



Date :- 25/04/2025

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc. in Comp. Scie (Sem. V & VI)

Ref. :- Decision of the Academic Council at its meeting held on 22/04/2025.

The Syllabi of B. Sc. in Comp. Scie (Fifth and Sixth Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2023 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2025-26.

Copy of the Syllabi Shall be downloaded from the College Website
(www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

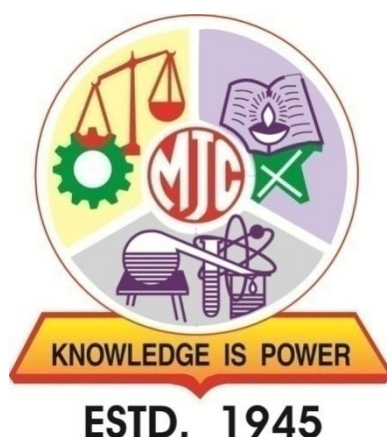
To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

Knowledge is Power

Khandesh College Education Society's
Moolji Jaitha College, Jalgaon
An "Autonomous College"

Affiliated to
Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon-425001



STRUCTURE AND SYLLABUS

B.Sc. Honours/Honours with Research (T.Y. B.Sc. Computer Science)

**Under Choice Based Credit System(CBCS)
and
as per NEP-2020 Guidelines**

[w.e.f. Academic Year: 2025-26]

Preface

The main aim of this course is to develop the technical skills of the candidate and make them experts in the process of using computers and other computer-related technologies. The course initially educates the candidates about all the basic fundamentals of the computer to strengthen their core so that they will find it easy to understand other complicated subjects that are there in the course.

Candidates with a graduate degree in Computer Science are getting a lot of job opportunities from different sectors. Businesses are using new advanced technologies for the smooth running of different operations, but with more advanced technology, different functions are becoming more sophisticated and complicated, this is when organizations need a Computer Science graduate to make this upgrading procedure simple and easy ensuring the smooth running of the business. Companies are hiring more Computer Science graduates in recent years to deal with the complex and complicated evolving of different technologies. A Computer Science graduate makes sure that all the computer facilities of the business are properly managed and handled by the workforce.

This course creates IT professionals who have done expertise in dealing with different technical problems. This course develops and upgrades the candidate's skills in different IT areas with term exams, practical learning, arranging summer internships for giving an IT workforce experience, and also organizing seminars with IT professionals so that the candidates can interact with the experts and clarify their doubts.

Hence, Board of Studies in Computer Science in its meeting held on 22nd March 2025 resolved to accept therevised syllabus for T. Y. B. Sc. (Computer Science) based on Choice Based Credit System (CBCS) of UGC, NEP-2020 and the Government of Maharashtra guidelines.

Program Outcomes (PO) for B.Sc. Program:

Program outcomes associated with a B.Sc. degree are as follows:

PO No.	PO
1	Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
2	Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
3	Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
4	Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
5	Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
6	Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
7	Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to engage in continuous learning, adapt to new technologies and advancements in their field, and stay updated with current research.

Programme Specific Outcome (PSO) for B.Sc. Computer Science Honours/Honours with Research:

After completion of this program, students are expected to learn/understand the:

PSO No.	PSO
1	Database Management System and store the data in adequate form.
2	Object oriented programming languages such as C++ , Java Programming.
3	Various web technologies used for website development.
4	Core concepts in computer science
5	Different front end framework tools
6	Latest technologies such as AngularJS.

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours Or Bachelor's Degree- Honours with Research	160	176	8	4

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

F.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1)	Subject-II (M-2)	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT, RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
I (4.5)	I	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	OE-1(2T)	---	AEC-1(2T) (Eng) VEC-1(2T) (ES) IKS(2T)	CC-1(2T)	22	UG Certificate
	II	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	OE-2(2T) OE-3(2P)	---	AEC-2(2T) (Eng) VEC-2(2T) (CI)	CC-2(2T)	22	
	Cum . Cr.	8	8	8	6	---	10	4	44	
Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										

S.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major*		Subject-II (M-2) Minor #	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
2 (5.0)	III	DSC-5(2T) DSC-6(2T) DSC-7(2P)	---	MIN-1(2T) MIN-2(2T) MIN-3(2P)	---	OE-4(2T)	SEC-1(2T)	AEC-3(2T) (MIL)	CC-3(2T) CEP(2)	22	UG Diploma
	IV	DSC-8(2T) DSC-9(2T) DSC-10(2P)	---	MIN-4(2T) MIN-5(2P)	---	OE-5(2T)	SEC-2(2T) SEC-3(2P)	AEC-4(2T) (MIL)	CC-4(2T) ⊗FP(2)	22	
	Cum . Cr.	12	---	10	---	4	6	4	8	44	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major & Minor.											

* Student must choose one subject as a Major subject out of M-1, M-2 and M-3 that he/she has chosen at First year

#Student must choose one subject as a Minor subject out of M-1, M-2 and M-3 that he/she has chosen at First year (Minor must be other than Major)

⊗ OJT/Internship/CEP should be completed in the summer vacation after 4th semester

T.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major		Subject-II (M-2) Minor	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
3 (5.5)	V	DSC-11(2T) DSC-12(2T) DSC-13(2T) DSC-14(2P) DSC-15(2P)	DSE-1A/B (2T) DSE-2A/B (2P)	---	---	---	VSC-1(2T) VSC-2(2P)	---	OJT/Int (4)	22	UG Degree
	VI	DSC-16(2T) DSC-17(2T) DSC-18(2T) DSC-19(2T) DSC-20(2T) IKS DSC-21(2P) DSC-22(2P)	DSE-3A/B (2T) DSE-4A/B (2P)	---	---	---	VSC-3(2T) VSC-4(2P)	---	---	22	
	Cum . Cr.	24	8	---	---	---	8	---	4	44	
		Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor									

Fourth Year B.Sc. (Honours)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-25(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	---	22	UG Honours Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-29(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	OJT/Int (4)	22	
	Cum. Cr.	28	8	4	---	---	---	4	44	
Four Year UG Honors Degree in Major and Minor with 176 credits										

Fourth Year B.Sc. (Honours with Research)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	RP(8)	22	
	Cum. Cr.	20	8	4	---	---	---	12	44	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC-** Department Specific Course, **DSE-** Department Specific Elective, **OE/GE-** Open/Generic elective, **VSC-** Vocational Skill Course, **SEC-** Skill Enhancement Course, **VSEC-** Vocation and Skill Enhancement Course, **AEC-** Ability Enhancement Course, **IKS-** Indian Knowledge System, **VEC-** Value Education Course, **T-** Theory, **P-** Practical, **CC-** Co-curricular **RM-** Research Methodology, **OJT-** On Job Training, **FP-** Field Project, **Int-** Internship, **RP-** Research Project, **CEP-** Community Extension Programme, **ENG-** English, **CI-** Constitution of India, **MIL-** Modern Indian Language

- Number in bracket indicate credit
- The courses which do not have practical 'P' will be treated as theory 'T'
- If student select subject other than faculty in the subjects M-1, M-2 and M-3, then that subject will be treated as Minor subject, and cannot be selected as Major at second year.

Details of T.Y. B.Sc. (Computer Science)

