



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE
(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)

Tamil Nadu, India

Website: www.svmcugi.com E-mail: svmugibca@gmail.com



DEGREE OF BACHELOR OF SCIENCE
IN
COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR
B.SC. COMPUTER SCIENCE PROGRAMME
(SEMESTER PATTERN)

(For Students Admitted in the College from the Academic Year 2023-2024 Onwards)



REGULATIONS AND SYLLABUS FOR B.SC. COMPUTER SCIENCE PROGRAMME

(For Students Admitted in the College from the Academic Year 2023-2024 Onwards)

1. Vision of the Department

To uplift the economically and educationally backward students by developing the personality of the individual, instilling high levels of discipline and preparing them to strive, to set global standards that contributes to the development of the society.

2. Mission of the Department

Impart the knowledge of recent technologies and equip the students with essential skills, technologically make them updated by creating intellectually inspiring environment for Learning, Research, Creativity, Innovation and Professional activities, enable them to become knowledgeable, motivated and resourceful IT professionals.

3. Definitions

- (i) **Programme:** Programme means a course of study leading to the award of the degree in a discipline.
- (ii) **Course:** Course refers to the subject offered under the Degree Programme.

4. Aim of the Programme

1. To produce the under Graduate in Computer Science with strong knowledge of theoretical computer science.
2. Impart quality education and provide technical skills in Computer Science through best of practices.
3. To produce graduates who can contribute professionally to the society and widely as IT professionals or entrepreneurs.
4. To develop Listening, Speaking, Reading, Writing skills with advanced technologies.
5. Forms the students to compete in the career and higher education with proper skillsets.
6. Effectively communicating computing concepts and solutions to create and initiate innovation in Computer field.
7. Effectively using their knowledge of Computing and Mathematical theory to develop sustainable solutions to computing problems.
8. To instill Human, Moral and ethical values in the young minds of the students and thereby improving the total personality of the students.



5. Programme Outcomes (Pos)

PO1	Scientific aptitude will be developed in Students
PO2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
PO3	Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
PO4	Students will possess basic subject knowledge required for higher studies, professional and applied courses.
PO5	Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
PO6	Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
PO7	The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
PO8	Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.
PO9	To recognize patterns and to identify essential and relevant aspects of problems.
PO10	Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
PO11	Mould the students into responsible citizens in a rapidly changing interdependent society.

6. Programme Specific Outcomes (PSOs)

PSO1	Think in a critical and logical based manner
PSO2	Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.
PSO3	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.



PSO4	Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.
PSO5	Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.
PSO6	Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.
PSO7	Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
PSO8	Develop a range of generic skills helpful in employment, internships& societal activities.
PSO9	Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

7. Eligibility for Admission

A candidate who has passed in Higher Secondary Examination with Mathematics or Business Mathematics or Computer Science or Statistics (Academic stream or Vocational stream) as one of the subject under Higher Secondary Board of Examination, Tamilnadu as per norms set by the Government of Tamilnadu or an Examination accepted as equivalent there to by the syndicate, subject to such conditions as may be prescribed there to are permitted to appear and qualify for the B.Sc. degree examination in Computer Science of this Autonomous College affiliated to Periyar University after a course of study of three academic years.

8. Duration of the Programme

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days (450 hours) for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

9. Features of Choice Based Credit System

Under Choice Based Credit System (CBCS), a set of Courses consisting of Core Courses, Elective Courses, Skill Based Elective Courses and Non-Major Elective Courses are offered. Beside the Core Courses, which are totally related to the major subject, the students have the advantage of studying supportive papers and Non-Major Courses. This provides enough



opportunity to the students to learn not only the major courses but also inter disciplinary and application oriented courses.

10. Syllabus

The syllabus of the B.Sc. Computer Science Degree Programme is divided into the following Courses:

- (i) **Language Courses:**
- (ii) **Core Courses:** The Core Courses are related to the Programme concerned including practicals and project offered under the Programme.
- (iii) **Elective Courses:** There are TWO Elective Courses offered under the Programme related to the Discipline or Generic but are to be selected by the students.
- (iv) **Skill Enhancement Courses (SEC):** This course aims to impart advanced and recent developments in the concerned discipline.
- (v) **Non-Major Elective (NME):** Irrespective of the discipline, the student can select papers that are offered by other disciplines as non-major elective course.
- (v) **Extra Credit Courses:** In order to facilitate the students gaining extra credits, the Extra Credit Courses are offered. According to the guidelines of the UGC, the students are encouraged to avail this option of enriching the knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals, such as SWAYAM, NPTEL, etc.

11. Programme of Study

The Programme of study for the Degree shall be in the Branch – Computer Science (Choice Based Credit System) with internal assessment comprised of instructions in the following subjects according to the syllabi and books prescribed from time to time.

12. Credit

Weightage given to each course of study is termed as Credit.

13. Credit System

The weightage of credits are spread over to four different semesters during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the student. A total of 140 Credits are prescribed for the B.Sc. Computer Science Degree Programme which is the minimum Credit requirement for the three years B.Sc. Computer Science Degree Programme.



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Bachelor of Computer Applications (BCA)

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2023-2024 Onwards)

Sl. No	Part	Nature of Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
							CIA	ESE	Total
SEMESTER – I									
1	I	Language	23UTA1F01	Foundation Tamil – I / Other Language	5	3	25	75	100
2	II	Language	23UEN1F01	Foundation English – I	5	3	25	75	100
3	III	Core – I	23UCS1C01	Python Programming	6	5	25	75	100
4		Core Practical – I	23UCS1P01	Python Programming Lab	3	5	25	75	100
5		Elective Course – I (Generic)	23UMA1A01	Discrete Mathematics - I	5	3	25	75	100
6	IV	SEC – I		NME	2	2	25	75	100
7		FC	23UCS1FC01	Problem Solving Techniques	4	2	25	75	100
Total					30	23	175	525	700
SEMESTER – II									
9	I	Language	23UTA2F02	Foundation Tamil – II / Other Language	5	3	25	75	100
10	II	Language	23UEN2F02	Foundation English - II	5	3	25	75	100
11	III	Core – II	23UCS2C02	Data Structures & Algorithms	6	5	25	75	100
12		Core Practical – II	23UCS2P02	Data Structures & Algorithms Lab	3	5	25	75	100
13		Elective Course – II (Generic)	23UMA1A02	Discrete Mathematics - II	5	3	25	75	100
14	IV	SEC – II		NME	3	2	25	75	100
15		SEC – III	23UCS2S01	Introduction to HTML	3	2	25	75	100
Total					30	23	175	525	700



