NATIONAL EDUCATION POLICY-2020

Common Minimum Syllabus for all Uttarakhand State Universities and Colleges for First Three Years of Higher Education

PROPOSED STRUCTURE OF
UG – INFORMATION TECHNOLOGY
SYLLABUS

2021

Curriculum Design Committee, Uttarakhand

Sr.No.	Name & Designation	
1.	**Prof. N.K. Joshi** Vice-Chancellor , Kumaun University Nainital	Chairman
2.	**Prof. O.P.S. Negi** Vice-Chancellor , Uttarakhand Open University	Member
3.	**Prof. P. P. Dhyani** Vice-Chancellor , Sri Dev Suman Uttarakhand University	Member
4.	**Prof. N.S. Bhandari** Vice-Chancellor, Soban Singh Jeena University Almora	Member
5.	**Prof. Surekha Dangwal** Vice-Chancellor, Doon University, Dehradun	Member
6.	**Prof. M.S.M. Rawat** Advisor, Rashtriya Uchchatar Shiksha Abhiyan, Uttarakhand	Member
7.	**Prof. K. D. Purohit** Advisor, Rashtriya Uchchatar Shiksha Abhiyan, Uttarakhand	Member

Syllabus Developed By

S.No.	Name	Designation	Department	Affiliation
1.	Dr. Ashish Mehta	Associate Professor, Convener & Head	Department of Computer Science	D. S. B. Campus, Kumaun University, Nainital

Syllabus Moderated By

S.No.	Name	Designation	Department	Affiliation
1.	Prof. M.C. Joshi	Professor & Head	Department of Information Technology	D. S. B. Campus, Kumaun University, Nainital
2.	Dr. Ashish Mehta	Associate Professor, Convener & Head	Department of Computer Science	D. S. B. Campus, Kumaun University, Nainital
3.	Dr. Ashutosh Kumar Bhatt	Associate Professor	School of Computer Sciences & Information Technology	Uttarakhand Open University
4.	Dr. Jeetendra Pande	Associate Professor	School of Computer Sciences & Information Technology	Uttarakhand Open University
5.	Dr. Parul Saxena	Assistant Professor	Department of Computer Science	S.S.J. University, Almora
6.	Dr. Manoj Kumar Bisht	Assistant Professor	Department of Computer Science	S.S.J. University, Almora
7.	Mrs. Umang	Assistant Professor & Head	Department of Information Technology	S.S.J. University, Almora

Department of Information Technology

Semester-wise Titles of the Papers in Information Technology					
Year	**Semester**	**Course Code**	**Course Title**	**Theory /Practical**	**Credits**
Certificate in Science					
First Year	I	IT101	Information System for Business	Theory	4
		IT103	Lab: Office Automation	Practical	2
			Minor Elective Paper [one from the list] EL1*	Theory	4
	II	IT102	Computer Networks and Web Technology	Theory	4
		IT104	Lab: Web Technology	Practical	2
			Minor Elective Paper [one from the list] EL1*	Theory	4
Diploma in Science					
Second Year	III	IT201	Computer Application in Business: Databases	Theory	4
		IT203	Lab: Computer Application in Business: Databases	Practical	2
			Minor Elective Paper [one from the list] EL2**	Theory	4
	IV	IT202	Introduction to Computer Programming	Theory	4
		IT204	Lab: Programming LAB	Practical	2
			Minor Elective Paper [one from the list] EL2**	Theory	4
Bachelor of Science (with specialization in I.T.)					
Third Year	V	IT301	Programming with Python	Theory	4
		IT303	Lab: Programming python	Practical	2
		IT305	Introduction to Cyber Security	Theory	4
		IT307	Industrial Training/Research Project		Qualifying
	VI	IT302	Operating Systems	Theory	4
		IT304	Lab: Shell Programming	Practical	2
		IT306	Cloud Computing	Theory	4
		IT308	Industrial Training/Research Project		Qualifying

