

MANGALORE UNIVERSITY



**National Education Policy – 2020
[NEP-2020]**

CURRICULUM STRUCTURE

FOR

**V AND VI SEMESTER B.Sc.
COMPUTER SCIENCE**

Model Curriculum for B.Sc

Semester	Course No	Theory/Practical	Credits	Paper Title	S.A	L.A
V	DSC5	Theory	4	Programming in Python	60	40
	DSC5-Lab	Practical	2	Python Programming Lab	25	25
	DSC6	Theory	4	Computer Networks	60	40
	DSC6-Lab	Practical	2	Computer Networks Lab	25	25
	SEC-4	Theory	3	Employability skills	60	40
VI	DSC8	Theory	4	Web Technologies	60	40
	DSC8-Lab	Practical	2	Web Technologies Lab - Java Script, HTMS, CSS Lab	25	25
	DSC9	Theory	4	Statistical Computing & R Programming	60	40
	DSC9-Lab	Practical	2	R Programming Lab	25	25
	SEC-5	Theory/Practical	2	Internship	30	20

V SEMESTER

Program Name	B.Sc	Semester	V
Course Title	Programming in Python (Theory)		
Course Code:	DSC5	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Setup python to develop simple applications
- Understand the basic concepts in Python Programming
- Learn how to write, debug and execute Python programs
- Understand and demonstrate the use of advanced data types such as tuples, dictionaries and lists, Tuples and Sets
- Design solutions for problems using object-oriented concepts in Python
- Use and apply the different Python Libraries for GUI Interface, Data Analysis and Data Visualization.
- Extend the knowledge of python programming to build successful career in software development.

Unit	Description	Hours
1	<p>Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program.</p> <p>Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples.</p> <p>Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.</p> <p>Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally.</p> <p>Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions</p>	13

2	<p>Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods.</p> <p>Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists.</p> <p>Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.</p> <p>Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.</p>	13
3	<p>File Handling: File Types; Operations on Files- Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.</p> <p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place</p>	13
4	<p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records.</p> <p>Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.</p> <p>Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart</p>	13
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019. 2. R. Nageswara Rao, "Core Python Programming", Dreamtech. <p>References:</p>		

Program Name	B.Sc	Semester	V
Course Title	Python Programming Lab (Practical)		
Course Code:	DSC5-Lab	No.of Credits	02
Contact hours	04 Hours	Duration of SEA/Exam	3 hour
Formative Assessment Marks	25 Marks	Summative Assessment Marks	25 Marks

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:4 Marks Execution:4Marks	8 Marks
Program-2	PART-B Writing:6 Marks Execution:6Marks	12 Marks
Practical Record		05 Marks
Total		25 Marks

Program Name	B.Sc	Semester	V
Course Title	Computer Networks (Theory)		
Course Code:	DSC6	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

- After the successful completion of the course, the student will be able to:
- Define various data communication components in networking.
- Describe networking with reference to different types of models and topologies.
- Understand the need for Network and various layers of OSI and TCP/IP reference model.
- Explain various Data Communications media.
- Describe the physical layer functions and components CO6 Identify the different types of network topologies and Switching methods.
- Describe various Data link Layer Protocols.
- Identify the different types of network devices and their functions within a network.
- Analyze and interpret various Data Link Layer and Transport Layer protocols.
- Explain different application

Unit	Description	Hours
1	Introduction: Uses of Computer Networks and its Applications- Business Applications, Home Applications, Mobile Users, Social Issues. Network Topologies: Bus, Star, Ring Network Hardware- Local Area Networks, Metropolitan Area Networks, Wide Area Networks, and Internetworks. Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.	13
2	The Physical Layer: Transmission Media- Twisted Pair, Coaxial Cable and Fiber Optics. Wireless Transmission- Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing-Frequency division, time division, code division, Switching. The Data Link Layer: Data link layer design issues-Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction-Error-Correcting Codes, Error -Detecting Codes. Elementary Data Link Protocols-An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol for an Error-Free Channel, A Simplex Protocol for a Noisy Channel. Sliding Window Protocols -A One Bit Sliding Window Protocol, A Protocol Using Go back n, A Protocol using Selective Repeat.	13

3	<p>The Network Layer: Network layer design issues-Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual Circuit and Datagram Networks. Routing Algorithms-Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing. Congestion Control Algorithms- Approaches to Congestion Control, Approaches to Congestion Control, Admission Control. The network layer in the Internet-The IP Version 4 Protocol, IP Address, IP Version 6, Internet Control Protocol, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP.</p>	13
4	<p>The Transport Layer: The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, connection Release, Error control and Flow Control. The Internet Transport Protocols-(TCP and UDP)-UDP- Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window,</p> <p>The Application Layer: DNS – Domain Name System-The DNS Name Space, Domain Resource Records, Name Servers. Electronic Mail-Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web- Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP-The HyperText Transfer Protocol</p>	13
<p>Text Book</p> <ol style="list-style-type: none"> 1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010. <p>References:</p> <ol style="list-style-type: none"> 1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw Hill, 2001. 2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017. 3. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012. 4. Data Communication & Network, Dr. Prasad, Wiley Dreamtech. 5. http://highered.mheducation.com/sites/0072967757/index.htmls 		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

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Program Name	B.Sc.	Semester	V
Course Title	Computer Networks Laboratory (Practical)		
Course Code:	DSC6 Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

PART-A-Network Simulation using NS simulator

PART-B-Implementation of networking algorithm using JAVA.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:4 Marks Execution:4Marks	8 Marks
Program-2	PART-B Writing:6 Marks Execution:6Marks	12 Marks
Practical Record		05 Marks
Total		25 Marks

Links for open source simulation software:

- o NS3 software: <https://www.nsnam.org/releases/ns-3-30/download/>
- o Packet Tracer Software: <https://www.netacad.com/courses/packet-tracer>
- o GNS3 software: <https://www.gns3.com/>

Links for open source simulation software:

<https://www.nsnam.com/2018/06/installation-of-ns2-in-ubuntu-1804.html#:~:text=Unlike%20earlier%20version%20of%20ubuntu,then%20ns2%20and%20the%20configuration>

<https://www.howtoinstall.me/ubuntu/18-04/nam/>

Program Name	BSC	Semester	V
Course Title	Employability skills (Theory)		
Course Code:	SEC-5	No.of Credits	03
Contact hours	48 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Program Name	B.Sc.	Semester	VI
Course Title	Web Technologies (Theory)		
Course Code:	DSC8	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- CO1. Understand basics of web technology
- CO2. Recognize the different Client-side Technologies and tools like, HTML, CSS, JavaScript
- CO3. Learn Java Servlets and JDBC
- CO4. Web Technology for Mobiles and Understand web security

Unit	Description	Hours
1	Introduction and Web Design: Introduction to Internet, WWW and Web 2.0, Web browsers, Web protocols and Web servers, Web Design Principles and Web site structure, client-server technologies, Client side tools and technologies, Server side Scripting, URL, MIME, search engine, web server- Apache, IIS, proxy server, HTTP protocol. Introductions to HTML. HTML5 Basics tags, Formatting tags in HTML, HTML5 Page layout and Navigation concepts, Semantic Elements in HTML, List, type of list tags, tables and form tags in HTML, multimedia basics, images, iframe, map tag, embedding audio and video clips on webpage.	13
2	Introduction to XML: XML Syntax, XML Tree, Elements, Attributes, Namespace, Parser, XSLT DOM, DTD, Schema. Introduction to CSS, CSS syntax, CSS selectors, CSS Background Cursor, CSS text fonts, CSS-List Tables, CSS Box Modeling, Display Positioning, Floats, CSS Gradients, Shadows, 2D and 3 Transform, Transitions, CSS Animations.	13
3	Introduction to JavaScript: JavaScript Data type and Variables, JavaScript Operators, Conditional Statements, Looping Statements, JavaScript Functions, Number, Strings, Arrays, Objects in JavaScript, Window and Frame objects, Event Handling in JavaScript, Exception Handling, Form Object and DOM, JSON, Browser Object Model.	13
4	Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, reading initialization parameters, Handling HTTP Request	13

Program Name	B.Sc.	Semester	VI
Course Title	Statistical Computing & R Programming(Theory)		
Course Code:	DSC9	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- CO1. Explore fundamentals of statistical analysis in R environment.
- CO2. Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- CO3. Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- CO4. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- CO5. Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

Unit	Description	Hours
1	Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting.	13
2	Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand- alone statement with illustrations in exercise, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility. Basic Data Visualization.	13
3	<p>Descriptive Statistics: Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Percentiles, Quartiles, Measures of Variability, Mean Absolute Deviation Range, Inter-Quartile-Range, Standard Deviation, Z-Scores. Coefficient of Variation, Measure of shape- Skewness and Kurtosis, Bar Chart, Pie Chart and Box Plot, Histogram, Frequency Polygon, Stem and Leaf Diagram.</p> <p>Probability, Probability and Sampling Distribution: Methods of assigning probability, Structure of probability, Marginal, union, joint and conditional probabilities. Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution, Uniform Distribution. Estimating the population mean using the and t-distribution.</p>	13

Program Name	B.Sc.	Semester	VI
Course Title	Web Technologies Lab		
Course Code:	DSC8-Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:4 Marks Execution:4Marks	8 Marks
Program-2	PART-B Writing:6 Marks Execution:6Marks	12 Marks
Practical Record		05 Marks
Total		25 Marks

Program Name	B.Sc.	Semester	VI
Course Title	R Programming Lab		
Course Code:	DSC9-Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:4 Marks Execution:4Marks	8 Marks
Program-2	PART-B Writing:6 Marks Execution:6Marks	12 Marks
Practical Record		05 Marks
Total		25 Marks

Program Name	B.Sc	Semester	VI
Course Title	Internship		
Course Code:	SEC-5	No.of Credits	02
Contact hours	30 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	20	Summative Assessment Marks	30

GUIDELINES FOR CONDUCTING INTERNSHIP:

Internships can cover a wide range of concepts and topics and some common concepts that can be covered under various types of internships:

- **Technical Skills**

- Depending on the field, interns can develop technical skills such as programming languages, software tools, data analysis, design software, and more.

- **Soft Skills:**

- Communication: Written and verbal communication skills, including effective email communication, presentations, and client interactions.
- Teamwork: Collaborating with colleagues, working in cross-functional teams, and building effective relationships.
- Time Management: Prioritizing tasks, managing deadlines, and staying organized.
- Problem Solving: Analyzing challenges, identifying solutions, and making informed decisions.

- Adaptability: Handling changes, learning new processes, and adjusting to evolving situations.
- **Innovation and Entrepreneurship:**
 - Exploring innovative business ideas, product development, market research, and business model creation.
- **Data Analytics and Interpretation:**
 - Learning how to work with data, perform analysis, and derive insights to inform decision-making.
- **Leadership and Management:**
 - Developing leadership skills, understanding different management styles, and learning how to motivate teams.

These are just a few examples of the many concepts that can be covered in internship programs. The specific concepts/coverage of the above will vary based on college infrastructure and faculty competence. It is important to tailor the internship experience to align with the interns' career goals and the industry needs.

Evaluation:

The report shall be prepared by the student under the guidance of the identified mentor in the college and submitted to the Head of the Department for evaluation. The report shall be evaluated by the two internal faculty members and submit the final sessional and summative marks to the university.