SEMESTER – III									
17	I	Language	23UTA3F03	Foundation Tamil – III / Other Language	5	3	25	75	100
18	II	Language	23UEN3F03	Foundation English - III	5	3	25	75	100
19	III	Core – III	23UCS3C03	Microprocessor and Microcontroller	6	5	25	75	100
20		Core Practical – III	23UCS3P03	Microprocessor and Microcontroller Lab	3	5	25	75	100
21		Elective Course – III (Generic)			6	3	25	75	100
22	IV	SEC – IV	23UCS3S02	Web Designing	2	1	25	75	100
23		SEC – V	23UCS3S03	Office Automation	2	2	25	75	100
25		Common Course		Environmental Studies	1	-			
Total					30	22	175	525	700
SEMESTER – IV									
26	I	Language	23UTA4F04	Foundation Tamil – IV / Other Language	5	3	25	75	100
27	II	Language	23UEN4F04	Foundation English - IV	5	3	25	75	100
28	III	Core – IV	23UCS4C04	Java Programming	6	5	25	75	100
29		Core Practical – IV	23UCS4P04	Java Programming Lab	3	5	25	75	100
30		Elective Course – IV (Generic)			5	3	25	75	100
31	IV	SEC – VI	23UCS4S04	PHP Programming	2	2	25	75	100
32		SEC – VII	23UCS4S05	Advanced Excel	2	2	25	75	100
33		Common Course	23UES401	Environmental Studies	2	2	25	75	100
Total					30	25	200	600	800
SEMESTER – V									
35	III	Core – V	23UCS5C05	Software Engineering	5	4	25	75	100
36		Core – VI	23UCS5C06	Database Management System	5	4	25	75	100
37		Core	23UCS5P05	Database	3	4	25	75	100



		Practical – V		Management System Lab					
38		Elective Course – V		Elective Course – V	5	3	25	75	100
39		Elective Course – VI		Elective Course – VI	5	3	25	75	100
40		Project		Project with Viva Voce	5	4	25	75	100
41	IV	Value Education		Value Education	2	2	25	75	100
42				Internship	-	2			
Total					30	26	175	525	700
SEMESTER – VI									
43	III	Core – VII	23UCS6C07	Computer Networks	7	4	25	75	100
44		Core – VIII	23UCS6C08	.Net Programming	6	4	25	75	100
45		Core Practical –VI	23UCS6P06	.Net Programming Lab	3	4	25	75	100
46		Elective Course – VII		Elective Course – VII	5	3	25	75	100
47		Elective Course – VIII		Elective Course – VIII	5	3	25	75	100
48	IV	PCSEC	23UCS6S06	Robotics & its Applications	4	2	25	75	100
49	V		23UEX601	Extension Activities	-	1	-	-	-
Total					30	21	150	450	600
Grand Total					180	140	1050	3150	4200

Note

CBCS – Choice Based Credit system

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

**Elective Courses****Elective – V**

Semester	Part	Course Code	Name of the Course
V	III	23UCS5E01	Introduction To Data Science
		23UCS5E02	Artificial Intelligence
		23UCS5E03	Artificial Neural Network

Elective – VI

Semester	Part	Course Code	Name of the Course
V	III	23UCS5E04	Natural Language Processing
		23UCS5E05	Software Project Management
		23UCS5E06	Cryptography

Elective – VII

Semester	Part	Course Code	Name of the Course
VI	III	23UCS6E07	IoT and its Applications
		23UCS6E08	Image Processing
		23UCS6E09	Big Data Analytics

Elective – VIII

Semester	Part	Course Code	Name of the Course
VI	III	23UCS6E10	Cloud Computing
		23UCS6E11	Grid Computing
		23UCS6E12	Virtual Reality



Skill Enhancement Courses

Part	Semester	Nature of Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
							CIA	ESE	Total
IV	I	SEC - I		NME	2	2	25	75	100
IV	II	SEC - II		NME	2	2	25	75	100
IV	II	SEC - III	23UCA2S01	Introduction to HTML	2	2	25	75	100
IV	III	SEC - IV	23UCA3S02	Web Designing	2	1	25	75	100
IV	III	SEC - V	23UCA3S03	Office Automation	2	2	25	75	100
IV	IV	SEC - VI	23UCA4S04	PHP Programming	2	2	25	75	100
IV	IV	SEC - VII	23UCA4S05	Advanced Excel	2	2	25	75	100
IV	VI	PCSEC SEC - VIII	23UCA6S06	Robotics & its Applications	2	2	25	75	100

Non Major Elective – (NME)

Extra Disciplinary Subjects offered by the Department of Computer Applications. The department can offer any one of the subjects to the other major subject students in each semester.

Part	Semester	Course Code	Name of the Course	Hours/Week	Credits	Marks		
						CIA	ESE	Total
IV	I	23UCS1N01	Understanding Internet	2	2	25	75	100
IV	I	23UCS1N02	Office Automation	2	2	25	75	100
IV	II	23UCS2N03	Introduction to HTML	2	2	25	75	100
IV	II	23UCS2N04	Web Designing	2	2	25	75	100



List of Extension Activities

1. National Service Scheme (NSS)
2. Youth Red Cross (YRC)
3. Physical Education (PYE)
4. Eco Club (ECC)
5. Red Ribbon Club (RRC)
6. Women Empowerment Cell (WEC)

14. Break-Up of Marks and Credits

The break-up of marks and credits for the B.Sc. Computer Science Degree Programme is as follows:

Sl. No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil	400	12
2.	II	Language – English	400	12
3.	III	Core Courses – Theory/Practical	1400	64
		Generic Elective Courses – Theory/Practical	400	12
		Discipline Elective Courses	400	12
		Project	100	4
4.	IV	Skill Enhancement Courses / NME	700	13
		Environmental Studies	100	2
		Value Education	100	2
		Foundation Course	100	2
		Professional Competency Skill Enhancement Course	100	2
		Internship / Industrial Training	-	2
5.	V	Extension Activities	-	1
Total			4200	140

- The students are advised to complete a **SWAYAM/MOOC** before the completion of the even semester of each year of study and submit the course completion certificate to the HOD. Two credits will be given to the candidates who have successfully completed.
- The field trip preferably relevant to the course should be undertaken every year.



15. Examinations

The examinations consist of Continuous Internal Assessment (CIA) and end of semester examinations (ESE). The ESE shall be of Three Hours duration for each theory course at the end of every semester. The candidate failing in any course(s) will be permitted to appear for each failed course(s) in the subsequent examination. The end of semester practical examinations shall be of Three Hours for each practical course conducted at the end of every even semester.

To maintain uniformity, particularly for interdepartmental transfer of credits, there shall be a uniform pattern of examination to be adopted by all the teachers offering courses. There shall be three tests, one seminar and one assignment for CIA and ESE during each semester. The distribution of marks for CIA and ESE shall be 25 marks and 75 marks, respectively. Further, the distribution of CIA will be 15 marks for test, 5 marks for assignment and 5 marks for attendance. The average of the highest two test marks out of the three CIA tests will be taken for CIA.