*List of Elective Papers EL1			
S. No.	**Course Code**	**Course Title**	**To be Opted in the Semester**
1	IT101	Information System for Business	I
2	IT105E	Web Based Technologies and Multimedia Applications (SWYAM) https://onlinecourses.swayam2.ac.in/nou22_cs03/preview	I/II
3	IT106E	Introduction to Cyber Security (SWYAM) https://onlinecourses.swayam2.ac.in/nou22_cs04/preview	I/II
4	IT107E	Moodle Learning Management System (SWYAM) https://onlinecourses.swayam2.ac.in/aic20_sp27/preview	I/II
****List of Elective Papers EL2**			
S. No.	**Course Code**	**Course Title**	**To be Opted in the Semester**
1	IT201	Computer Application in Business: Databases	III
2	IT205E	PHP and MySQL (SWYAM) https://onlinecourses.swayam2.ac.in/aic20_sp27/preview	III/IV
3	IT206E	Cyber Security Tools Techniques and Counter Measures (SWYAM) https://onlinecourses.swayam2.ac.in/nou22_ge24/preview	III/IV

Programme Prerequisites:

1. Students must have passed their 10+2 level of education from a recognised educational Board.
2. Keen Interest in computer & information technology.

Programme Introduction

B.Sc. I.T. is a 3 years long Undergraduate program. As the name suggests, this program revolves around the field of Information Technology. Basically, B.Sc. IT, is all about storing, processing, securing and managing Information. Information Databases, Networks, software development & testing and programming etc are some of the vital topics that one will come across in this program.

B.Sc. (Information Technology) degree is the comprehensive course that involves the study of computing technology, covering everything from installing applications to designing complex computer networks and information databases. This degree course includes the study of software development, databases, computer networking, web design, programming, etc.

Programme outcomes (POs): Through completion of the Bachelor of Science in Information Technology programme, students will:

PO 1	Apply knowledge of computing requirements and mathematics for technology solutions in business applications. ✓ Apply knowledge of applications development. ✓ Develop scripts for information technology applications. ✓ Develop computer code for business applications. ✓ Create, install, and configure virtual machines.
PO 2	Analyze a problem and identify and define the computing requirements for the appropriate solutions. ✓ Plan, install, manage, and troubleshoot a computer network. ✓ Apply telecommunications principles to design and configure a network. ✓ Plan and implement security technology.
PO 3	Design and use spreadsheets and data applications for business processes and tracking. ✓ Use spreadsheets for business applications and project tracking. ✓ Design a relational database using Microsoft Access.
Programme specific outcomes (PSOs) Certificate in Science	
PSO 1	Understand the fundamental concepts like what is information, how it can be managed must be acknowledged in business.
PSO 2	Understand the basic concepts of computer networks and various switching techniques.
PSO 3	Build web applications using HTML, JavaScript and PHP
Programme specific outcomes (PSOs) Diploma in Science	
PSO 1	Understand basic concepts of Databases
PSO 2	Learn fundamentals of Computer Programming.
Programme specific outcomes (PSOs) Bachelor of Science (with specialization in Information Technology)	
PSO 1	Illustrate the process of problem solving using Python programming language and apply solutions to real world problems.
PSO 2	To understand the basics of cyber security.
PSO 3	To Gain knowledge of the fundamentals and intermediate-level concepts of Operating Systems.

Year wise Structure of B.Sc. in Information Technology (CORE / ELECTIVE COURSES & PROJECTS)												
Subject: Information Technology												
Type of Programme	**Year**	**Sem**	**Paper I**	**Credits /hrs**	**Paper 2**	**Credits /hrs**	**Paper 3**	**Credits /hrs**	**Elective Paper**	**Credits /hrs**	**Research Project**	**Credit/hrs**
Certificate	I	I	Information System for Business	4/60	Lab: Office Automation	2/60			* Minor Elective Paper [from the list] EL1	4/60		
		II	Computer Networks and Web Technology	4/60	Lab: Web Technology	2/60						
Diploma	II	III	Computer Application in Business: Databases	4/60	Lab: Computer Application in Business: Databases	2/60			** Minor Elective Paper [from the list] EL2	4/60		
		IV	Introduction to Computer Programming	4/60	Lab: Programming LAB	2/60						
Bachelor of Science	III	V	Programming with Python	4/60	Lab: Programming python	2/60	Introduction to Cyber Security	4/60			Industrial Training/Research Project	Qualifying
		VI	Operating Systems	4/60	Lab: Shell Programming	2/60	Cloud Computing	4/60			Industrial Training/Research Project	Qualifying

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT101	**Course Title:** Information System for Business		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Remember the role of Information System in an organization.		
CO 2:	Understand terminologies related to Information System.		
CO 3:	Analyze the development process of an Information System.		
CO 4:	Understand ethics and responsibilities of a person and organization in a Digital Age.		
Credits: 4	**Core Compulsory and Minor elective for students of other Subject/Faculty**		
Max. Marks:25+75	**Min. Passing Marks:**		

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	What is an Information System, Components of Information System, Role of Information System, System hardware, Moore's Law, Role of Software in an organization, Types of Software,	12
II	Data and Databases, Types of Database, Big Data, Data Warehouse, Networking and Communication, History of Internet, Organizational Networking, Information System Security Triad, Tools of Information Security, Personel Information Security.	12
III	Why IT matters, Collaborative Systems, Decision Support Systems, Business process, role of Information System in Business process, ERP Systems, People in Information System, emerging roles.	12
IV	Information System Development, System Development Lifecycle, Types of Programming Languages, What is Globalization, Impact of Internet on Globalization, what is digital divide, Steps to alleviate Digital Divide	12
V	Ethics in Information System, Intellectual Property and Copyright, Patent, Responsibilities of individual, organization and government in Information Age, Future Trends in Information System.	12

Suggested Readings:

- Information Systems for Business and Beyond by David T. Bourgeois, PhD, The Saylor Academy.
- Business Information Systems, 5th edn by Paul Bocji, Pearson.
- Principle of Information System, Ralph Stair.

Suggested equivalent online courses:

- https://onlinecourses.swayam2.ac.in/cec21_ge05/preview

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** I
Course Code: IT103		**Course Title:** Lab: Office Automation	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	create and format a word document, presentations and files		
CO 2:	formatting the worksheets		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic / Lab Experiment List	No. of Lectures
	1. Create a news-paper document with at least 200 words, • Use margins as, top:1.5, bottom:2, left:2, right:1 inches. • Use heading "Gandhi Jayanti", font size: 16, font color: red, font face: Arial Black. • With first letter "dropped" (use drop cap option) of the first paragraph containing a picture at the right side • Use three columns from the second paragraph onwards till the half of the page. • Then use heading "Computer basics" • Create paragraph using two columns till the end of the page. 2. Create a Mathematical question paper using, at least five equations • With fractions, exponents, summation function • With at least one „m*n" matrix • Basic mathematical and geometric operators. • Use proper text formatting, page color and page border. 3. Create a flowchart using • Proper shapes like ellipse, arrows, rectangle, and parallelogram. • Use grouping to group all the parts of the flowchart into one single object. 4. Create a table using table menu with, • At least 5 columns and 10 rows. • Merge the first row into one cell. • Merge the second row into one cell, then split the second row into three cells. • Use proper table border and color. • Insert proper content into the table with proper text formatting. 5. Create a table using two columns, • The left column contains all the short-cut keys and right side column contains the function of the short-cut keys. • Insert a left column using layout option. Name the heading as Serial No. 6. Create two letters with the following conditions in Ms Word and find the difference. • Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use "justify" text alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing. • Use step by step mail-merge wizard to design a letter. 7. Create a letter, which must be sent to multiple recipients.	**60**

- Use Mail-Merge to create the recipient list.
- Use excel sheet to enter the recipient.
- Start the mail merge using letter and directory format. State the difference.

8. Create a table “Student result” with following conditions.
   - The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average and result with manual entry.
   - Use formulas for total and average.
   - Find the name of the students who has secured the highest and lowest marks.
   - Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively).
9. Create a power-point presentation with minimum 5 slides.
   - The first slide must contain the topic of the presentation and name of the presentation.
   - Must contain at least one table.
   - Must contain at least 5 bullets, 5 numbers.
   - The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.
   - The body must be, font size: 24, font-face: Comic Sans MS, font-color: green.
   - Last slide must contain “thank you”.
10. Create a power-point presentation with minimum 10 slides
    - Use word art to write the heading for each slides.
    - Insert at least one clip-art, one picture
    - Insert at least one audio and one video
    - Hide at least two slides
11. Create a power-point presentation with minimum 5 slides
    - Use custom animation option to animate the text; the text must move left to right one line at a time.
    - Use proper transition for the slides.
12. Create a database “Student” with,
    - At least one table named “mark sheet” with field name “student name, roll number, mark1, mark2, mark3, mark4, total”
    - The data types are, student name: text, roll number: number, mark1 to mark4: number, total: number. Roll number must be the primary key.
    - Enter data in the table. The total must be calculated using update query.
    - Use query for sorting the table according to the descending/ascending order of the total marks.