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/ Week			Marks			
					T	P	Total	Internal		External	
								T	P	T	P
Semester V, Level – 5.5											
DSC-11	DSC	CS-DSC-351	Database System Concepts	2	2	---	2	20	---	30	---
DSC-12	DSC	CS-DSC-352	Python Programming-I	2	2	---	2	20	---	30	---
DSC-13	DSC	CS-DSC-353	System Analysis and Design	2	2	---	2	20	---	30	---
DSC-14	DSC	CS-DSC-354	Practical on Database System Concepts	2	---	4	4	---	20	---	30
DSC-15	DSC	CS-DSC-355	Practical on Python Programming-I	2	---	4	4	---	20	---	30
DSE-1A	DSE	CS-DSE-351A	Web Programming using PHP	2	2	---	2	20	---	30	---
DSE-1B	DSE	CS-DSE-351B	Web Technologies *	2	2	---	2	20	---	30	---
DSE-2A	DSE	CS-DSE-352A	Practical on Web Programming using PHP	2	---	4	4	---	20	---	30
DSE-2B	DSE	CS-DSE-352B	Practical on Web Technologies	2	---	4	4	---	20	---	30
VSC-1	VSC	CS-VSC-351	Internet of Thing	2	2	---	2	20	---	30	---
VSC-2	VSC	CS-VSC-352	Practical on IoT	2	---	4	4	---	20	---	30
OJT/Int	OJT	CS-OJT-351	On Job Training/Internship	4	---	8	8	---	40	---	60
Semester VI, Level – 5.5											
DSC-16	DSC	CS-DSC-361	Data Analytics	2	2	---	2	20	---	30	---
DSC-17	DSC	CS-DSC-362	Python Programming-II	2	2	---	2	20	---	30	---
DSC-18	DSC	CS-DSC-363	Operating System	2	2	---	2	20	---	30	---
DSC-19	DSC	CS-DSC-364	Computer Network	2	2	---	2	20	---	30	---
DSC-20	DSC/IKS	CS-DSC-365	Evolution of Computing in India	2	2	---	2	20	---	30	---
DSC-21	DSC	CS-DSC-366	Practical on Data Analytics	2	---	4	4	---	20	---	30
DSC-22	DSC	CS-DSC-367	Practical on Python Programming-II	2	---	4	4	---	20	---	30
DSE-3A	DSE	CS-DSE-361A	Front End Framework-Angular	2	2	---	2	20	---	30	---
DSE-3B	DSE	CS-DSE-361B	Linux BASH (Shell Scripting) *	2	2	---	2	20	---	30	---
DSE-4A	DSE	CS-DSE-362A	Practical on Front End Framework – Angular	2	---	4	4	---	20	---	30
DSE-4B	DSE	CS-DSE-362B	Practical on Linux BASH (Shell Scripting)	2	---	4	4	---	20	---	30
VSC-3	VSC	CS-VSC-361	Mobile Application Development	2	2	---	2	20	---	30	---
VSC-4	VSC	CS-VSC-362	Practical on Mobile Application Development	2	---	4	4	---	20	---	30

* Online Course offered by Swayam

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
 - External examination will be of 1½ hours duration
 - There shall be 3 questions: Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. The tentative pattern of question papers shall be as follows;
 - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
 - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method

carrying 10/5 marks:

- i. Individual Assignments
- ii. Seminars/Classroom Presentations/Quizzes
- iii. Group Discussions/Class Discussion/Group Assignments
- iv. Case studies/Case lets
- v. Participatory & Industry-Integrated Learning/Field visits
- vi. Practical activities/Problem Solving Exercises
- vii. Participation in Seminars/Academic Events/Symposia, etc.
- viii. Mini Projects/Capstone Projects
- ix. Book review/Article review/Article preparation
- x. Any other academic activity
- xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT. The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations. The subject teachers are required to communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Practical examination shall be conducted for 2 consecutive days for 2 hr/ day where incubation condition is required.
- There shall be 05 marks for journal and viva-voce. Certified journal is compulsory to appear for practical examination.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by department as per schedule given.
- For internal practical examination student must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details refer internal theory examination guidelines.
- Finally 40 (10+30) marks performance of student will be converted into 20 marks.

SEMESTER-V

T.Y. B.Sc. Computer Science (Major)
Semester-V
CS-DSC-351: Database System Concepts

Total Hours: 30

Credits: 2

Course Objectives	- To understand the basic concepts and the applications of database systems - Master the basics of SQL and construct queries using SQL - Understand the relational database design principles. - Familiar with the basic issues of transaction processing and concurrency control.	
Course Outcomes	After successful completion of this course, students are expected to: - Understand the fundamental concepts and terminology associated with database systems, including architecture, design, and various models. - Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations. - Understand and Apply normalization techniques to improve the database design to the given problem and build database for any problem. - Understand transaction processing and crash recovery system.	
Unit	Contents	Hours
Unit I	Introduction to DBMS, Entity Relationship Models and Data Normalization - Overview, Definition, characteristics of data in database - DBMS Models - Comparison of DBMS Models - Queries in DBMS with examples (SQL : DDL, DML, DCL, TCL) - ER-Model and its components - ER-Diagrams - Keys and relationship - Data Normalization - Normal Forms (1NF, 2NF, 3NF,BCNF,4NF and 5 NF)	8
Unit II	Relational data model using SQL - Relations (concepts, definition) - Conversion of ER to Relational model - Integrity Constraints (Base Table Constraints, Domain Constraints, Referential Integrity) - Data types in SQL - Types of SQL Commands - Table Operations (Create, Alter, Truncate, Drop) - Basic SQL Statements (Select, Insert, Delete, Update)	8
Unit III	SQL Statements and Relational Database Design - Operators (Arithmetic, Logical, Comparative, Assignments, Relational) - Clauses in SQL (group by, having, where) - Aggregate functions, Nested Sub queries - Join in SQL (inner joins, outer joins and their types) - PL/PgSQL: Datatypes, Language structure - Controlling the program flow, conditional statements, loops - Views - Stored Functions, Stored Procedures - Handling errors and exceptions - Cursors - Concepts of Triggers	8

Unit IV	Database Implementations and Crash Recovery • Database security • Database integrity • Transaction Concept, Transaction State • Transaction Properties (ACID) • Failure classification • Recovery concepts • Log base recovery • Checkpoints • Recovery with concurrent transactions (Rollback, checkpoints, commit) • Database backup and recovery from catastrophic failure.	6
Study Resources	• Korth H, Silberschatz A., and Sudarshan S., (2011). Database System Concepts, 6th Ed., Tata McGraw-Hill Education • Elmasri R. and Navathe S., (2004). Fundamentals of Database Systems, 4th Ed. Pearson Education, Inc. • Singh S., (2011). Database Management System : Concepts, design & applications, 2nd Ed, Pearson publication • Leon A. and Leon M., (2002), Database Management Systems, Leon Vikas • Douglas K., Souglas S., (2005), PostgreSQL, 2nd Ed, Sams Publishing • Stones R. and Matthew M., (2011), Beginning Databases with PostgreSQL, 2nd Ed., Apress	

T.Y. B.Sc. Computer Science (Major)
Semester-V
CS-DSC-352: Python Programming-I

Total Hours: 30

Credits: 2

Course Objectives	• To introduce Python Environment to students. • To develop problem solving skills and their implementation through Python. • To understand and implement concepts of List in Python. • To be able to work with Tuple and Dictionary in Python.	
Course Outcomes	At the end of the course, the student will be able to • Explain basic principles of Python programming language. • Construct and apply various filters for a specific task. • Apply the best features of mathematics, engineering and natural sciences to program real life problems. • Work with Tuple and Dictionary in Python.	
Unit	Contents	Hours
Unit I	Introduction to Python Python- an interpreted high level language, interactive mode and script mode. • Variables, Expressions and Statements • Variables and Types-mutable and Immutable variable and Keywords. • Operators and Operands in Python. • (Arithmetic, relational and logical operators), • Operator precedence, Expressions and Statements (Assignment statement); • Taking input (using raw_input() and input()) and displaying output - print statement • Comments in Python. Conditional and Looping Construct • if - else statement and nested if – else • while loop, for loop, • use of range function in for, • Nested loops • break, continue, pass statement • Use of compound expression in conditional constructs	8
Unit II	Functions • Built-In Function, invoking built in functions • Module (Importing entire module or selected objects using from statement) • Functions from math, random, time & date module.	8

	• Composition • User Define Function: Defining, invoking functions, passing parameters (default parameter values, keyword arguments) • Scope of variables, void functions and functions returning values	
Unit III	Strings • Creating, initializing and accessing the elements; • String operators: +, *, in, not in, range, slice [n:m] • String built in functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitle, partition, replace, join, split, count, decode, encode, swapcase • Strings constants defined in string module Regular Expression and Pattern Matching Lists • Concept of mutable lists, creating, initializing and accessing the elements of list • List operations (Concatenation, Repetation, Membership, list slices), List comprehensions • List functions & methods: len, insert, append, extend, sort, remove, reverse, pop • Tuple functions: cmp(), len(), max(), min(), tuple() • Concept of Sets, creating, initializing and accessing the elements of set • Sets operation (Membership, union, intersection, difference, and symmetric difference) • Dictionaries Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements • Dictionary functions & Methods: cmp, len, clear (), get(), has_key(), items(), keys(), update(), values()	8
Unit IV	Modules • More on Modules: Executing modules as scripts, The Module Search Path, “Compiled” Python files • Standard Modules • The dir() Function • Packages Importing * From a Package, Intra-package References, Packages in Multiple Directories	6
Study Resources	Reference Books • Lutz M.Z., (2009), Learning Python, 4th edition, O’Reilly USA • Dawson M., (2008), Programming with python, A users Book, Cengage Learning	

	• Beazley D., (2010), Python Essential Reference, 4th edition, AddisonWelsely, USA • McGrath M., (2018), Python in easy steps, 2nd edition, In easy steps Limited, • Peter C. N., Samuel A., (2005), Beginning Pythonl, Wrox Publication. • Brown C.M., (2018), Python, the Complete Reference, McGraw Hill Education, USA Web References • https://docs.python.org	
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T.Y. B.Sc. Computer Science (Major)
Semester-V
CS-DSC-353: System Analysis and Design

Total Hours: 30

Credits: 2

Course Objectives	- To provide an overview of the concepts and techniques of systems analysis - To introduce variety of new software used by analysts, designers to manage projects. - To analyze and document systems, design new systems and implement their plans. - To give students a practical experience of the systems analysis and design process.	
Course Outcomes	After successful completion of this course, students are expected to: - Understand the principles and tools of systems analysis and design - Understand the application of computing in different context - Solve a wide range of problems related to the analysis, design and construction of information systems - Analysis and Design of systems of small sizes	
Unit	Contents	Hours
Unit I	System Analysis Fundamentals - The System: Definition and Concepts - Elements of a System: Input, Output Processor, Control, Feedback, Environment, Boundaries and Interface - Characteristics of a System - Types of systems: Physical and Abstract System, Open and Closed Systems, Man-made Systems - Information and its categories TPS, OAS, MIS, DSS, ESS	7
Unit II	System Planning - System Analyst: Role and need of system analyst - System Analyst as an agent of change - Introduction to SDLC - System documentation: Types of documentation and their importance. - Initial Investigations, Identification of user needs, - Feasibility Study	8
Unit III	Project Selection and Requirement Determination - Project Identification and Selection; - System selection plan and proposal, Prototyping - Cost-Benefit Analysis: Tools and Techniques - Introduction to Requirement Determination - Requirement Analysis techniques - Requirement Gathering techniques - Use Case Analysis	7
Unit IV	The Essentials of design - Data Flow Diagram (DFD) - Logical and Physical DFDs - Developing DFD; System Flowcharts and Structured charts, - Decision trees and Decision tables. - System Design Module specifications	8

	• Module Coupling and cohesion • Top-down and bottom-up design • Logical and Physical design • Structured design.	
Study Resources	• Alan Dennis, Barbara Haley Wixom, Roberta M. Roth, (2009), Systems Analysis and Design, 4th Ed Wiley • Elias m. Awad: System Analysis and Design • Perry Edwards: System Analysis & design Mc Graw Hill • System Analysis and Design Methods, Whitten, Bentaly and Barlow, Galgotia Publication. • Modern System Analysis and Design, Jeffrey A. Hofer Joey F. George Joseph S. Valacich Addison Weseley.	

T.Y. B.Sc. Computer Science (Major)
Semester-V
CS-DSC-354: Practical on Database System Concepts

Total Hours: 60

Credits: 2

Course Objectives	- To provide students hands on practice on Database Systems - To understand the basic concepts and the applications of database systems practically - Master the basics of SQL and construct queries using SQL - Understand the relational database design principles.	
Course Outcomes	At the end of the course, the student will be able to - construct SQL Queries and execute it. - can apply validations and constraints - develop database applications	
Sr. No.	Content	Hours
1	Demonstration of database : Create, Alter and Delete	4
2	Demonstration of creating table and use of DDL statements : Create, Alter and Drop Table	4
3	Demonstration of use of DML statements: Select, Insert, Update and Delete	4
4	Practical for Retrieving Data Using following clauses. - Simple select clause - Accessing specific data with Where - Ordered By - Distinct - Group By	4
5	Demonstration of Operators use in database (Arithmetic, Logical, Comparative, Assignments, Relational)	4
6	Practical Based on Aggregate Functions. - AVG • COUNT • MAX - MIN • SUM • CUBE	4
7	Practical Based on implementing use of UNION, INTERSECTION, SET, DIFFERENCE	4
8	Implement Nested Queries & JOIN operation	4
9	Practical Based on performing different operations on a view.	4
10	Practical Based on performing conditional statement	4
11	Practical Based on performing update view to Add or replace operations on a view.	4
12	Practical Based on implementing use of Procedures	4
13	Practical Based on implementing Handling error and exception	4
14	Practical Based on implementing use of Triggers	4
15	Practical Based on implementing Cursor	4
Study Resources	Korth H, Silberschatz A., and Sudarshan S., (2011). Database System Concepts, 6th Ed., Tata McGraw-Hill Education	

	• Elmasri R. and Navathe S., (2004). Fundamentals of Database Systems, 4th Ed. Pearson Education, Inc. • Singh S., (2011). Database Management System : Concepts, design & applications, 2nd Ed, Pearson publication • Leon A. and Leon M., (2002), Database Management Systems, Leon Vikas
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***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Major)
Semester-V
CS-DSC-355: Practical on Python Programming-I

Total Hours: 60

Credits: 2

Course Objectives	- To provide students hands on practice on Python programs - To apply List, Tuple and Dictionary for problem solving in Python - To develop logic for problem solving	
Course Outcomes	At the end of the course, the student will be able to - develop the programs using Python. - develop their own module according to requirement and reuse it wherever necessary. - solve real life problems using Python.	
Sr. No.	Contents	Hours
1	Write a program to check whether the number is even or odd, print out an appropriate message to the user.	4
2	Write a program which will find all such numbers which are divisible by 7.	4
3	Write a program which will print GCD of two numbers.	4
4	Write a program that prints out all the elements of the list that are less than 10.	4
5	Write a program to determine whether the number is prime or not.	4
6	Write a program to check whether a number is palindrome or not.	4
7	Write a program which can compute the factorial of a given numbers. (using recursion and without recursion).	4
8	Write a program that asks the user how many Fibonacci numbers to generate and then generates them.	4
9	Write a program to demonstrate all string functions in Python.	4
10	Write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.	4
11	Write a program to demonstrate all list functions in Python.	4
12	Write a program to demonstrate all tuple functions in Python.	4
13	Write a program to demonstrate all dictionary functions in Python.	4
14	Write a program to demonstrate set operations in Python.	4
15	Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Given the input: 34,67,55,33,12,98 Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34', '67', '55', '33', '12', '98')	4
Study Resources	- Lutz M.Z., (2009), Learning Python, 4th edition, O'Reilly USA - Dawson M., (2008), Programming with python, A users Book,	

	Cengage Learning • Beazley D., (2010), Python Essential Reference, 4th edition, AddisonWelsely, USA • McGrath M., (2018), Python in easy steps, 2nd edition, In easy steps Limited, • Peter C. N., Samuel A., (2005), Beginning Pythonl, Wrox Publication. • Brown C.M., (2018), Python, the Complete Reference, McGraw Hill Education, USA Web References • https://docs.python.org
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***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Elective)
Semester-V
CS-DSE-351A: Web Programming using PHP

Total Hours: 30

Credits: 2

Course Objectives	• To understand Core-PHP concepts. • To learn Server Side Scripting Language • To learn server side scripting • To acquaint knowledge of Object oriented in PHP.	
Course Outcomes	• To Design dynamic and interactive Web pages. • PHP framework for effective design of web applications. • To be able to work with server side scripting. • To be able to work with object oriented programming in PHP.	
Unit	Contents	Hours
Unit I	Basics of PHP • Web architecture • Web Server (xamp Server, apache server) • Web Browser • Introduction to Web Development • Introduction to PHP • Features & Drawbacks of PHP, • How PHP Works? • Version of PHP. • Lexical Structure of PHP • Structure & Syntax of PHP • PHP with HTML • Comments • Data Types • Variables • Operator • Flow Control Statements • Conditional Statements • Looping Statements • Exit, Return, Die, Include and Require Statements	8
Unit II	PHP Arrays & functions • Indexed Vs Associative arrays • Multidimensional arrays • Storing data in arrays • Extracting multiple values • Converting between arrays and variables • Traversing arrays • Sorting arrays • Different array function in PHP • Introduction to Function : Defining and Calling a function • Scope of variables in function • Function Parameters	8

	• Returning Values from a function • Recursive Functions • Introduction to String : Types of strings in PHP • Printing functions • Comparing strings • Manipulating and Searching strings • Regular Expressions	
Unit III	Web Techniques • Introduction • HTTP Basics • Processing Forms • Methods (Get and Post Method) • Parameters (\$_GET and \$_POST) • Self-Processing Pages • File Uploads • Form Validation	8
Unit IV	Object-Oriented PHP • Introduction and Benefits of OOPs • Creating a Class • Creating an Object • Adding a Method • Adding a Properties • Visibility (Public, Private and Protected) • Constructor and Destructors • Inheritance (Extending a class) • Abstract classes, Final classes • Interfaces • Exception handling	6
Study Resources	• Beginning PHP and MySQL, 3rd Ed., W. Jason Gilmore, A press Publication. • PHP 5.1 for Beginners, Ivan Bayross and Sharnam Shah, SPD Publication • Beginning PHP5 Dave Mercer et al. Wrox Press • PHP for Beginners [Book] / auth. Ivan Bayross, Sharanam Shah, THE X Team. - [s.l.] : SPD. • Steven Holzner, HTML Black Book , Dremtech press. • Web Technologies, Black Book, Dreamtech Press • http://www.php.net.in • http://www.w3schools.com • http://www.tutorialpoints.com	

T.Y. B.Sc. Computer Science (Elective)
Semester-V

CS-DSE-351B: Web Technologies

(SWAYAM course: NOU24 CS09)

Total Hours: 30

Credits: 2

Course Objectives	• To explain different components and technologies of World Wide Web as a platform. • To design and develop websites using fundamental web languages, technologies, and tools. • Distinguish between server-side and client-side web technologies. • Describe various web technology and application development issues and trends.	
Course Outcomes	After successful completion of this course student are able to: • gain knowledge on designing static and dynamic web pages. • validate web pages at client-side. • gain knowledge on server side scripting. • develop a business application using STRUTS.	
Unit	Contents	Hours
Unit I	MARKUP LANGUAGES Web Standards • The History of Markup Languages • HTML, XML, XHTML • WML-Wireless Markup Language • Cascading Style Sheets (CSS) • DHTML • Client-Side and Server-Side Technologies • Basics of HTML • HTML Document Structure	8
Unit II	Introduction to Forms and CSS • The <FORM>, <INPUT> Tag • Text input, Inline Style sheet • Internal Style Sheet • External Style sheet • Imported Style Sheet • Cascading Rules , Order rules	8
Unit III	JAVASCRIPT AND HTML Document Object Model • JAVASCRIPT AND EVENT HANDLING- javascript cookies , Store Cookies • Introduction to JSP , Comparison of Servlets with JSP • Advantages of JSP , JSP engines , JSP Architecture • Life cycle of a JSP Page , Directory structure of JSP , Anatomy of a JSP page • JSP Components and Tags • Creation of a small Web application using JSP	8
Unit IV	JSP Elements and Actions • JSP Implicit Objects • JSP - Exception Handling	6

	• JSP Session Tracking • Steps to run JSP using Tomcat server • JSP WITH JDBC- Creating a database table, Basic steps to connect database , Install Mysql	
Study Resources	• Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009. • Joel Sklar, Principles of Web Design, Cengage Learning, 6th Edition, 2015. • B. M. Harwani, Developing Web Applications in PHP and AJAX, Tata McGraw-Hill, 2010. • Internet and World Wide Web How to program, Paul J. Deitel, Harvey M. Deitel, and Abbey Deitel, 5th Edition, Pearson Education, 2011. • https://www.w3schools.com • https://developer.mozilla.org • http://html.net • https://onlinecourses.swayam2.ac.in/nou24_cs09/preview	

T.Y. B.Sc. Computer Science (Elective)
Semester-V
CS-DSE-352A: Practical on Web Programming using PHP

Total Hours: 60

Credits: 2

Course Objectives	• To understand Core-PHP concepts. • To learn Server Side Scripting Language • To learn server side scripting • To acquaint knowledge of Object oriented in PHP.	
Course Outcomes	• To Design dynamic and interactive Web pages. • PHP framework for effective design of web applications. • To be able to work with server side scripting. • To be able to work with object oriented programming in PHP.	
Sr. No.	Content	Hours
1	Design web pages using HTML that will contain online admission forms.	4
2	Write PHP scripts that demonstrate \$_POST and \$_GET.	4
3	Write PHP scripts that demonstrate the use of indexed array.	4
4	Write PHP scripts that demonstrate the use of Associative array.	4
5	Write PHP scripts that demonstrate the use of Multidimensional array.	4
6	Write PHP scripts that demonstrate conditional statements in PHP.	4
7	Write PHP scripts for calculating factorial of given number.	4
8	Write PHP scripts for checking whether the given number is Armstrong or not.	4
9	Write PHP script that will display grade based on criteria given below using the marks obtained in T.Y.BSc. Examination. a. Distinction (70 and above) b. First Class (60 - 69) c. Pass (40 - 59) d. Fail (below 40)	4
10	Write a PHP script to demonstrate different String functions.	4
11	Write a PHP script to demonstrate calling function by Call by Value concept	4
12	Write a PHP script to demonstrate calling function by Call by reference concept.	4
13	Write a PHP script to Demonstrate use of constructor and destructor.	4
14	Write a PHP script to Demonstrate OOPS Concept in PHP.	4
15	Write a PHP script to demonstrate Exception Handling.	4

Study Resources	• Beginning PHP and MySQL, 3rd Ed., W. Jason Gilmore, A press Publication. • PHP 5.1 for Beginners, Ivan Bayross and Sharnam Shah, SPD Publication • Beginning PHP5 Dave Mercer et al. Wrox Press • PHP for Beginners [Book] / auth. Ivan Bayross, Sharanam Shah, THE X Team. - [s.l.] : SPD. • http://www.php.net.in • http://www.w3schools.com • http://www.tutorialpoints.com	
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***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Elective)
Semester-V
CS-DSE-352B: Practical on Web Technologies

Total Hours: 60

Credits: 2

Course Objectives	- To create a fully functional website with mvc architecture. - To develop dynamic web pages - To familiar with client side scripting - To familiar with server side scripting	
Course Outcomes	At the end of the course, the student should be able to: - gain knowledge on designing static and dynamic web pages. - validate web pages at client-side. - Design and validate XML documents. - Gain knowledge on server side scripting. - develop a business application using STRUTS.	
Sr. No.	Contents	Hours
1	Create a static web page using HTML for online book store.	4
2	Develop and demonstrate the usage of inline, internal and external style sheet using CSS	4
3	Design a web page using CSS which includes the following: 1) Use different font, styles: In the style definition you define how each selector should work (font, color etc.).	4
4	Create a web page to demonstrate use of flexible box model in CSS.	4
5	Write JavaScript to validate the following fields of registration page - Name (Name should contains alphabets and the length should not be less than 6 characters)	4
6	Write JavaScript to validate the following fields of registration page- Password (Password should not be less than 6 characters length).	4
7	Write JavaScript to validate the following fields of registration page - E-mail id (should not contain any invalid and must follow the standard pattern (name@domain.com))	4
8	Write JavaScript to validate the following fields of registration page Phone number (Phone number should contain 10 digits only).	4
9	Write JavaScript to calculate square and cube of numbers from 1 to 10 and output HTML text that displays resulting values in an html table format.	4
10	Write a Java program that demonstrates JDBC.	4
11	Write a Java program that demonstrates JSP to find factorial of given number.	4
12	Write a Java program that demonstrates JSP for to check given number is palindrom or not.	4
13	Write a Java program that demonstrates JSP for to check given number is Armstrong or not.	4
14	Write a Java program that demonstrates JSP to find largest of three numbers.	4
15	Write a Java program that demonstrates JSP for to check given number is prime or not.	4

Study Resources	• Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009. • Joel Sklar, Principles of Web Design, Cengage Learning, 6th Edition, 2015. • B. M. Harwani, Developing Web Applications in PHP and AJAX, Tata McGraw-Hill, 2010. • Internet and World Wide Web How to program, Paul J. Deitel, Harvey M. Deitel, and Abbey Deitel, 5th Edition, Pearson Education, 2011. • https://www.w3schools.com • https://developer.mozilla.org • http://html.net	
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***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Vocational)
Semester-V
CS-VSC-351: Internet of Thing

Total Hours: 30

Credits: 2

Course Objectives	- To study fundamental concepts of IoT - To understand roles of sensors in IoT - To Learn different protocols used for IoT design - Understand the role of IoT in various domains of Industry	
Course Outcomes	After successful completion of this course, students are expected to: - Understand the various concepts, terminologies and architecture of IoT systems. - Use sensors and actuators for design of IoT. - Understand various applications of IoT - Understand APIs to connect IoT related technologies	
Unit	Contents	Hours
Unit I	Fundamentals and Applications of IoT - Fundamentals of IoT Introduction Definitions & Characteristics of IoT, Components used for IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M. - Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection	7
Unit II	Programming with Arduino - Introduction to Arduino, Study of Arduino board, Arduino Installation - Program structure, data types, variables and constants, Operators, Control statements, Loops - Functions, Strings, Time, Arrays, Arduino Function Libraries, Arduino Advanced: Due and Zero, Pulse Width Modulation, Random Numbers, Interrupts, Communication, Inter-Integrated Circuits, Serial Peripheral Interface.	7
Unit III	Sensors Networks - Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working - IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit - RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.	8
Unit IV	Wireless Technologies for IoT - WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. - IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMQP, CoAP, MQTT. Edge connectivity and protocols	8

Study Resources	• HakimaChaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications • Olivier Hersent, David Boswarthick, and Omar Elloumi, — “The Internet of Things: Key Applications and Protocols”, WileyPublications • Vijay Madisetti and ArshdeepBahga, — “Internet of Things (A Hands-on-Approach)”, 1 st Edition, VPT, 2014. • J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016. • 5. Keysight Technologies, “The Internet of Things: Enabling Technologies and Solutions for Design and Test”, Application Note, 2016.	
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T.Y. B.Sc. Computer Science (Vocational)
Semester-V
CS-VSC-352: Practicals on IoT

Total Hours: 60

Credits: 2

Course Objectives	- To study fundamental concepts of IoT - To understand roles of sensors in IoT - To Learn different protocols used for IoT design - Understand the role of IoT in various domains of Industry	
Course Outcomes	After successful completion of this course, students are expected to: - Understand the various concepts, terminologies and architecture of IoT systems. - Use sensors and actuators for design of IoT. - Understand various applications of IoT - Understand APIs to connect IoT related technologies	
Sr. No.	Contents	Hours
1	Study of Components required for IoT.	4
2	Study of Applications of IoT	4
3	Study of type of sensors.	4
4	Understanding Arduino UNO Board and Components	4
5	Installing and work with Arduino IDE	4
6	Blinking LED sketch with Arduino	4
7	LED Fade Sketch and Button Sketch	4
8	Using Pulse Width Modulation	4
9	Reading Analog Voltage using LED Bar Graph	4
10	Reading Analog Voltage using Potentiometre	4
11	Use keyboard library to logout from user session.	4
12	Working with Adafruit Libraries in Arduino	4
13	Spinning a DC Motor and Motor Speed Control Sketch	4
14	Demonstrate Humidity and Temperature sensors	4
15	Demonstration of PIR Sensor for human movement.	4
Study Resources	- HakimaChaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications - Olivier Hersent, David Boswarthick, and Omar Elloumi, — “The Internet of Things: Key Applications and Protocols”, WileyPublications - Vijay Madiseti and ArshdeepBahga, — “Internet of Things (A Hands-on-Approach)”, 1 st Edition, VPT, 2014. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016. - Keysight Technologies, “The Internet of Things: Enabling Technologies and Solutions for Design and Test”, Application Note, 2016.	

***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (On Job Training)
Semester-V
CS-OJT-351: On Job Training/Internship

Total Hours: 120

Credits:4

Course Objectives	• To provide the students with actual work experience • To make aware prescribe standards and guidelines at work • To develop the employability of participating student • To avail an opportunities to eventually acquire job experiences
Course Outcomes	After successful completion of this course, students are expected to: • Get actual work experience with office and virtual exposure to various management styles, technical, industrial, and procedural systems • Acquaint the knowledge related to working hours, work protocols and guidelines • Understand the roles and responsibilities of employee as well as team work • Justify job experiences that match their potentials, skills, and competencies
Internship An internship is a professional learning experience that offers meaningful, practical work related to a student's field of study or career interest. An internship gives a student the opportunity for career exploration and development, and to learn new skills. On the job training On the job training is a form of training provided at the workplace. During the training, employees are familiarized with the working environment they will become part of. Employees also get a hands-on experience using machinery, equipment, tools, materials, etc.	
Internship / OJT Procedure: 1. Pre-Approval: Students should seek approval from the college before starting the Internship / OJT. This ensures that the Internship / OJT aligns with the curriculum and meets the necessary criteria. 2. Mentor and Supervisor: Each student should have an assigned mentor at the organization/industry where they are interning. Additionally, an Internship / OJT supervisor from the college will be appointed to guide and monitor the progress. 3. Regular Reporting: Students should maintain regular communication with their supervisor and mentor, providing progress reports and seeking feedback. 4. Professional Conduct: Students must adhere to professional conduct throughout the Internship / OJT, including punctuality, respect for colleagues, and adherence to the organization's/industry's policies and guidelines. 5. Student Diary: Students should maintain a diary to document their experiences, challenges faced, and lessons learned during the Internship / OJT. 6. Final Report: At the end of the Internship / OJT, students should submit a comprehensive final report, summarizing their accomplishments, contributions, and key takeaways. 7. Evaluation: The Internship / OJT is worth 4 credits (equivalent to 100 marks), and the evaluation will be divided into two categories: one by the mentor and the other by the Internship / OJT supervisor. The mentor's evaluation (internal examination) will carry 40 marks, and it will be based on the student's performance during the Internship / OJT. External examination will be conducted by mentor and supervisor which will be based on the student's diary, the final report prepared by the student, and their performance in the final viva voce, and will carry 60 marks. The total marks obtained by the students in both evaluations will be added together for the purpose of final evaluation. The evaluation of the students will be conducted by the mentor using the evaluation sheet provided by the college.	

Internal Evaluation Criteria for Students by the Mentor:

1. **Quality of Work** (10 marks): How well did the student perform their assigned tasks during the Internship / OJT? Evaluate the accuracy, thoroughness, and attention to detail in their work.
2. **Initiative and Proactiveness**(10 marks): Did the student show initiative in taking on additional responsibilities or tasks beyond their assigned role? Did they demonstrate a proactive attitude towards problem-solving?
3. **Communication Skills** (10 marks): Assess the student's ability to communicate effectively with colleagues, superiors, and clients (if applicable). Consider both written and verbal communication.
4. **Problem-Solving Skills and Time Management** (10 marks): Evaluate the student's ability to analyze problems, propose solutions, and implement effective strategies to overcome challenges. How well did the student manage their time during the Internship / OJT? Were they able to meet project deadlines and handle multiple tasks efficiently?

External Evaluation Criteria for Students by the Supervisor and Mentor:

1. **Student Diary** (15 marks): Review the student's diary to understand their reflections, insights gained, and self-assessment of their performance during the Internship / OJT.
2. **Final Report** (15 marks): Evaluate the quality and comprehensiveness of the student's final report, including the clarity of their achievements and contributions.
3. **Presentation of Student in Viva Voce** (30 marks): Evaluate the responses given by the student to the questions asked by the faculty in the Viva Voce.

Evaluation Criteria for Final Viva Voce:

1. Presentation Skills
2. Knowledge of the Internship / OJT Project
3. Practical Application and Work Experience
4. Problem-Solving and Critical Thinking
5. Communication and Professionalism

SEMESTER-VI

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-361: Data Analytics

Total Hours: 30

Credits: 2

Course Objectives	After successful completion of this course, students are expected to: • To understand the fundamental concepts of big data analytics. • To learn to use various techniques for mining data • To understand the basic concepts of R- Programming • To apply R- Programming for Data Analytics	
Course Outcomes	On completion of the course, student will be able to : • To understand the fundamental concepts of big data analytics. • To learn to use various techniques for mining data • To understand the basic concepts of R- Programming • To apply R- Programming for Data Analytics	
Unit	Contents	Hours
Unit I	Unit 1: Data Analytics • Data Analytics Overview • State of the Practice in Analytics • Key Roles for the New Big Data Ecosystem • Examples of Data Analytics	5
Unit II	Unit 2: Data Analytics Lifecycle • Data Analytics Lifecycle Overview • Phase 1: Discovery • Phase 2: Data Preparation • Phase 3: Model Planning • Phase 4: Model Building • Phase 5: Communicate Results • Phase 6: Operationalize • Case Study: Global Innovation Network and Analysis (GINA)	10
Unit III	Unit 3: Introduction to R • Introduction to R • Exploratory Data Analysis • Statistical Methods for Evaluation • Vectors, the R Workhorse • Character Strings • Matrices • Lists • Data Frames • Classes • R – OPERATORS, Control Structures, functions • Data Visualization using R	8

Unit IV	Machine Learning algorithms using R • Classification: SVM • Clustering: K-means • Association rule mining	7
Study Resources	• Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data- EMC Education Services, Wiley Publication. • “The book of R A first course in Programming and Statistics”, by Tilman M. Davies, ISBN-13:978-1-59327-651-5 • “R Programming for Data Science”, Roger D. Peng	

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-362: Python Programming - II

Total Hours: 30

Credits: 2

Course Objectives	- To learn how to design and code Python applications. - To develop problem solving skills and their implementation through Python. - To develop the ability to write database applications in Python	
Course Outcomes	After successful completion of this course, students are expected to: - Implement object oriented concepts, database applications. - Implement GUI applications using Python. - Apply the best features of mathematics, engineering and natural sciences to program real life problems.	
Unit	Contents	Hours
Unit I	Errors and Exceptions - Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions(try - finally), Predefined Clean-up Actions I/O and File Handling - Output Formatting, Reading and Writing Files, File Exceptions, Paths and - Directories, Directory Contents, Obtaining Information about Files, Renaming, Moving, Copying, and Removing Files, Creating and Removing Directories, Globbing	8
Unit II	Introduction to Object Oriented concepts in Python - Object Oriented concepts, Objects - Python Scopes and Namespaces, Classes, Class Objects, - Instance Objects, Method Objects, - Class and Instance Variables, Inheritance	7
Unit III	GUI with Python - GUI Programming Toolkits for Python, - Tkinter Introduction, - Creating GUI Widgets with Tkinter, - Resizing the Widget, Configuring Widget Options, - Putting the Widgets to Work, - Creating Layouts, Packing Order, - Controlling Widget Appearances, - Radio Buttons and Checkboxes, Dialog Boxes, Other Widget Types	8

Unit IV	Python with MySQL • Introduction to MySQL, • Installing MySQL Driver - MySQL Connector or MySQL • Db MySQL Database connection with Python, • Creating Database in MySQL using Python • Create a Table in MySQL with Python, • Insert, Select, Update and Delete • Operation in MySQL with Python, COMMIT and ROLLBACK Operations	7
Study Resources	• Lutz M.Z., (2009), Learning Python, 4th edition, O'Reilly USA • Dawson M., (2008), Programming with python, A users Book, Cengage Learning • Beazley D., (2010), Python Essential Reference, 4th edition, AddisonWesely, USA • McGrath M., (2018), Python in easy steps, 2nd edition, In easy steps Limited, • Peter C. N., Samuel A., (2005), Beginning Pythonl, Wrox Publication. • Brown C.M., (2018), Python, the Complete Reference, McGraw Hill Education, USA	

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-363: Operating System

Total Hours: 30

Credits: 2

Course Objectives	- To understand basic concepts and functions of modern operating systems. - To understand the concept of process, and thread with scheduling, process synchronization and deadlock. - To know the concept of I/O and File management, various Memory management techniques and related algorithms.	
Course Outcomes	After successful completion of this course, students are expected to: - familiar with Operating System Services. - understand CPU scheduling algorithms, memory Management Techniques, Disk Drum Scheduling algorithms, Deadlock preventions and avoidance. - aware about android operating systems – its architecture, applications and uses.	
Unit	Contents	Hours
Unit I	Introduction - What is an operating system? - Types of Operating System - Services of Operating System - Functions of operating system. CPU scheduling - Multiprogramming Concepts Basic Concept of CPU scheduling: CPU-I/O burst cycle, CPU scheduler, - Preemptive scheduling, Dispatcher , Performance criteria's Scheduling Algorithms:FCFS, SJF, Priority scheduling, Round-robin scheduling - Multilevel queues, multilevel feedback queue	8
Unit II	Memory Management - Logical versus Physical Address space, Swapping - Multiple partition allocation MFT, MVT - Paging, Segmentation - Virtual Memory Management – Background, Demand paging Disk and Drum Scheduling - First Come first serve scheduling, - Shortest Seek Time First Scheduling, - SCAN Scheduling, - C-SCAN Scheduling	7
Unit III	Deadlocks - Concept of Deadlock, Deadlock Characterization, Deadlock Prevention, - Deadlock, Avoidance, Deadlock Detection, Recovery from Deadlock	8

Unit IV	Overview of Android Operating system What is android operating system? Android Architecture, Features of Android operating system, Applications of android operating system, What is Google play store?	7
Study Resources	- Silberschatz P., Galvin P. B., Gangne G., (2012), Operating system concepts, 9th edition, Addison Wesley, USA - Tanenbaum A. S., (2007), Modern Operating Systems, 3rd edition, P .H.I. New Delhi. - Godbole A.S., Kahate A., (2010), Operating Systems, 3rd edition, McGraw Hill Education. - Garaenta M., (2014), Learning Android, 2nd edition, O Reilly - Wolfson M., (2013), Android developers tools Essential, O Reilly	

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-364: Computer Network

Total Hours: 30

Credits: 2

Course Objectives	- To understand different types of networks, various topologies and application of networks. - To understand the various Internetworking models. - To understand various working of each layer in above models. - To aware about Computer security using cryptography.	
Course Outcomes	After successful completion of this course, students are expected to: - understand the information exchange done across the network with the help of OSI & TCP/IP models. - learn how errors are captured & handled in network. - familiar with logical addressing and routing algorithms.	
Unit	Contents	Hours
Unit I	Introduction to Computer Networks and Network Model Computer Networks: Goals and applications – Business Application , Home Application, Mobile User, Social Issues Network Types: LAN, MAN, WAN, Wireless Networks, Home Networks, Internet Work, Topologies: star, bus, mesh, ring etc. OSI Reference Model: Functionality of each layer, TCP/IP Reference Model	8
Unit II	The Physical Layer - Transmission Media - Guided Media: Fiber Optics, Satellite Communication, Microwave Communication, Submarine Cables. - Unguided Media: Radio Transmission, Microwave Transmission, Infrared & - Millimeter Waves, Light wave Transmission - Switching - Circuit Switching, Message Switching and Packet Switching, comparison of circuit & packet switching The Data link Layer - Services Provided to Network Layer - Framing, Error Control , Flow Control - Error Detection – Redundancy, Parity Check, Checksum & CRC - Error Correction – Hamming Code.	7
Unit III	The Network Layer - Logical Addressing IPV4 Addresses: - Address Space - Classfull Addressing,	8

	• Classless Addressing, Routing Algorithm: • Shortest Path, • Multicast Routing, • Congestion Control, • Introduction to Congestion Control, • Deadlocks Transport Layer • Process to Process Delivery, Client-Server Paradigm, Multiplexing and • Demultiplexing Connectionless v/s Connection Oriented Services, Reliable v/s • Unreliable Transmission, UDP and TCP	
Unit IV	Cryptography and Public key Infrastructure • Introduction: • Cryptography, • Cryptanalysis, • Cryptology, • Substitution • Techniques: • Caesar's cipher, • Monoalphabetic and Polyalphabetic • Transposition techniques: • Rail fence technique, • Simple Columnar • Public key infrastructures: • basics, digital certificates, • certificate authorities, • registration authorities, Digital Signature	7
Study Resources	• Tanenbaum A. S., (2003), Computer Networks, 4th edition, Prentice Hall, Netherland • Forouzan B. A., (2013), Data Communication & Networking, 5th edition, McGraw Hill Higher Education Delhi • Black U.D.,(1987), Data Communication & Distributed Networks, 2nd edition Prentice-Hall, Englewood Cliffs • Kahate A., (2017), Cryptography and Network Security, 3rd edition, McGraw Hill.	

T.Y. B.Sc. Computer Science (Major with IKS)
Semester-VI
CS-DSC-365: Evolution of Computing in India

Total Hours: 30

Credits: 2

Course Objectives	The learner will be able to - gain insights into the historical contributions and advancements in computing science from ancient Indian civilizations. - explore and understand key contributions to computing during the 19th century, shaping the foundation of modern computational theory and technology. - analyze the impact of government policies on the IT industry and assess the current status and trends within the sector.	
Course Outcomes	After successful completion of this course, students are expected to: - achieve the knowledge about the history of computing in Indian civilization. - know the impact of computing in the foundation of modern computational theory. - Analyze the impact of government the policies on IT industry.	
Unit	Contents	Hours
Unit I	Computing Science in Ancient India - An overview of Ancient Indian Science - Vedic Cognitive science, mathematical and physical science, - Scientist of ancient India, Binary numbers in Indian Antiquity - Pingala's classification of Meters, - Encode decode system in Ancient India-Katayapadi Scheme, - Panini's contribution in computing -The Panini-Backus Form, Fowlers' automaton .	7
Unit II	Contribution in Computing in 19th Century - Laying the foundation, First computer in India, - TIFRAC, Self-reliant growth of computer industry, - ECIL's computer division, - PARAM super computer, - NASSCOM, Contribution of CDAC, - Development of multilingual software. Indian computer scientist, Indian IT industrialist.	8
Unit III	Government Policies - Economy of India, Government initiative - Role of government institution & Ministry of Information Technology - Government Policies at early stage and revised policies - Consequences of Government policies.	7
Unit IV	Status of IT industry - Entry of private sector in computer industry - Liberalization of economy and software expert growth - The period of rapid growth of IT industry - Indian IT industry in global perspective - Indian ICT industry in global perspective	8

	• Future of IT industry	
Study Resources	• “Computing science in Ancient India”, T.R.N. Rao / SubhashKak • “History of Computing in India 1955-2010”, V. Rajaraman, IEEE n Computer Society • “HomiBhabha and the Computer Revolution”, R.K. Shyamsunder and M. A. Pai, Oxford University, 2011 • https://www.scribd.com/document/57187049/History-of-Computer-Technology-in-India# • https://en.m.wikipedia.org/wiki/TCIFRAC • https://en.m.wikipedia.org/wiki/Information_technology_in_India	

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-366: Practical on Data Analytics

Total Hours: 60

Credits: 2

Course Objectives	After successful completion of this course, students are expected to: • To understand the fundamental concepts of big data analytics. • To learn to use various techniques for mining data • To understand the basic concepts of R- Programming • To apply R- Programming for Big Data Analytics	
Course Outcomes	On completion of the course, student will be able to : • To understand the fundamental concepts of big data analytics. • To learn to use various techniques for mining data • To understand the basic concepts of R- Programming • To apply R- Programming for Big Data Analytics	
Sr. No.	Contents	Hours
1	Installation of R Studio	4
2	Basic syntax of R	4
3	Demonstration of Vector data objects	4
4	Demonstration of matrix, array in R.	4
5	Demonstration and use of data frames in R.	4
6	Demonstration of sample data creation and data manipulation in R.	4
7	Demonstration of if, if..else, if..else..if statements in R.	4
8	Demonstration of switch, for, while repeat statements in R.	4
9	Demonstration of various next ,break statements in R.	4
10	Demonstration of functions in R	4
11	Write the R Program to demonstrate data visualization using Bar and Line Charts, etc.	4
12	Write the R Program to demonstrate data visualization using Pie Chart, Scatter Plot etc.	4
13	Write the R program to classify the data using SVM.	4
14	Write the R Program to classify the data using K-means clustering.	4
15	Write the R program to implement Association rule mining.	4
Study Resources	• Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data- EMC Education Services, Wiley Publication. • “The book of R A first course in Programming and Statistics”, by Tilman M. Davies, ISBN-13:978-1-59327-651-5 • “R Programming for Data Science”, Roger D. Peng	

***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Major)
Semester-VI
CS-DSC-367: Practical on Python Programming- II

Total Hours: 60

Credits: 2

Course Objectives	After successful completion of this course, students are expected to: - To learn how to design and code Python applications. - To develop different application using Python. - To develop the ability to write database applications in Python	
Course Outcomes	On completion of the course, student will be able to : - develop Python Programs using object oriented concepts. - connect Database with Python applications. - implement GUI applications using Python.	
Sr. No.	Contents	Hours
1	Write a program to demonstrate Exception Handling in Python	4
2	Write a program to demonstrate the working of classes and objects.	4
3	Write a program to demonstrate Inheritance in Python	4
4	Write a program to demonstrate Overloading Methods in Python.	4
5	Write a program to demonstrate read & write file, renaming, Moving, Copying, and Removing Files.	4
6	Write a Python GUI program to create text-box to accept a value from the user using tkinter module	4
7	Write a Python GUI program to add a button in your application using tkinter module.	4
8	Write a Python GUI program to create a Combobox widget using tkinter module	4
9	Write a program to create a database application for insert, update and delete in a table using MySQL.	4
10	Write a program to demonstrate Operator Overloading in Python.	4
11	Write a Python GUI program to demonstrate menu widget using tkinter module	4
12	Write a Python GUI program to demonstrate use of dialog boxes using python.	4
13	Write a Python GUI program to demonstrate layout manegment in python.	4
14	Write a Python GUI program to create a Checkbutton widget using tkinter module	4
15	Develop a student data entry from with the help of GUI widget using tkinter module.	4
Study Resources	- Lutz M.z., (2009), Learning Python By Mark Lutz, 4th edition, O'Reilly USA - Dawson M., (2008), Programming with python, A users Book, Cengage Learning - Beazley D., (2010), Python Essential Reference, 4th edition, AddisonWelsely, USA - McGrath M., (2018), Python in easy steps, 2nd edition, www.w3school.org	

***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Elective)
Semester-VI
CS-DSE-361A: Front End Framework -Angular

Total Hours: 30

Credits: 2

Course Objectives	- Understanding Basic concept of AngularJS - Properly separate the model, view, and controller layers of your application and implement them using AngularJS - Master AngularJS expressions, filters, AngularJS directives and scopes - Build Angular forms - Understand the design of single-page applications and how AngularJS facilitates their development	
Course Outcomes	At the end of the course, the student should be able to: - Build an awesome User Interface - Create and bind controllers with JavaScript - Validate user input data - Write own filters, directives and controls - Create animation in web page and Create single page application	
Unit	Content	Hours
Unit I	Introduction To Angularjs - What is AngularJS?, Why AngularJS? - Features of AngularJS - AngularJS architecture, Setting up the Environment - Model-View-Controller explained - My first AngularJS app - Angular expressions: How to use expressions, Number and String Expressions, Object Binding and Expressions - Working with Arrays, Forgiving Behaviour - Angular expressions v/s Javascript expressions	07
Unit II	Filters And Modules - Built-in filters- Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter, Filter Filter, Using AngularJS filters, Creating custom filters - Introduction to AngularJS Modules-Module Loading and Dependencies - Creation vs Retrieval, Bootstrapping AngularJS - Role of a Controller- Attaching properties and functions to scope Nested Controllers, Using filters in Controllers, Controllers in External Files, Controllers & Modules, Controllers	08
Unit III	Directives - Introduction to Directives- Directive lifecycle - Using AngularJS built-in directives - Core Directives - Conditional Directives - Style Directives - Mouse and Keyboard Events Directives, - Matching directives	08

	• Creating a custom directive	
Unit IV	Forms in angularjs • Working with Angular Forms, Model binding, Understanding Data Binding, Binding controls to data, Form controller, Validating Angular Forms, Form events, Updating models with a twist, \$error object • What is scope, Scope lifecycle, Two way data binding, Scope inheritance, Scope & controllers, Scope & directives, \$apply and \$watch, Rootscope, Scope broadcasting, Scope events • Single Page Application (SPA)-what is SPA, Pros & Cons of SPA, Installing the ngRoute module, Configure routes, Passing parameters, Changing location, Resolving promises, Create a Single Page Application	07
Study Resources	• Professional AngularJS by Diego Netto and Valeri Karpov-Wrox press • Learning AngularJS by Brad Dayley- Addison-Wesley Professiona • AngularJS by Brad Green and ShyamSeshadri- O'Reilly • Pro AngularJS by Adam Freeman-APress • Learning AngularJS: A Guide to AngularJS Development by Ken Williamson-O'Reilly Media • Beginning AngularJS by Andrew Grant-Apress	

T.Y. B.Sc. Computer Science (Elective)
Semester-VI
CS-DSE-361B: Linux BASH (Shell Scripting)

Total Hours: 30

Credits: 2

Course Objectives	- To demonstrate Linux environment - To familiarize system access and user accounts - To aware basic concepts of BASH shell programming - To learn BASH scripting	
Course Outcomes	At the end of the course, the student should be able to: - understand the Linux environment - use Linux system and can access different user accounts - handle the file system and perform different operations on file - program using BASH shell	
Unit	Content	Hours
Unit I	History and Development of Linux - A Brief History of Linux - Basic features of Linux OS - Components of Linux System - Benefits of Linux, Linux Licensing - Examining Linux Distributions System Access and User Accounts - Logging In and out Using the Linux System - Creating Additional User Accounts - Creating & Managing Groups - Managing Users Linux Commands	07
Unit II	File System and File Operations - Introduction to The File System and Working with Linux Permissions - File System Navigation - Managing The File System Understanding Permissions - Changing File And Directory Permissions - Changing Default Permissions And Ownership Archiving Files Archiving Files With Tar - Zippping Files - Creating and Viewing Files Using The Vi Editor - Studying Other Editors - Linux Filter Commands	08
Unit III	Introduction to Bash Scripting - Basics of Shell Scripting - Bash structure, Bash variables, user input, comments, arguments - Bash arrays- substring in bash, slicing - Bash Conditional Expression- file expression, string expression, arithmetic operator, exit status operators	08

