TEACHING AND EXAMINATION SCHEME
B. Sc. Computer Science - III Year
WEF 2022 - 2023

	Paper Name (Theory)	Lec	Exam Hours	MARKS	
				Min	Max
bcs-301	Java Programming	3	3	18	50
bcs-302	Discrete Mathematics	3	3	18	50
bcs-303	Software Engineering & Project Management	3	3	18	50
bcs-304	Web Technologies	3	3	18	50
bcs-305	Digital Design Using VHDL	3	3	18	50
bcs-306	Internet of Things	3	3	18	50
	Total of Theory Marks				**300**

	Paper Name (Practical)	Pract Hours	Exam Hours	MARKS	
				Min	Max
bcs-307	Java Programming Lab	3	3	18	50
bcs-308	Electronics Practical Lab	3	3	18	50
bcs-309	Digital Design Using VHDL Lab	3	3	18	50
bcs-310	Project	6	3	18	50
	Total of Practical Marks				**200**

	Total of Theory & Practical Marks				**500**

B. Sc. (Computer Science)
Scheme of Examination

Theory:

Part A:
1. 10 Question of 1.5 mark each – 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part B:
1. 5 Questions of 3 marks each – 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part C:
1. 3 Questions of 7+7+6 marks each – 20 marks.
2. There will be an internal choice in each question.
3. Answer should not exceed 400 words

Practical & Projects:

Practical exams shall be conducted by one internal and one external examiner of a batch of 40 students in a day.

Duration of Practical exam is 3 hours.

A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.

Practical of 50 marks distribution is as under:
   a. 30 marks for practical examination exercise for 3 questions
   b. 10 marks for Viva-voce
   c. 10 marks for Laboratory Exercise File

The number of paper and the maximum marks for each paper are shown against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper, wherever prescribed, separately.

Classification of successful candidates shall be as follows:

First Division	60%	of the aggregate marks prescribed at (a) Part I Examination, (b) Part II Examination,
Second Division	48%	(c) Part III Examination, taken together

All the rest shall be declared to have passed the examination, if they obtain the minimum pass marks in each subject viz. 36% no division shall be awarded at the Part I and Part II examination.

Note:

Eligibility for admission in First year of B. Sc. (CS) is 10+2 with Science examination of any board with at least 50% marks. As regards admission on reserved category seats government rules will be applicable.

Duration: 3 hours	**Max Marks: 50**

bcs-301Java Programming

Introduction to Java, history, characteristics, Object Oriented Programming, data types, variables, arrays, difference between Java and C++

Control statements: Selection, iteration, jump statements, operators

Introduction to classes, class fundamentals, constructor, methods, stack class, inheritance, creating multilevel hierarchy, method over riding

Packages and interfaces, exception handling, multi-threaded programming, I/O applets

Java Library, string handling, string comparison, string buffer, utility classes, vector stack dictionary, applet class, introduction to AWT, working with frame windows.

Java Beans, beans architecture, AWT components, advantage of Java Beans, beans serialization, JDBC, class and methods, API components, JDBC components, driver, connectivity to database processing result and interfaces, RMI, comparison of distributed and non-distributed Java programs, interfaces, RMI architecture layer, ODBC, CORBA, CORBA services and products, CGI, structure of CGI.

Duration: 3 hours	**Max Marks: 50**

bcs-302Discrete Mathematics

Groups & Rings: Introduction to semi-groups, monoiods, groups, generators, cosets,normal subgroups, Langrange's Theorem, homomorphism, rings, polynomial rings, andfields.

Lattices: Introduction to partial orders, semi-lattices, and lattices.

Vector spaces: vector spaces, linear combinations, convex sets, linear independence,dimension, the column rank and row rank of a matrix.

Linear Mappings: linear mappings and vector space of linear maps, the kernel and theimage of a linear map, orthogonal complement of a subspace, the vector space ofhomogeneous system of linear equations, set of solutions of a non-homogeneous systemof linear equations, matrix associated with a linear map, change of bases, composition oflinear maps, inverse of a linear map.

Scalar products on vector spaces, norm, Schwartz's inequality, Bessel's inequality,orthogonal bases, bilinear maps and matrices, determinants, the rank of a matrix and sub-determinant,Cramer's rule, determinants as areas and volumes, Eigen vectors and Eigenvalues, Eigen space, The characteristic polynomial, Eigen values and Eigen vectors of asymmetric matrix, diagonalisation of a symmetric linear map

Classification of conic sections and quadric surfaces

Duration: 3 hours	Max Marks: 50

bcs-303Software Engineering & Project Management

Concepts of Software Engineering, Software Characteristics, components applications, software Metrics and Models; Process and Product Metrics, Size metric, Complexity metric, McCabe's Cyclometic Complexity, Halsted Theory, Function Point Analysis.