16. Components of Continuous Internal Assessment (CIA)

Components		Marks	Total Marks
Theory			
CIA I	75	(75+75 = 150/10)	25
CIA II	75	15	
Assignment		05	
Attendance		05	
Practical			
CIA		15	25
Practical Observation Notebook		05	
Attendance		05	



17. QUESTION PAPER PATTERN

Bloom's Taxonomy Based Assessment Pattern

(K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate)

(i) Theory Examinations (CIA I & CIA II = 25 Marks and ESE = 75 Marks)

Knowledge Level	Section	Marks	Description	Total Marks
K1	A (Answer ALL) Q1–Q15	$15 \times 1 = 15$	Multiple Choice Questions (MCQ) (Three questions from each unit)	15
K2	B (Answer any THREE out of FIVE) Q16–Q20	$3 \times 5 = 15$	Short Answers (One question from each unit)	15
K3 & K4	C (Either or Pattern) Q20–Q25	$5 \times 9 = 45$	Descriptive/Detailed Answers (Two questions from each unit)	45
Total Marks				75

Passing Minimum (CIA) 40% = 10 Marks

Passing Minimum (ESE) 40% = 30 Marks

40 Marks

(ii) Practical Examinations (CIA = 40 Marks and ESE = 60 Marks)

Knowledge Level	Components	Marks	Total
K3	Experiments	60	75
K4	Record Work	15	
K5			

Passing Minimum (CIA) 40% = 10 Marks

Passing Minimum (ESE) 40% = 30 Marks

40 Marks



The candidate shall be declared to have passed the examination if the candidates secure not less than 30 marks out of 75 marks in the semester examination in each theory course and 10 marks out of 25 marks in the CIA and in total not less than 40 marks.

For the practical course, 30 marks out of 75 marks in the semester examination and the record notebook taken together and 10 marks out of 25 marks in the CIA and in total 40 marks. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary.

Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

18. Maximum Duration for the Completion of the B.Sc. Computer Science Programme

The maximum duration for completion of the B.Sc. Computer Science Programme shall not exceed twelve semesters.

19. Commencement of this Regulation

This regulation and syllabus shall take effect from the academic year 2023–2024 for students who are admitted to the first year of the Programme during the academic year 2023–2024 and thereafter.

20. Grading

Once the marks of the cumulative CIA and ESE are available, they will be added. The marks thus obtained will then be graded as per details given below:

Marks and Grades:

The following table gives the marks grade points, letter grades and classification to indicate the performance of the candidate.

Range of Marks	Grade Points	Letter Grade	Description
90–100	9.0–10.0	O	Outstanding
80–89	8.0–8.9	D+	Excellent
75–79	7.5–7.9	D	Distinction



70–74	7.0–7.4	A+	Very Good
60–69	6.0–6.9	A	Good
50–59	5.0–5.9	B	Average
40–49	4.0–4.9	C	Satisfactory
00–39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

C_i = Credits earned for course i in any semester

G_i = Grade Point obtained for course i in any semester

n = Semester in which such course were credited

Grade point average (for a Semester):

Calculation of grade point average semester-wise and part-wise is as follows:

$$\text{GRADE POINT AVERAGE [GPA]} = \frac{\sum C_i G_i}{\sum C_i}$$

Sum of the multiplication of grade points by the credits of the courses under each part

$$\text{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the courses under each part}}{\text{Sum of the credits of the courses under each part in a semester}}$$

Calculation of Grade Point Average (CGPA) (for the entire programme):

A candidate who has passed all the examinations under different parts (Part – I to V) is eligible for the following part wise computed final grades based on the range of CGPA.

$$\text{CUMULATIVE GRADE POINT AVERAGE [CGPA]} = \frac{\sum \sum C_{ni} G_{ni}}{\sum \sum C_{ni}}$$

Sum of the multiplication of grade points by the credits of the entire program under each part

$$\text{GPA} = \frac{\text{Sum of the multiplication of grade points by the credits of the entire program under each part}}{\text{Sum of the credits of the courses of the entire program under each part}}$$



21. Classification of Successful Candidates

A candidate who passes all the examinations and securing following CGPA and Grades shall be declared as follows:

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5–10.0	O+	First Class – Exemplary
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	
5.0 and above but below 5.5	B	Second Class
4.5 and above but below 5.0	C+	
4.0 and above but below 4.5	C	Third Class

22. Ranking

A candidate who qualifies for the B.Sc. Computer Science, passing all the Examinations in the first attempt within the minimum period prescribed for the Programme from the date of admission to the Programme and secures first or second class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular subject to a maximum of 10 ranks.

23. Conferment of the Degree

No candidate shall be eligible for conferment of the Degree unless he/she has undergone the prescribed Programme of study for a period of not less than six Semesters in an Institution approved by and affiliated to the Periyar University and earns has passed the Examinations as have been prescribed.



24. Transitory Provision

Candidates who have undergone the Programme of Study prior to the Academic Year 2023–2024 will be permitted to take the Examinations under those Regulations for a period of six years i.e. up to and inclusive of the Examination of April 2029. Thereafter, they will be permitted to take the Examination only under the Regulations in force at that time.



PROGRAMME SYLLABUS



Programme: B.Sc Computer Science				
Core – I		Course Code: 23UCS1C01		Course Title: Python Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	6	90	5	100

Course Objectives

1. To understand the nature of Python programming.
2. To describe the core syntax and semantics of Python programming language.
3. To infer the object-oriented programming concepts in Python.
4. To understand why Python is a useful scripting language for developers.
5. To get practical knowledge of a popular programming language Python.

UNIT - I

Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.

UNIT - II

Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.

UNIT - III

Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules

UNIT - IV

Lists: Creating a list -Access values in List-Updating values in ListsNested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple



– Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

UNIT - V

Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

TEXT BOOK

ReemaThareja, —Python Programming using problem solving approach, First Edition, 2017, Oxford University Press.

Dr. R. NageswaraRao, —Core Python Programming, First Edition, 2017, Dream tech Publishers.

REFERENCES

1. VamsiKurama, —Python Programming: A Modern Approach, Pearson Education.
2. Mark Lutz, “Learning Python”, Orielly.
3. Adam Stewarts, “Python Programming”, Online.
4. Fabio Nelli, —”Python Data Analytics”, APress.
5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.

Web Reference

- <http://www.python.org>
- <http://www/python.org/doc/>
- <http://wiki.python.org/>
- <http://pypi.python.org/pypi>
- <http://www/mhhe.com/kamthane/python>



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand and explain Python Programming.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Interpret the fundamental Python syntax and semantics.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of scripting and the contributions of scripting languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Articulate the Object-Oriented Programming concepts used in python.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Write codes using Multiple level of organizational structures, functions, classes, modules and package.	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with PSOs

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	2	3	3	3	2
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	3	3	3	3	3
Weight age of course contributed to each PSO	15	14	15	15	13	14

3– Strong

2– Medium

1– Low



Programme: B.Sc Computer Science				
Core Practical – I		Course Code: 23UCS1P01		Course Title: Python Programming Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	3	45	5	100

Course Objectives

1. To train the students for the basics of coding and executing Python scripts.
2. To understand the various data structures available in Python programming language and apply them in solving computational problems.
3. To develop problem solving skills and their implementation through python.
4. To apply various constructs of the language for data analytics.

List of Programs

1. Program using variables, constants, I/O statements in Python.
2. Program using Operators in Python.
3. Program using Conditional Statements.
4. Program using Loops.
5. Program using Jump Statements.
6. Program using Functions.
7. Program using Recursion.
8. Program using Arrays.
9. Program using Strings.
10. Program using Modules.
11. Program using Lists.
12. Program using Tuples.
13. Program using Dictionaries.
14. Program for File Handling.