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** II
Course Code: IT102		**Course Title:** Computer Networks and Web Technology	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the basic concepts of computer networks and various switching techniques.		
CO 2:	Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.		
CO 3:	Create web pages using HTML and Cascading Styles sheets, JavaScript.		
CO 4:	Build web applications using PHP.		
Credits: 4		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	**Introduction to Computer Networks:** Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. back-bone networks- repeaters, hubs, switches, bridges, router and gateways.	15
II	**Networks Switching Techniques and Access mechanisms:** Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.	10
III	**Introduction to HTML:** Basics of HTML, formatting and fonts, commenting code, hyperlink, lists, tables, images, forms, Meta tags, Character entities, frames and frame sets, Overview and features of HTML5. **Style Sheets:** Need for CSS, Introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3	15
IV	**Introduction to JavaScript:** JavaScript Variables and Data Types, Declaring Variables, Data Types, Statements and Operators, Control Structures, Conditional Statements, Loop Statements, Object-Based Programming, Functions, Executing Deferred Scripts, Objects, Message box in JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array.	10
V	**PHP:** Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP**.**	10

Suggested Readings:

- Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Prentice Hall, 2007
- JavaScript: The Good Parts by Douglas Crockford
- HTML5 for Web Designers by Jeremy Keith
- The Art and Science of CSS: Create Inspirational, Standards-Based Web Designs by Cameron Adams
- Headfirst PHP & MySQL by Lynn Beighley & Michael Morrison
- B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007
- A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002

Suggested equivalent online courses:

- https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
- https://onlinecourses.swayam2.ac.in/nou20_cs05/preview
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Students must have passed their 10+2 level of education from a recognized educational Board.

Subject: Information Technology			
Programme/Class: Certificate		**Year:** 1st	**Semester:** II
Course Code: IT104	**Course Title:** Lab: Web Technology		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's		
CO 2:	Create web pages using HTML and Cascading Styles sheets ,JavaScript and PHP		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic / Lab Experiment List	No. of Lectures
	1. Design the following static web pages required for online book store. a) Home page: - the static home page must contains three pages b) Top frame:- logo and college name and links to homepage, login page, registration Page, catalogue page and cart page c) Left frame:- at least four links for navigation which will display the catalogue of Respective links d) Right frame:- the pages to links in the left frame must be loaded here initially it Contains the description of the website. 2. Write *JavaScript* to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty). 3. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size). 4. Develop and demonstrate the usage of inline, internal and external style sheet using CSS . 5. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert 6. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters. 7. Develop and demonstrate PHP Script for the following problems: a) Write a PHP Script to find out the Sum of the Individual Digits.	**60**

b) Write a PHP Script to check whether the given number is Palindrome or not.

8. Write a PHP Program to display current Date, Time and Day.
9. Write a program to design a simple calculator using (a) JavaScript (b) PHP
10. Implement the following web application using (a) PHP (b) HTML: A web application that takes a name as input and on submit it shows a hello <name> page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name > message with the duration of usage (hint: Use session to store name and time).

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Subject: Information Technology			
Programme/Class: Diploma		**Year:** 2nd	**Semester:** III
Course Code: IT201		**Course Title:** Computer Application in Business: Databases	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand terms related to database design and management		
CO 2:	Assess various database models.		
CO 3:	Evaluate the normality of a logical data model, and correct any anomalies		
CO 4:	Implement relational databases using Real World Data		
Credits: 4		**Core Compulsory AND Minor elective for students of other Subject/Faculty**	
Max. Marks: 25+75		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction: Characteristics of database approach, Advantages, Database system architecture, Overview of different types of Data Models and data independence, Schemas and instances, Database languages and interfaces; E-R Model : Entities, Attributes, keys, Relationships, Roles, Dependencies, E-R Diagram.	**12**
II	Introduction to Relational model, Constraints: Domain, Key, Entity integrity, Referential integrity; Keys: Primary, Super, Candidate, Foreign; Relational algebra: select, project, union, intersection, cross product, different types of join operations.	**12**
III	Normalization: Definition, Functional dependencies and inference rules, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.	**12**
IV	Indexing: Files, Blocks, and Records, Hashing; RAID; Replication; Single-Level and Multi-Level Indexes; B-Trees and B+-Trees. Transactions processing: Definition, desirable properties of transactions, serial and non-serial schedules, concept of serializability, conflict-serializable schedules.	**12**
V	SQL: Data Types, statements: select, insert, update, delete, create, alter, drop; views, SQL algebraic operations; Stored procedures: Advantages, Variables, creating and calling procedures, if and case statements, loops, Functions, Triggers.	**12**