System Development Life Cycle (SDLC) Steps, Water fall model, Prototypes, Spiral model. Planning and Software Project: Cost Estimation, Project Scheduling, Quality Assurance Plans, project Monitoring Plans.

Software Development & Software Design : System design, detailed design, function oriented design, object oriented design user Interface design, Design level metrics: Phases, Process Models, Role of Management, Role of Metrics and Measurement, Software Quality factors,

Coding and Testing: Programming Practices, verification, Monitoring and Control. Testing level metrics Software quality and reliability Clean room approach, software reengineering.

Testing & Reliability: Testing Fundamentals, Test case design, Functional Testing, Structural Testing, Test Plan activities during testing, Unit System , Integration Testing. Concept of Software Reliability, Software Repair and Availability, Software Errors and Faults Reliability Models (JM, GO, MUSA Markov) Limitations of Reliability Models

Duration: 3 hours	**Max Marks: 50**

bcs-304 Web Technologies

Internet – current state, hardware and software requirement, ISP, an internet account, web home page, URL, browser, security on web, searching tools, search engines, FTP, Gopher, Telnet, emails, TFTP

Web browser architecture, web page and multimedia, static dynamic and active web page, simple mail transfer protocol, simple network management protocol, hypertext transfer protocol

Basics of PHP: Introduction to PHP, what does PHP do? ,history of PHP , language basics ,data types , variables , expressions and operators , flow control statements , including code , embedding PHP in web pages.

Functions & Strings: Calling a function, defining a function, variable scope, function parameters, return values, variable functions, anonymous functions. Strings: Accessing individual characters, cleaning strings, encoding and escaping, comparing strings, manipulating and searching strings, regular expressions.

Arrays & Objects: Indexed vs. associative arrays, identifying elements of an array, storing data in arrays, multidimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays, sorting. Objects: Creating an object, accessing properties and methods, declaring a class, introspection.

MySQL Overview: Introduction, connecting to and disconnecting from the server , Entering queries , Creating and using a database , Creating and selecting a database , creating a table , loading data into a table , Retrieving information from a table , selecting all data , selecting particular rows , selecting particular columns , sorting rows , date calculations , working with NULL values , pattern matching , counting rows , using more than one tables.

MySQL databases in PHP: Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.

JavaScript - JavaScript Introduction , Variable, If-Else, Switch, Operators, Popups, Functions,Iterator functions, Loops, Forms, Events, and Event Handling, Try-Catch, Introduction to JavaScript Objects, JS Built-in Objects:Array,String , Date , window, document, navigator, status, history, location. Event handling, DOM, dynamically adding, removing and replacing DOM

Duration: 3 hours	**Max Marks: 50**

bcs-305Digital Design Using VHDL

Introduction & Behavioural Modelling
Introduction to HDLs: Difference between HDL and other software languages – Different HDLs in vogue. Overview of digital system design using HDL

Basic VHDL Language Elements: Identifiers, Data objects, scalar and composite data types, Operators

Behavioural Modelling with examples: Entity declaration, Architecture body, Process statement and sequential statements. Inertial and transport delay models, creating signal waveforms, signal drivers, effect of transport and inertial delays on signal drivers.

Data Flow and Structural Modelling
Data Flow Modelling with examples: Concurrent signal assignment statement, Concurrent versus sequential signal assignment, Delta delays, Multiple drivers, Conditional signal assignment statement, selected signal assignment statement, concurrent assertion statement.

Structural Modelling with examples: Component declaration, Component instantiation and examples, direct instantiation of component.

Subprograms and Packages
Subprograms and Overloading: Functions and procedures with simple examples –subprogram overloading, Operator overloading.

Packages and Libraries: Package declaration, package body, design file, design libraries, order of analysis, implicit visibility, explicit visibility, library clause and use clause.

Advanced Features: Entity statements, Generate statements, Attributes, Aggregate targets, ports and their behaviour.

Simulation and Hardware modelling

Model Simulation: Simulation – Writing a Test Bench for a Half and a Full adder.

Hardware Modelling Examples: Modelling entity interfaces, Modelling simple elements, Different styles of modelling, Modelling regular structures, Modelling delays, Modelling conditional operations, Modelling a clock divider and a pulse counter.

Duration: 3 hours	**Max Marks: 50**

bcs-306 Internet of Things

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

IOT Data Link Layer & Network Layer Protocols PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Transport & Session Layer Protocols, Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

Service Layer Protocols & Security, Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer