features in real world situations and Computer Science applications.
	CO3	Apply combinatorial and graph theoretical concepts to understand Computer Science concepts and apply them to solve problems
Physical Computing and IoT Programming	CO1	Enable learners to understand System On Chip Architectures.
	CO2	Introduction and preparing Raspberry Pi with hardware and installation.

	CO3	Learn physical interfaces and electronics of Raspberry Pi and program them using practical's Learn how to make consumer grade IoT safe and secure with proper use of protocols.
Web Programming	CO1	To design valid, well-formed, scalable, and meaningful pages using emerging technologies.
	CO2	Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites To develop and implement client-side and server-side scripting language programs.
	CO3	To develop and implement Database Driven Websites. Design and apply XML to create a markup language for data and document centric applications.
S.Y.B.Sc. C.S. Semester IV		
Fundamentals of Algorithms	CO1	Understand the concepts of algorithms for designing good program
	CO2	Implement algorithms using Python
	CO3	To develop application
Advanced Java	CO1	Understand the concepts related to Java Technology
	CO2	Explore and understand use of Java Server Programming
	CO3	To learn and developed Java based application
Computer Networks	CO1	Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'.
	CO2	Useful to proceed with industrial requirements and International vendor certifications.
	CO3	To learn network topologies
Software Engineering	CO1	Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
	CO2	Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.

	CO3	Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice Able to use modern engineering tools necessary for software project management, time management and software reuse.
Linear Algebra using Python	CO1	Appreciate the relevance of linear algebra in the field of computer science.
	CO2	Understand the concepts through program implementation
	CO3	Install a computational thinking while learning linear algebra.
.Net Technologies	CO1	Understand the .NET framework
	CO2	Develop a proficiency in the C# programming language
	CO3	Proficiently develop ASP.NET web applications using C#. Use ADO.NET for data persistence in a web application
Android Developer Fundamentals	CO1	Understand the requirements of Mobile programming environment.
	CO2	Learn about basic methods, tools and techniques for developing Apps Explore and practice App development on Android Platform
	CO3	Develop working prototypes of working systems for various uses in daily lives.

T.Y.B.Sc. CS Sem V		
USCS501 Artificial Intelligence	CO1	After completion of this course, learner should get a clear understanding of AI and different search algorithms used for solving problems.
	CO2	The learner should also get acquainted with different learning algorithms and models used in machine learning.
	CO3	Artificial Intelligence (AI) and accompanying tools and techniques bring transformational changes in the world. Machines capability to match, and sometimes even surpass human capability, make AI a hot topic in Computer Science. This course aims to introduce the learner to this interesting area.
USCS502 Linux Server Administration	CO1	Learner will be able to develop Linux based systems and maintain
	CO2	Learner will be able to install appropriate service on Linux server as per requirement.
	CO3	Learner will have proficiency in Linux server administration.
USCS503 Software Testing and Quality Assurance	CO1	Understand various software testing methods and strategies.
	CO2	Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software.
	CO3	Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance
USCS504 Information and Network Security	CO1	Understand the principles and practices of cryptographic techniques.
	CO2	Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application.
	CO3	Understand various protocols for network security to protect against the threats in a network
USCS505 Architecting of IoT	CO1	Learners are able to design & develop IoT Devices.
	CO2	They should also be aware of the evolving world of M2M Communications and IoT analytics.
USCS506 Web Services	CO1	Emphasis on SOAP based web services and associated standards such as WSDL

	CO2	Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services
	CO3	To understand WCF service. To design secure web services and QoS of Web Services
USCS507 Game Programming	CO1	Learner should study Graphics and gaming 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.
	CO2	Along with the VR and AR they should also aware of GPU, newer technologies and programming using most important API for windows.
	CO3	Learner should get the understanding computer Graphics programming using DirectX or OpenGL.
T.Y.B.Sc. C.S. Semester VI		
USCS601 Wireless Sensor Networks and Mobile Communication	CO1	After completion of this course, learner should be able to list various applications of wireless sensor networks.
	CO2	Describe the concepts, protocols, design, implementation and use of wireless sensor networks.
	CO3	Implement and evaluate new ideas for solving wireless sensor network design issues.
USCS602 Cloud Computing	CO1	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.
	CO2	Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	They should explain the core issues of cloud computing such as security, privacy, and interoperability.
USCS603 Cyber Forensics	CO1	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
	CO2	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.

USCS604 Information Retrieval	CO1	After completion of this course, learner should get an understanding of the field of information retrieval and its relationship to search engines.
	CO2	It will give the learner an understanding to apply information retrieval models.
	CO3	To provide an overview of the important issues in classical and web information retrieval.
USCS605 Digital Image Processing	CO1	Learner should review the fundamental concepts of a digital image processing system.
	CO2	Analyze the images in the frequency domain using various transforms.
	CO3	Evaluate the techniques for image enhancement and image segmentation.
	CO4	Apply various compression techniques. They will be familiar with basic image processing techniques for solving real problems.
USCS606 Data Science	CO1	Understanding basic data science concepts. Learning to detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.
	CO2	Making aware of how to address advanced statistical situations, Modeling and Machine Learning.
	CO3	After completion of this course, the students should be able to understand & comprehend the problem. To define suitable statistical method to be adopted.
USCS607 Ethical Hacking	CO1	To understand the ethics, legality, methodologies and techniques of hacking.
	CO2	Learner will know to identify security vulnerabilities and weaknesses in the target applications
	CO3	To test and exploit systems using various tools and understand the impact of hacking in real time machines.



HOD COMPUTER SCIENCE




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