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement
CO1	Learn to design and implement conditional branches and loops efficient programming using python.
CO2	Learn working with functions, lists and list processing.
CO3	Learn to work with exception handling, classes and objects.
CO4	Learn to apply overloading concepts.
CO5	Learn to use inheritance and polymorphism.

Mapping of COs with PSOs

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	1	3	2	3
CO3	3	3	3	3	2	2
CO4	3	3	3	3	2	3
CO5	3	2	3	3	3	3
Weight age of course contributed to each PSO	15	15	13	15	13	14

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
FCore – I		Course Code: 23UCS1FC01		Course Title: Problem Solving Techniques
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	4	60	2	100

Course Objectives

1. Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
2. Implement different programming constructs and decomposition of problems into functions.
3. Use data flow diagram, Pseudo code to implement solutions.
4. Define and use of arrays with simple applications
5. Understand about operating system and their uses

UNIT – I

Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. Programming Languages: Machine language, Assembly language, Highlevel language, 4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.

UNIT – II

Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). Structured Programming: Algorithm: Features of good algorithm, Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. Pseudocode: Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. Program design: Modular Programming.

UNIT – III

Selection Structures: Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. Repetition Structures: Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.

**UNIT – IV**

Data: Numeric Data and Character Based Data. Arrays: One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.

UNIT – V

Data Flow Diagrams: Definition, DFD symbols and types of DFDs. Program Modules: Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. Files: File Basics-Creating and reading a sequential file- Modifying Sequential Files.

Text Book

Stewart Venit, —Introduction to Programming: Concepts and Design, Fourth Edition, 2010, Dream Tech Publishers.

Web Resources

<https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm> 2.

<http://www.nptel.iitm.ac.in/video.php?subjectId=106102067> 3.

http://utubersity.com/?page_id=876

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6



Mapping of COs with PSOs

PO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	3	3	3	2
Weight age of course contributed to each PSO	15	14	14	15	15	14

3 – Strong

2– Medium

1 – Low



Programme: B.Sc Computer Science				
Core – II		Course Code: 23UCS2C02		Course Title: DATA STRUCTURE AND ALGORITHMS
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	6	90	5	100

Course Objectives

1. To understand the concepts of ADTs
2. To learn linear data structures-lists, stacks, queues
3. To learn Tree structures and application of trees
4. To learn graph structures and application of graphs
5. To understand various sorting and searching

UNIT – I

Abstract Data Types (ADTs)- List ADT-array-based implementation linked list implementationsingly linked lists-circular linked lists-doublylinked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal

UNIT – II

Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-OperationsCircular Queue- Priority Queue- deQueueapplications of queues.

UNIT – III

Tree ADT-tree traversals-Binary Tree ADT-expression treesapplications of trees-binary search tree ADT- Threaded Binary TreesAVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.

UNIT – IV

Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs

UNIT – V



Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions Separate chaining- Open Addressing- Rehashing Extendible Hashing

Text Book

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++||, Pearson Education 2014, 4th Edition.
2. 2 ReemaThareja, —Data Structures Using C||, Oxford Universities Press 2014, 2nd Edition

Reference Books

1. Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, —Introduction to Algorithms||, McGraw Hill 2009, 3rd Edition.
2. Aho, Hopcroft and Ullman, —Data Structures and Algorithms||, Pearson Education 2003

Web Resources

1. <https://www.programiz.com/dsa>
2. <https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	On completion of this course, students will	
CO2	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO3	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO4	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO5	Solve problem involving graphs, trees and heaps.Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO4, PO5,PO PO6



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	1	3	3	3
CO3	3	3	3	2	3	2
CO4	3	2	3	2	3	3
CO5	3	3	3	3	3	3
Weight age of course contributed to each PSO	15	14	13	13	15	14

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core Practical – II		Course Code: 23UCS2P02		Course Title: DATA STRUCTURE & ALGORITHMS LAB
Semester II	Hours/Week 3	Total Hours 45	Credits 5	Total Marks 100

Course Objectives

1. To understand the concepts of ADTs
2. To learn linear data structures-lists, stacks, queues
3. To learn Tree structures and application of trees
4. To learn graph structures and application of graphs
5. To understand various sorting and searching

List of Programs

1. Write a program to implement the List ADT using arrays and linked lists.
2. Write a programs to implement the following using a singly linked list.
 - Stack ADT
 - Queue ADT
3. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).
4. Write a program to implement priority queue ADT.
5. Write a program to perform the following operations:
 - Insert an element into a binary search tree.
 - Delete an element from a binary search tree.
 - Search for a key element in a binary search tree.
6. Write a program to perform the following operations
 - Insertion into an AVL-tree
 - Deletion from an AVL-tree
7. Write a programs for the implementation of BFS and DFS for a given graph.
- 8 Write a programs for implementing the following searching methods:



- Linear search
- Binary search.

9. Write a programs for implementing the following sorting methods:

- Bubble sort
- Selection sort
- Insertion sort
- Radix sort.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
CO3	Describe the hash function and concepts of collision and its resolution method	PO1,PO3,PO6
CO4	Solve problem involving graphs, trees and heaps	PO3,PO4
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	1	3	2	3
CO3	3	3	3	3	2	3
CO4	3	3	3	3	2	3
CO5	3	2	3	3	3	3
Weight age of course contributed to each PSO	15	15	13	15	13	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core – III		Course Code: 23UCS3C03		Course Title: Microprocessor and Microcontroller
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	6	90	5	100

Course Objectives

1. To introduce the internal organization of Intel 8085 Microprocessor.
2. To know about various instruction sets and classifications
3. To enable the students to write assembly language programs using 8085.
4. To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.
5. To provide real-life applications using microcontroller.

UNIT – I

Digital Computers - Microcomputer Organization-Computer languages –Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations..

UNIT – II

8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.

UNIT – III

BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.

UNIT – IV

The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.

UNIT – V



Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.

Text Books

- 1.R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV]
- 2.Soumitra Kumar Mandal ---Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051, Tata McGraw Hill Education Private Limited. [for unit V].

Reference Books

1. Mathur- —Introduction to Microprocessor| - 3rd Edition- Tata McGraw-Hill -1993.
2. Raj Kamal - —Microcontrollers: Architecture, Programming, Interfacing and System Design|, Pearson Education, 2005.
3. Krishna Kant, —Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096|, PHI, 2008

Web Resources

- 1.E-content from open source libraries
- 2.<https://www.bing.com/>, <https://theopennotes.in/>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor.	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is PO4,PO6	PO4,PO6



	applied to develop programs on multibyte arithmetic operations.	
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
CO5	An exposure to create real time applications using microcontroller.	PO3,PO6

Mapping of COs with PSOs

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2
CO2	3	3	3	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	3	2	3	2
Weight age of course contributed to each PSO	15	15	14	12	14	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core Practical–III		Course Code: 23UCS3P03		Course Title: Microprocessor and microcontroller Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	3	45	5	100

Course Objectives

1. To introduce the internal organization of Intel 8085 Microprocessor.
2. To know about various instruction sets and classifications
3. To enable the students to write assembly language programs using 8085.
4. To interface the peripheral devices to 8085 using Interrupt controller and DMA interface
5. To provide real-life applications using microcontroller.