Suggested Readings:

- Elmasri's and Navathe's Fundamentals of Database Systems. Addison-Wesley
- Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education
- Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education

Suggested equivalent online courses:

- https://onlinecourses.swayam2.ac.in/nou21_cm02/preview
- https://onlinecourses.nptel.ac.in/noc20_cs60/preview
- https://www.classcentral.com/course/swayam-bcos-183-computer-application-in-business-23768
- https://www.careers360.com/courses-certifications/swayam-database-management-courses-brp- org

This course can be opted as an elective by the students of following subjects: students of other Subject/Faculty

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Certificate

Subject: Information Technology			
Programme/Class: Diploma		**Year:** 2nd	**Semester:** III
Course Code: IT203	**Course Title:** Lab: Computer Application in Business: Databases		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	practice the concepts learnt in the theory by designing and querying a database for a chosen organization		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic / List of Experiments	No. of Lectures
	1. **E-R Model :** Analyze the organization and identify the entities , attributes and relationships in it. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any. 2. **Concept design with E-R Model:** Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). 3. **Relational Model:** Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion. 4. **Normalization:** Apply the First, Second and Third Normalization levels on the database designed for the organization 5. **Installation of Mysql and practicing DDL commands:** Installation of MySql. Creating databases, How to create tables, altering the database, dropping tables and databases if not required. Try truncate, rename commands etc. 6. **Practicing DML commands on the Database created for the example organization:** DML commands are used to for managing data within schema objects. Some examples: SELECT - retrieve data from the a database, INSERT - insert data into a table, UPDATE - updates existing data within a table, DELETE - deletes all records from a table, the space for the records remains. 7. **Querying:** practice queries (along with sub queries) involving ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Subject: Information Technology		
Programme/Class: Diploma	**Year:** 2nd	**Semester:** IV
Course Code: IT202	**Course Title:** Introduction to Computer Programming	
Course outcomes:	On completion of the course, the student will be able to:	
CO 1:	Acquire the Knowledge of the structure and model of the Java programming language	
CO 2:	Use the Java programming language for various programming technologies	
Credits: 4	**Core Compulsory**	
Max. Marks: 25+75	**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0		

Unit	Topic	No. of Lectures
I	Introduction: Java Essentials, Its characteristics, Execution and Compilation, Data types, Variables, Control Statements, Standard Input/ Output.	15
II	Constructors, Object Oriented Concepts: Encaptulation, Abstraction, Inheritance, Polymorphisms, JAVA Packages.	15
III	Exception Handling, Wrapper Classes, Autoboxing, Multi-thread Programming.	15
IV	Applets, Event Handling, AWT, Database Handling using JDBC.	15

Suggested Readings:

- E Balaguruswamy, Programming with JAVA, A Primer (5e), Kindle Edition
- Bruce Eckel, Thinking in Java (4e)
- Herbert Schildt, Java: The Complete Reference (9e)
- Y. Daniel Liang, Introduction to Java Programming (10e)
- Paul Deitel, Harvey Deitel, Java: How To Program (10e)
- Cay S. Horsttnann, Core Java Volume I –Fundamentals (10e)

Suggested equivalent online courses:

- https://onlinecourses.nptel.ac.in/noc19_cs84/preview
- https://onlinecourses.nptel.ac.in/noc21_cs56/preview

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Certificate

Subject: Information Technology			
Programme/Class: Diploma		**Year:** 2nd	**Semester:** IV
Course Code: IT204		**Course Title:** Lab: Programming LAB	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	practice the concepts learnt in the theory of computer programming		
CO 2:	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	List of Experiments	No. of Lectures
	Students are required to implement object-oriented paradigm using JAVA. Below is the list of some of the experiments: 1. Program on strings: Check the equality of two strings, Reverse a string. 2. Program using loops: to find the sum of digits of a given number, display a multiplication table, display all prime numbers between 1 to 1000. 3. Program to demonstrate all math class functions. 4. Program on files: to copy a file to another file using Java to package classes. 5. Program to demonstrate method over-riding and overloading 6. Programs on inheritances. 7. Multi-threaded programming.	60