Unit IV	Bash Conditions and scripts • If • if-else • switch • Bash loops- for • while, until • continue, break • Writing scripts and excuting scripts • Creating menus in Bash	07
Study Resources	• Begining Linux Programming, 4th Edition, N. Matthew, R.Stones, Wrox, Wiley India Edition. • Unix for Programmers 3rd Ed, Graham Glass & King Ables, Pearson Education. • System Programming with C and Unix, A.Hoover, Pearson • Linux System Programming, Robert Love, O'Reily, SPD • Shell Scripting, S.Parker, Wiley India Pvt. Ltd	

T.Y. B.Sc. Computer Science (Elective)
Semester-VI
CS-DSE-362A : Practical on Front End Framework -Angular

Total Hours: 60

Credits: 2

Course Objectives	- To understand basic concept of AngularJS - To separate the model properly, view, and controller layers of your application and implement them using AngularJS - Master AngularJS expressions, filters, AngularJS directives and scopes - Build Angular forms - Understand the design of single-page applications and how AngularJS facilitates their development	
Course Outcomes	At the end of the course, the student should be able to: - Build an awesome User Interface - Create and bind controllers with JavaScript - Validate user input data - Write own filters, directives and controls - Create animation in web page and Create single page application	
Sr. No.	Contents	Hours
1	Write angular js app which display your name, college name, class.	4
2	Write angular js app which demonstrate one way and two way data binding.	4
3	Demonstrate ng-cut,ng-copy & ng-paste directive.	4
4	Demonstrate different directive related to mouse and keyboard events.	4
5	Demonstrate Conditional Directives.	4
6	Write angular js app which display list of employees in tabular for having different color for even odd row.	4
7	Write angular js app for creating custom directive which display current date and current time in elements, attributes, class and comment.	4
8	Demonstrate all types of Expressions used in angular js.	4
9	Demonstrate nested controller.	4
10	Demonstrate number, currency, Uppercase and Lowercase Filters.	4
11	Write angular js app for displaying current date in 10 different format using date filter.	4
12	Write angular js app which sort array object data in ascending and descending by using orderby filter.	4
13	Write angular js app which demonstrate filter filter and json filter.	4
14	Write angular js code for Creating custom filters.	4
15	Demonstrate filter in controller for following filter a. Filter b. Date c. Order by	4

Study Resources	• Professional AngularJS by Diego Netto and Valeri Karpov-Wrox press • Learning AngularJS by Brad Dayley- Addison-Wesley Professiona • AngularJS by Brad Green and ShyamSeshadri- O'Reilly • Pro AngularJS by Adam Freeman-APress • Learning AngularJS: A Guide to AngularJS Development by Ken Williamson- O'Reilly Media • Beginning AngularJS by Andrew Grant-Apress *Mandatory to perform any 12 practical from above.
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T.Y. B.Sc. Computer Science (Elective)
Semester-VI
CS-DSE-362B : Practical on Linux BASH (Shell Scripting)

Total Hours: 60

Credits: 2

Course Objectives	- To Learn Basics of Linux Operating System - To learn file management and permission advance commands - To give the practical knowledge of BASH programming.	
Course Outcomes	At the end of the course, the student should be able to: - Understand the concepts of Linux Operating System - Use shell script to create files and handle text documents - Create Bash shell script - Create menus and interactive interface using Bash.	
Sr. No	Contents	Hour
1	Demonstrate the commands : wd, cd, mkdir, cat, more less	4
2	Demonstrate the commands : head,tail,ls,date, cal, rmdir, mv, rm, cp	4
3	Demonstration of chmod command	4
4	Write a Bash Script to check entered number is negative positive or zero.	4
5	Write a Bash Script For Cheking Even/Odd numbers Using && Operator.	4
6	Write a Bash Script For Removing Duplicate Lines from Files	4
7	Write a Bash Script to demonstrate linux filter commands	4
8	Write a Bash Script to demonstrate zipping commands	4
9	Write a Bash Scriptto use switch statement	4
10	Write a Bash Script conditional statements.	4
11	Write a Bash Script to demonstrate for looping statements	4
12	Write a Bash Script to demonstrate arrays in Bash	4
13	Write a Bash Script to demonstrate strings in Bash	4
14	Write a Bash Script to create menus for interactive interface.	4
15	Write a Bash Script to demonstrate continue and break statements	4
Study Resources	- Begining Linux Programming, 4th Edition, N. Matthew, R.Stones, Wrox, Wiley India Edition. - Unix for Programmers 3rd Ed, Graham Glass & King Ables, Pearson Education. - System Programming with C and Unix, A.Hoover, Pearson - Linux System Programming, Robert Love, O'Reily, SPD - Shell Scripting, S.Parker, Wiley India Pvt. Ltd	

***Mandatory to perform any 12 practical from above.**

T.Y. B.Sc. Computer Science (Vocational)
Semester-VI
CS-VSC-361: Mobile Application Development

Total Hours: 30

Credits: 2

Course Objectives	- To learn basics of Mobile Application Development - To understand use of activities, intents and fragments - To learn to design User Interface - To learn to store and retrieve data from database	
Course Outcomes	After successful completion of this course, students are expected to: - Install Android SDK and tools required for mobile application development - Use activities, intents and fragments for Mobile Application Developments - Design user interface using views and menus - Design Mobile application to create, store and retrieve databases	
Unit	Contents	Hours
Unit I	Introduction to Mobile Application Development - What is Android? - Features of Android - Architecture of Android - Android SDK Overview - Exploring IDE - Creating first Hello word Android Application	8
Unit II	Activities, Intents and Fragments - Definition of Activity - Life cycle of Activity - Applying styles, themes and hiding titles of Activity - Introduction to intents - Linking Activities with Intents - Intent filter - Introduction of Fragments - Life cycle of Fragment - Interaction between Fragments	8
Unit III	User Interface - Introduction to Views and ViewGroups - Layouts in Android-FrameLayout, LinearLayout, TableLayout, TableRow, GridLayout, RelativeLayout - Creating New Views - Creating and Using Menus	8
Unit IV	Data Storage and Retrieval - Introduction to SQLite - Cursors and Content Values - Working with Android Databases	6
Study Resources	Professional Android™ Application Development, Reto Meier, Wrox Publications, ISBN: 978-0-470-34471-2	

	• Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication • Android SQLite Essentials,Sunny Kumar Aditya, Vikash Kumar KarnPackt Publishing Ltd. ISBN 978-1-78328-295-1
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T.Y. B.Sc. Computer Science (Vocational)
Semester-VI
CS-VSC-362: Practical on Mobile Application Development

Total Hours: 60

Credits: 2

Course Objectives	- To learn basics of Mobile Application Development - To understand use of activities, intents and fragments - To learn to design User Interface - To learn to store and retrieve data from database	
Course Outcomes	After successful completion of this course, students are expected to: - Install Android SDK and tools required for mobile application development - Develop Mobile Application Using activities, intents and fragments - Design user interface using views and menus - Design Mobile application to create, store and retrieve databases	
Sr. No.	Contents	Hours
1	Installation of Android SDK and required tools	4
2	Develop a mobile application to display “Hello World”	4
3	Display dialog window using Activity	4
4	Link Activities using intents and return results from an Intent	4
5	Passing Data Using an Intent Object	4
6	Demonstrate Use of Fragments by adding fragments dynamically in Activity	4
7	Demonstrate interactions between fragments	4
8	Display notifications using NotificationManager	4
9	Demonstrate use of FrameLayout, LinearLayout, TableLayout, TableRow, GridLayout, RelativeLayout	4
10	Create Mobile Application to demonstrate creation and modification of Views	4
11	Demonstrate the behaviour of activity when the device changes orientation	4
12	Create mobile application to demonstrate Menus	4
13	Create Database and Tables using SQLite.	4
14	Demonstrate Insert, Update and deletion of rows in Table.	4
15	Demonstrate data retrieval from database tables.	4
Study Resources	- Professional Android™ Application Development, Reto Meier, Wrox Publications, ISBN: 978-0-470-34471-2 - Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication - Android SQLite Essentials, Sunny Kumar Aditya, Vikash Kumar KarnPackt Publishing Ltd. ISBN 978-1-78328-295-1	

***Mandatory to perform any 12 practical from above.**