List of Programs:

I. Addition and Subtraction

1. 8 - bit addition
2. 16 - bit addition
3. 8 - bit subtraction
4. BCD subtraction

II. Multiplication and Division

1. 8 - bit multiplication
2. BCD multiplication
3. 8 - bit division

III. Sorting and Searching

1. Searching for an element in an array.
2. Sorting in Ascending and Descending order.
3. Finding the largest and smallest elements in an array.
4. Reversing array elements.
5. Block move.



IV. Code Conversion

1. BCD to Hex and Hex to BCD
2. Binary to ASCII and ASCII to binary
3. ASCII to BCD and BCD to ASCII

V. Simple programs on 8051 Microcontroller

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Interfacing Experiments using 8051
 1. Realisation of Boolean Expression through ports.
 2. Time delay generation using subroutines.
 3. Display LEDs through ports

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic PO4,PO6 operations	PO4,PO6
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
CO5	An exposure to create real time applications using microcontroller	PO3,PO6



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	14	11	15	15	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core – VI		Course Code: 23UCS3C04		Course Title: Java Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	6	90	5	100

Course Objectives

1. To provide fundamental knowledge of object-oriented programming
2. To equip the student with programming knowledge in Core Java from the basics up.
3. To enable the students to use AWT controls, Event Handling and Swing for GUI.
4. To provide fundamental knowledge of object-oriented programming.
5. To equip the student with programming knowledge in Core Java from the basics up

UNIT – I

Introduction: Review of Object Oriented concepts - History of Java - Java buzzwords - JVM Architecture - Data types - Variables - Scope and life time of variables - arrays - operators - control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - Static Method String and StringBuffer Classes.

UNIT – II

Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages:** Definition - Access Protection - Importing Packages. **Interfaces:** Definition - Implementation - Extending Interfaces **Exception Handling:** try - catch - throw - throws - finally - Built-in exceptions - Creating own Exception classes.

UNIT – III

Multithreaded Programming: Thread Class - Runnable interface - Synchronization - Using synchronized methods - Using synchronized statement - Interthread Communication - Deadlock. **I/O Streams:** Concepts of streams - Stream classes - Byte and Character stream - Reading console Input and Writing Console output - File Handling.

UNIT – IV

AWT Controls: The AWT class hierarchy - user interface components - Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels - Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers.



Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes

UNIT – V

Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel, JTextField - JTextArea - JList - JComboBox - JScrollPane.

Text Book

1. Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2. Gary Cornell, *Core Java 2 Volume I – Fundamentals*, Addison Wesley, 1999

Reference Books

1. Head First Java, O’Rielly Publications,
2. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010

Web Resources

1. <https://javabeginnertutorial.com/core-java-tutorial>
2. <http://docs.oracle.com/javase/tutorial/>
3. <https://www.coursera.org/>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java..	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weight age of course contributed to each PSO	14	14	13	14	14	11

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core Practical – IV		Course Code: 23UCS3P04		Course Title: Java Programming Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	3	45	5	100

Course Objectives

1. To provide fundamental knowledge of object-oriented programming.
2. To equip the student with programming knowledge in Core Java from the basics up.
3. To enable the students to know about Event Handling .
4. To enable the students to use String Concepts.
5. To equip the student with programming knowledge in to creat GUI using AWT controls

List of Programs

1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer
- 2 Write a Java program to multiply two given matrices.
- 3 Write a Java program that displays the number of characters, lines and words in a text
- 4 Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
- 5 Write a program to do String Manipulation using CharacterArray and perform the following string operations:
 - a. String length Weightage of course contributed to each
 - b. Finding a character at a particular position
 - c. Concatenating two strings
- 6 Write a program to perform the following string operations using String class:
 - a. String Concatenation
 - b. Search a substring
 - c. To extract substring from given string
- 7 Write a program to perform string operations using String Buffer class:
 - a. Length of a string
 - b. Reverse a string



- c. Delete a substring from the given string
- 8 Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
- 9 Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.
- 10 Write a program to demonstrate the use of following exceptions.
- Arithmetic Exception
 - Number Format Exception
 - ArrayIndexOutOfBoundsException
 - NegativeArraySizeException
- 11 Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes
- 12 Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
- 13 Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).
- 14 Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
- 15 Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with —stop|| or —ready|| or —go|| should appear above the buttons in a selected color. Initially there is no message shown.



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
CO3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
CO4	Implement AWT and Event handling.	PO4, PO5, PO6
CO5	Use Swing to create GUI.	PO3, PO6

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weight age of course contributed to each PSO	14	14	13	14	14	12

3– Strong

2– Medium

1 – Low



Programme: B.Sc Computer Science				
Core – V		Course Code: 23UCS5C05		Course Title: Software Engineering
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	5	75	5	100

Course Objectives

1. Gain basic knowledge of analysis and design of systems
2. Ability to apply software engineering principles and techniques
3. Model a reliable and cost-effective software system
4. Ability to design an effective model of the system
5. Perform Testing at various levels and produce an efficient system.

UNIT – I

Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.

UNIT – II

Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, 15 object- oriented vs function-oriented design

UNIT – III

Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.

UNIT – IV

Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration



testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.

UNIT – V

Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.

Text Book

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, Prentice Hall of India Private Limited, 2018.

Reference Books

1. Roger S.Pressman and Bruce R.Maxim, “Software Engineering: A Practitioner's Approach”, 8th Edition, McGraw Hill Higher Education, 2015.
2. Richard Fairley, “Software Engineering Concepts”, TMGH Publications, 2004.
3. Hans van Vliet, “Software Engineering: Principles and Practice”, Third Edition, Wiley, 2010.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Gain basic knowledge of analysis and design of systems.	PO1
CO2	Ability to apply software engineering principles and techniques	PO1, PO2
CO3	Model a reliable and cost-effective software system	PO4, PO6
CO4	Ability to design an effective model of the system	PO4, PO5, PO6
CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO6



Mapping of COs with POs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	2	3
CO2	3	2	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	2	2	2
CO5	3	3	3	2	2	2
Weight age of course contributed to each PSO	15	13	14	10	10	11

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core – VI		Course Code: 23UCS5C06		Course Title: Database Management System
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	5	75	4	100

Course Objectives

1. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
2. To understood the concepts of data base management system, design simple Database models
3. To learn and understand to write queries using SQL, PL/SQL.
4. To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
5. To understood the concepts of data base management system, design simple Database models

UNIT – I

Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction

UNIT – II

Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set 15 operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram

UNIT – III

Normalization of Database Tables: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.

UNIT – IV



Advanced SQL:Relational SET Operators: UNION – UNION ALL – INTERSECT – MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function

UNIT – V

PL/SQL:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Text Books

- 1.Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
- 2 Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

Reference Book

- 1.Abraham Silberschatz, Henry F.Korth and S.Sudarshan,—Database System Conceptsl, McGraw Hill International Publication ,VI Edition
2. Shio Kumar Singh , —Database Systems —,Pearson publications ,II Edition

Web Resources

- 1.Web resources from NDL Library, E-content from open-source libraries

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1



CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, EntityRelationship Model	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions.	PO3, PO5

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weight age of course contributed to each PSO	15	12	10	11	12	13

3 – Strong

2– Medium

1 – Low



Programme: B.Sc Computer Science				
Core Practical – V		Course Code: 23UCS5P05		Course Title: Database Management System Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	3	45	5	100

Course Objectives

1. To understand the concepts of Database concepts.
2. To understand the concepts of Relational Calculus.
3. To develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.
4. To develop programming skills in PL/SQL.
5. To create a relational database using a relational database package, function and trigger.