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Course Prerequisites: Certificate

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** V
Course Code: IT301		**Course Title:** Programming with Python	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand basics of Python		
CO 2:	Illustrate the process of problem solving using python and apply solutions to real world problems.		
Credits: 4		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Introduction and Overview: Overview of Python Programming: Structure of a Python Program, Elements of Python, Python Interpreter, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings.	10
II	Operators and Statements: Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). Creating Python Programs: Input and Output Statements.	12
III	Decision making and Branching: Control statements (Branching, Looping, Conditional Statement, Difference between break, continue and pass, default arguments. Defining Functions.	12
IV	Classes and Objects: An introduction to object-oriented programming in Python. objects, operator overloading, overriding, special methods. Inheritance, polymorphism and composition.,	12
V	Iterators and Generators: Iteration protocol, Iterable objects, generators and generator expressions. Use of generators, assertions. Testing and debugging of a python project.	14

Suggested Readings:

- T. Budd, Exploring Python, TMH, 1st Ed, 2011
- Python Tutorial/Documentation www.python.or 2015
- Allen Downey, Jeffrey Elkner, Chris Meyers, how to think like a computer scientist: learning with Python, Freely available online.2012

Suggested equivalent online courses:

- https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
- https://onlinecourses.nptel.ac.in/noc19_cs40/preview

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Diploma

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** V
Course Code: IT303		**Course Title:** Lab: Programming python	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand basics of Python		
CO 2:	Illustrate the process of problem solving using python and apply solutions to real world problems.		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4

Unit	Topic / Lab Experiment List	No. of Lectures
	• Write a program to demonstrate different number data types in Python. • Write a program to perform different Arithmetic Operations on numbers in Python. • Write a programs to perform different String Operations. • Write programs to showcase the python time library. • Write a program to demonstrate working with lists in python. • Write a program to demonstrate working with tuples in python. • Write a program to demonstrate working with dictionaries in python. • Write programs to demonstrate the uses of functions. • Demonstrate the use of *args, **kwargs in python. • Write Programs to showcase use of lambda functions. • Write a python program to define a module and import a specific function in that module to another program. • Write Programs for file operations in python. • Write programs to demonstrated the working of generator. • Implement programs to showcase the uses of Iterators. • Demonstrate OOPs Capabilities of python language. • Demonstrate Exception Handling features of Python. • Write testing cases for python programs.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Course Prerequisites: Diploma

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** V
Course Code: IT305	**Course Title:** Introduction to Cyber Security		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the concepts of cyber security and data privacy in today's environment.		
CO 2:	Obtain the understanding of how automation is changing the concepts and expectations concerning privacy and the increasingly interconnected issue of security.		
Credits: 4		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0			

Unit	Topic	No. of Lectures
I	Basic Cyber Security Concepts: Introduction to Cyber Security, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy, Nodal Authority, International convention on Cyberspace.	12
II	Basic Data Privacy Concepts: Fundamental Concepts, Definitions, Statistics, Data Privacy Attacks, Data linking and profiling, access control models, role based access control, Discretionary and mandatory access control, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.	12
III	Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities – Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Poor Cyber Security Awareness. Cyber Security Safeguards – Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	12
IV	Data explosion: Statistics and Lack of barriers in Collection and Distribution of Person-specific information, Mathematical model for characterizing and comparing real-world data sharing practices and policies and for computing privacy and risk measurements.	12
V	Survey of techniques: Protection models, Disclosure control, inferring entity identities, Strength and weaknesses of techniques, entry specific databases, computation systems for protecting delimited data, protecting textual documents, Scrub.	12

Suggested Readings:

- B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
- Raef Meeuwisse, Cyber Security for Beginners, Cyber Simplicity Ltd., 2017.