List of Programs

I. SQL

1. DDLCOMMANDS
2. DMLCOMMANDS
3. TCLCOMMANDS

II. PL/SQL

4. FIBONACCI SERIES
5. FACTORIAL
6. STRING REVERSE
7. SUM OF SERIES
8. TRIGGER

III. CURSOR

9. STUDENT MARK ANALYSIS USING CURSOR

IV. APPLICATION

10. LIBRARY MANAGERMENTSYSTEM
11. STUDENT MARK ANALYSIS



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Understand database concepts, structures and E-R Model.	PO1
CO2	Understand the relational model and relational algebra operations.	PO1, PO2
CO3	Normalize the relational tables applying normalization rules.	PO4, PO6
CO4	Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Trigger.	PO4, PO5, PO6
CO5	Apply PL/SQL procedural interfaces statement on relational tables as per requirements.	PO3, PO5

Mapping of COs with PSOs

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weight age of course contributed to each PSO	12	12	13	14	14	11

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core – VII		Course Code: 23UCS6C07		Course Title: Computer Networks
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	7	105	5	100

Course Objectives

1. To learn the basic concepts of Data communication and Computer network
2. To learn about wireless Transmission
3. To learn about networking and data link layer.
4. To study about Network communication.
5. To learn the concept of Transport layer.

UNIT – I

Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media

UNIT – II

Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.

UNIT – III

Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth..

UNIT – IV

Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.

UNIT – V

Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography



Text Book

1. A. S. Tanenbaum, —Computer Networks, 4th Edition, Prentice-Hall of India, 2008.

References Books

1. B. A. Forouzan, —Data Communications and Networking, Tata McGraw Hill, 4th Edition, 2017
2. F. Halsall, —Data Communications, Computer Networks and Open Systems, Pearson Education, 2008
3. D. Bertsekas and R. Gallager, —Data Networks, 2nd Edition, PHI, 2008.
4. Lamarca, —Communication Networks, Tata McGraw- Hill, 2002

Web Resources

1. https://en.wikipedia.org/wiki/Computer_network
2. <https://citationsy.com/styles/computer-networks>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4

**Mapping of COs with PSOs**

PSO CO	PO1	PO2	PO3	PO4	PO5	
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	15	11	11	12	10	13

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core – VIII		Course Code: 23UCS6C08		Course Title .Net Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	6	90	5	100

Course Objectives

1. To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.
2. To develop ASP.NET Web application using standard controls.
3. To implement file handling operations.
4. To handles SQL Server Database using ADO.NET.
5. Understand the Grid view control and XML classes.

UNIT – I

Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.

UNIT – II

Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.

UNIT – III

Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.

UNIT – IV

ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – DataBinding

**UNIT – V**

Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.

Textbook

1. Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
2. 2 Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.

Reference Books

1. Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2017.
2. Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres, 2013.
3. Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc. 2016.
4. Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGrawHill, 2008.
5. Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, Apress, 2010.

Web Resources

1. <https://www.geeksforgeeks.org/introduction-to-net-framework/>
2. <https://www.javatpoint.com/net-framework>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
CO2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO5
CO3	To Work On Various Controls Files	PO1, PO3, PO6
CO4	To create a web application using Microsoft ADO.NET.	PO2, PO6
CO5	To develop web applications using XML	PO1, PO3, PO6



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	12	14	14	14

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Core Practical – VI		Course Code: 23UCS6P06		Course Title: .Net Programming Lab
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	3	45	5	100

Course Objectives

1. To develop ASP.NET Web application using standard controls.
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To implement XML classes.
5. To utilize ASP.NET security features for authenticating the website

List of Programs

1. Create an exposure of Web applications and tools
2. Implement the Html Controls
3. Implement the Server Controls
4. Web application using Web controls.
5. Web application using List controls.
6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.
7. Web application using Data Controls.
8. Data binding with Web controls
9. Data binding with Data Controls.
10. Database application to perform insert, update and delete operations.
11. Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.
12. Implement the Xml classes.
13. Implement Authentication – Authorization.
14. Ticket reservation using ASP.NET controls.
15. Online examination using ASP.NET controls



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	To create web applications and implement various controls	PO1, PO2, PO4
CO2	Create web pages in Rich control.	PO3, PO5
CO3	Develop knowledge about file handling operations	PO1, PO4, PO5
CO4	An ability to design XML classes	PO2, PO4, PO6
CO5	To develop a software to solve real-world problems using ASP.NET	PO1, PO3, PO5, PO6

Mapping of COs with PSOs

PO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weight age of course contributed to each PSO	15	12	10	11	12	13

3 – Strong

2 – Medium

1 – Low



ELECTIVE COURSES



Programme: B.Sc Computer Science				
Elective – V		Course Code: 23UCS5E01		Course Title: Introduction to Data Science
Semester V	Hours/Week 3	Total Hours 45	Credits 3	Total Marks 100

Course Objectives

1. To learn about basics of Data Science and Big data.
2. To learn about overview and building process of Data Science.
3. To learn about various Algorithms in Data Science.
4. To learn about Hadoop Framework.
5. To learn about case study about Data Science.

UNIT – I

Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science

UNIT – II

The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .

UNIT – III

Algorithms : Machine learning algorithms – Modeling process – Types– Supervised – Unsupervised - Semi-supervised

UNIT – IV

Introduction to Hadoop : Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types

UNIT – V

Case Study: Prediction of Disease - Setting research goals – Data retrieval – preparation - exploration - Disease profiling – presentation and automation



Text Books

Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016

Reference Books

1. Roger Peng, “The Art of Data Science”, lulu.com 2016.
2. Murtaza Haider, “Getting Started with Data Science – Making Sense of Data with Analytics”, IBM press, E-book.
3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, “Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools”, Dreamtech Press 2016.
4. Annalyn Ng, Kenneth Soo, “Numsense! Data Science for the Layman: No Math Added”, 2017, 1st Edition.
5. Cathy O’Neil, Rachel Schutt, “Doing Data Science Straight Talk from the Frontline”, O’Reilly Media 2013.
6. Lillian Pierson, “Data Science for Dummies”, 2017 II Edition

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	14	11	15	11	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – V		Course Code: 23UCS5E02		Course Title: Artificial Intelligence
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	3	45	3	100

Course Objectives

1. To learn various concepts of AI Techniques.
2. To learn various Search Algorithm in AI.
3. To learn probabilistic reasoning and models in AI.
4. To learn about Markov Decision Process.
5. To learn various type of Reinforcement learning..

UNIT – I

Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT – II

Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search

UNIT – III

Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

UNIT – IV

Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT – V

Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning

**Text Book**

1. Stuart Russell and Peter Norvig, —Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, —Artificial Intelligence, Tata McGraw Hill

Reference Books

1. Trivedi, M.C., —A Classical Approach to Artificial Intelligence, Khanna Publishing House, Delhi.
2. Saroj Kaushik, —Artificial Intelligence, Cengage Learning India, 2011
3. David Poole and Alan Mackworth, —Artificial Intelligence: Foundations for Computational Agents, Cambridge University Press 2010

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	PO1
CO2	Understand various Search Algorithm in AI.	PO1, PO2
CO3	Understand probabilistic reasoning and models in AI.	PO4, PO6
CO4	Understand Markov Decision Process	PO4, PO5, PO6
CO5	Understand various type of Reinforcement learning Techniques.	PO3, PO4



Mapping of COs with PSOs

SO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weight age of course contributed to each PSO	15	12	10	11	12	13

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – V		Course Code: 23UCS5E03		Course Title: Artificial Neural Networks
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	3	45	3	100

Course Objectives

1. Understand the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks.
2. Understand the Error Correction and various learning algorithms and tasks.
3. Identify the various Single Layer Perception Learning Algorithm.
4. Identify the various Multi-Layer Perception Network.
5. Analyze the Deep Learning of various Neural network and its Applications.

UNIT – I

Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non- Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.

UNIT – II

Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.

UNIT – III

Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.

**UNIT – IV**

Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm

UNIT – V

Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature\ extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications

Text Book

1. Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.
2. “Neural Network- A Comprehensive Foundation”- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.

Reference Books

1. Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.	PO1
CO2	Learn about the Error Correction and various learning algorithms and tasks.	PO1, PO2
CO3	Learn the various Perception Learning Algorithm.	PO4, PO5
CO4	Learn about the various Multi-Layer Perception	PO4, PO5, PO6
CO5	Understand the Deep Learning of various Neural network and its Applications.	PO3, PO5



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	2	3	2	3	2	2
Weight age of course contributed to each PSO	14	14	11	15	10	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VI		Course Code: 23UCS5E04		Course Title: Natural Language Processing
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	3	45	3	100

Course Objectives

- 1.To understand approaches to syntax and semantics in NLP.
2. To learn natural language processing and to learn how to apply basic algorithms in this field.
3. To understand approaches to discourse, generation, dialogue and summarization within NLP.
4. To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
5. To understand current methods for statistical approaches to machine translation.

UNIT – I

Introduction : Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue-Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.

UNIT – II

Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.Syntactic Analysis: Context-free Grammar-Constituency Parsing-Probabilistic Parsing.

UNIT – III

Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution Discourse Coherence and Structure.

UNIT – IV



Natural Language Generation: Architecture of NLG Systems Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

UNIT – V

Information retrieval and lexical resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Nonclassical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers- POS Tagger- Research Corpora SSAS.

Text Book

1. Daniel Jurafsky, James H. Martin, —Speech & language processing, Pearson publications.
- 2 Allen, James. Natural language understanding. Pearson, 1995.

Reference Books

1. Pierre M. Nugues, —An Introduction to Language Processing with Perl and Prolog, Springer

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain a broad understanding of text data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of realworld applications. Use NLP methods to perform topic modelling	PO1, PO2, PO3, PO4, PO5, PO6



CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6
------------	---	------------------------------------

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	2	3	3	3	2	3
CO3	3	3	3	3	3	3
CO4	3	2	3	3	2	3
CO5	3	3	3	3	3	3
Weight age of course contributed to each PSO	14	14	15	15	13	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VI		Course Code: 23UCS6E05		Course Title: Software Project Management
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	3	45	3	100

Course Objectives

- 1.To define and highlight importance of software project management.
- 2.To formulate and define the software management metrics & strategy in managing projects
3. To famialarize in Software Project planning
- 4.Understand to apply software testing techniques in commercial environment

UNIT – I

Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.

UNIT – II

Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.

UNIT – III

Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.

UNIT – IV

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.

**UNIT – V**

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study

Text book

Robert T. Futrell, Donald F. Shafer, Linda I. Safer, —Quality Software Project Management, Pearson Education Asia 2002.

Reference Book

1. Pankaj Jalote, —Software Project Management in Practice, Addison Wesley 2002.
2. Hughes, —Software Project Management, Tata McGraw Hill 2004, 3rd Edition.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Understand the principles and concepts of project management	PO1
CO2	Knowledge gained to train software project managers	PO1, PO2
CO3	Apply software project management methodologies	PO4, PO5
CO4	Able to create comprehensive project plans	PO3, PO5, PO6
CO5	Evaluate and mitigate risks associated with software development process	PO3, PO4



Mapping of COs with PSOs

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	2
CO2	3	1	3	2	2	2
CO3	2	3	2	3	3	3
CO4	3	3	2	3	3	2
CO5	2	2	2	3	3	3
Weight age of course contributed to each PSO	13	11	10	13	13	12

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VI		Course Code: 23UCS5E06		Course Title: Cryptography
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	3	45	3	100

Course Objectives

1. To understand the fundamentals of Cryptography .
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks
5. To design security applications in the field of Information technology

UNIT – I

Introduction: The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.

UNIT – II

Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography

UNIT – III

Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES –RSA: The RSA algorithm.

UNIT – IV

Network Security Practices: IP Security overview - IP Security architecture – Authentication Header. Web Security: SecureSocketLayer and Transport Layer Security – Secure Electronic Transaction.

UNIT – V

Intruders – Malicious software – Firewalls.

**Text Books**

1. William Stallings, —Cryptography and Network Security Principles and Practicesl.

Reference Books

- 1 Behrouz A. Foruzan, —Cryptography and Network Securityl, Tata McGraw-Hill, 2007.
- 2 AtulKahate, “Cryptography and Network Security”, Second Edition, 2003, TMH.
- 3 M.V. Arun Kumar, “Network Security”, 2011, First Edition, USP.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards.	PO1, PO2, PO3, PO4, PO5, PO6

**Mapping of COs with POs**

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	2	3	2
CO2	3	2	3	2	3	3
CO3	3	3	3	2	3	3
CO4	2	3	3	3	2	3
CO5	3	2	3	3	3	3
Weight age of course contributed to each PSO	14	13	15	12	14	14

3 – Strong**2 – Medium****1 – Low**



Programme: B.Sc Computer Science				
Elective – VII		Course Code: 23UCS6E07		Course Title: Internet of Things and its applications
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

1. Use of Devices, Gateways and Data Management in IoT.
2. Design IoT applications in different domain and be able to analyze their performance
3. Implement basic IoT applications on embedded platform
4. To gain knowledge on Industry Internet of Things
5. To Learn about the privacy and Security issues in IoT

UNIT – I

IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT – II

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT – III

IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

**UNIT – IV**

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management

UNIT – V

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Text Book

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”,
2. Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference Books

1. Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, kindle version.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,.
3. Walteneus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”
4. Cuno Pfister, “Getting Started with the Internet of Things”, O’Reilly Media 2011



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn NoSQL databases and management.	PO3, PO5

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	12	11	15	15	14

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VII		Course Code: 23UCS6E08		Course Title: Image Processing
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

- 1.To learn fundamentals of digital image processing.
2. To learn about various 2D Image transformations
3. To learn about various image enhancement processing methods and filters
4. To learn about various classification of Image segmentation techniques
- 5.To learn about various image compression techniques

UNIT – I

Digital Image Fundamentals: Image representation – Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis

UNIT – II

2D Image transforms: Properties of 2D-DFT - Walsh transform -Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition

UNIT – III

Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.