Suggested equivalent online courses:

- https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
- https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Diploma

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** VI
Course Code: IT302		**Course Title:** Operating Systems	
Course outcomes:	On completion of this Programme, the student will be able to		
CO 1:	Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.		
CO 2:	Analyse important algorithms e.g. Process scheduling and memory management algorithms		
CO 3:	Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques		
Credits: 4		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	**Introduction:** Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine.	10
II	**Process Management**: Processes: Definition, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching – Threads – Concept of multithreads. **Process Scheduling:** Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only), Scheduling algorithms: Pre-emptive and Non, pre-emptive, FCFS – SJF – RR, Multiprocessor scheduling: Types, Performance evaluation of the scheduling.	10
III	**Inter-process Communication:** Race Conditions, Critical Section, Mutual Exclusion, Peterson's Solution, The Producer Consumer Problem, Semaphores, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.	10
IV	**Deadlocks:** Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.	15
V	**Memory Management:** Basic Memory Management: Definition, Logical and Physical address map , Memory allocation : Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction , Paging : Principle of operation, Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit, Demand paging (Concepts only), Page Replacement policies : Optimal (OPT), First in First Out (FIFO, Least Recently used (LRU).	15

Suggested Readings:

- A Silberschatz, P B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
- A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
- W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India.

Suggested equivalent online courses:

- https://onlinecourses.nptel.ac.in/noc20_cs04/preview
- https://onlinecourses.nptel.ac.in/noc19_cs51/preview

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Diploma

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** VI
Course Code: IT304		**Course Title:** Lab: Shell Programming	
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand basics shell commands		
CO 2:	Understand commands related to process control and apply them to manage processes.		
CO 3:	Understand the concepts of control structure, loops, case and functions in shell programming and apply them to create shell scripts		
Credits: 2		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	
Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4			

Unit	Topic/ Lab Experiment List	No. of Lectures
	1) Use of basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit. 2) Commands related to inode, I/O redirection, piping, process control commands, mails. 3) Shell Programming: shell script exercise based on following: • Interactive shell script • Positional parameters • Arithmetic • If-then-fi, if-then-else-fi, nested if-else • Logical operators • Else + if equals elif, case structure • While ,for loop • Meta characters 4) Write a shell script to create a file in $USER /class/batch directory. Follow the Instructions • Input a page profile to yourself, copy it into other existing file • Start printing file at certain line • Print all the difference between two file, copy the two files at $USER/CSC/2007 directory. • Print lines matching certain word pattern. 5) Write shell script for- • Showing the count of users logged in • Printing Column list of files in your home directory. • Listing your job with below normal priority • Continue running your job after logging out. 6) Write a shell script to change date format. Show the time taken in execution of this script. 7) Write a shell script to print file names in directory showing date of creation & serial no. of file. 8) Write a shell script to count lines, words & characters in its input. (do not use wc). 9) Write a shell script to print end of a Glossary file in reverse order using array. 10) Write a shell script to check whether Ram logged in; continue checking further after every 30 seconds till success. 11) Write a shell script to compute GCD & LCM of two numbers. 12) Write a shell script to find whether a given number is prime.	**60**

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	**Marks**
Record File	5
Viva Voce	5
Practical Assessment	15
Total	25

Course Prerequisites: Diploma

Subject: Information Technology			
Programme/Class: Bachelor of Science		**Year:** 3rd	**Semester:** VI
Course Code: IT306	**Course Title:** Cloud Computing		
Course outcomes:	On completion of the course, the student will be able to:		
CO 1:	Understand the basic concepts of Cloud Computing		
CO 2:	Understand the key dimensions of the challenges and benefits of Cloud Computing.		
CO 3:	Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies.		
Credits: 4		**Core Compulsory**	
Max. Marks: 25+75		**Min. Passing Marks:**	

Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0

Unit	Topic	No. of Lectures
I	Cloud Computing Overview, Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.	10
II	Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.	10
III	Cloud Computing Architecture, Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service (PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.	15
IV	Service Management in Cloud Computing, Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling.	15
V	Cloud Security : Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.	10

Suggested Readings:

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
- Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

Suggested equivalent online courses:

- https://onlinecourses.nptel.ac.in/noc20_cs20/preview
- https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

This course can be opted as an elective by the students of following subjects: NONE

Suggested Continuous Evaluation Methods:

Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall

Internal Assessment	Marks
Class Interaction	5
Quiz/ Assignments	5
Seminar/Presentation	5
Unit Test/Class Test	10
Total	25

Course Prerequisites: Diploma

**********END OF DOCUMENT**********