**UNIT – IV**

Image segmentation: Classification of Image segmentation techniques -Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.

UNIT – V

Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,

Text Book

1.S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015

2 Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009

Reference Books

1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988
2. Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003
3. Pratt William K , Digital Image Processing: , John Wiley,4/e,2007

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Understand the fundamental concepts of digital image processing.	PO1
CO2	Understand various 2D Image transformations	PO1, PO2
CO3	Understand image enhancement processing techniques and filters	PO4, PO6
CO4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
CO5	Understand various image compression techniques	PO3, PO5



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weight age of course contributed to each PSO	15	14	11	15	10	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VII		Course Code: 23UCS6E09		Course Title: Big Data Analytics
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

1. Understand the Big Data Platform and its Use cases, Map Reduce Jobs
2. To identify and understand the basics of cluster and decision tree
3. To study about the Association Rules, Recommendation System
4. To learn about the concept of stream
5. Understand the concepts of NoSQL Databases

UNIT – I

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value –Understanding Big Data Storage — A General Overview of High- Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model

UNIT – II

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.

UNIT – III

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative



Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT – IV

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT – V

NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E- Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Text Book

AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Reference Books

- 1.David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/Elsevier Publishers, 2013
2. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
CO4	Perform analytics on data streams.	PO3, PO5, PO6
CO5	Learn NoSQL databases and management.	PO3, PO4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	14	11	15	15	13

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VIII		Course Code: 23UCS6E10		Course Title: Cloud Computing
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

1. Learning fundamental concepts and Technologies of Cloud Computing.
2. Learning various cloud service types and their uses and pitfalls.
3. To learn about Cloud Architecture and Application design.
4. To know the various aspects of application design, benchmarking and security on the Cloud.
5. To learn the various Case Studies in Cloud Computing.

UNIT – I

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.

UNIT – II

Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks – Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network



Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack

UNIT – III

Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non- Relational Approach (NoSQL).

UNIT – IV

Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.

UNIT – V

Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems – Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Text Book

Arshdeep Bahga, Vijay Madiseti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
3. David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
4. Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO5	Understand various Case Studies in Cloud Computing.	PO3, PO6

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	14	11	15	15	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective –VIII		Course Code: 23UCS6E11		Course Title: Grid Computing
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

1. To learn the basic construction and application of Grid computing.
2. To learn grid computing organization and their Role.
3. To learn Grid Computing Anatomy.
4. To learn Grid Computing road map.
5. To learn various type of Grid Architecture.

UNIT – I

Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.

UNIT – II

Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.

UNIT – III

Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology.

UNIT – IV

The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#.

**UNIT – V**

Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, #XML messages and Enveloping#, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.

Text Book

Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.

Reference Books

1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	To understand the basic elements and concepts of Grid computing.	PO1
CO2	To understand the Grid computing toolkits and Framework.	PO1, PO2
CO3	To understand the concepts of Anatomy of Grid Computing.	PO4, PO6
CO4	To understand the concept of service oriented architecture.	PO4, PO5
CO5	To Gain knowledge on grid and web service architecture.	PO3, PO5



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weight age of course contributed to each PSO	15	14	11	15	10	10

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Elective – VIII		Course Code: 23UCS6E12		Course Title: Virtual Reality
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	3	100

Course Objectives

1. To provide knowledge on basic principles of virtual & augmented reality
2. To have the ability to use its technology as a platform for real-world applications.

UNIT – I

Virtual Reality: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System – Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces

UNIT – II

Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkits and Scene Graphs – Traditional and Emerging Applications of VR

UNIT – III

Augmented Reality: Introduction – Augmented Reality Concepts: Working Principle of AR – Concepts related to AR- Ingredients of an Augmented Reality Experience

UNIT – IV

Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies

**UNIT – V**

Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR – Mobile Augmented Reality: Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality

Text Book

1. Grigore C. Burdea and Philippe Coiffet, “Virtual Reality Technology”, Wiley Student Edition , Second Edition (Unit I: Chapter 1,2; Unit II: Chapter 3,4,6,8, 9)
2. Alan B. Craig(2013), “Understanding Augmented Reality: Concepts and Applications” (Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
3. Jon Peddie (2017), “Augmented Reality: Where We Will All Live”, Springer, 1st Edition (Unit IV: Chapter 7 (Tools & Technologies))

Reference Books

1. Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), “Developing Virtual Reality Applications: Foundations of Effective Design”, Elsevier(Morgan Kaufmann Publishers)
2. Paul Mealy (2018), “Virtual and Augmented Reality”, Wiley
3. Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), “Virtual Reality Augmented Reality: Myths and Realities”, Wiley



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Outline the basic terminologies, techniques and applications of VR and AR	PO1
CO2	Describe different architectures and principles of VR and AR systems	PO1, PO2
CO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	PO4, PO6
CO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	PO4, PO5
CO5	Assess the importance of VR/AR content and interactions to implement for the real- world problem	PO3, PO5

Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weight age of course contributed to each PSO	15	14	11	15	15	10

3 – Strong

2 – Medium

1 – Low



Skill Enhancement Course (SEC)



Programme: B.Sc Computer Science				
Skill Based Elective Course – III		Course Code: 23UCS2S01		Course Title: Introduction to HTML
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	2	30	2	100

Course Objectives

1. Insert a graphic within a web page.
2. Create a link within a web page.
3. Create a table within a web page.
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page. Create a web page.

UNIT – I

Introduction :WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage
–HTMLBasics:Understandingtags.

UNIT – II

TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements:Headingsp
aragraph(<p> tag)–Fontstyleelements:(bold,italic,font,small,strong,strike,bigtags)

UNIT – III

Lists:Typesoflists:Ordered,Unordered– NestingLists–Othertags:Marquee,HR,BR-
UsingImages –CreatingHyperlinks.

UNIT – IV

Tables:CreatingbasicTable,Tableelements,Caption–Tableandcellalignment–Rowspan,C
olspan–Cellpadding.

UNIT – V

Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.

Text Books

- 1.“Mastering HTML5 and CSS3 Made Easy”, TeachUComp Inc., 2014.
- 2 .Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”



Web Resources

1. <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>

2. <https://www.w3schools.com/html/default.asp>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

Mapping of COs with PSOs

PSO \ CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weight age of course contributed to each PSO	14	15	14	14	15	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Skill Based Elective Course – IV		Course Code: 23UCS3S02		Course Title: Web Designing
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	2	30	2	100

Course Objectives

1. Understand the basics of HTML and its components
2. To study about the Graphics in HTML
3. Understand and apply the concepts of XML and DHTML
4. Understand the concept of JavaScript
5. To identify and understand the goals and objectives of the Ajax

UNIT – I

HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing text- heading and horizontal rules-list-font size, face and color- alignment links-tables-frames.

UNIT – II

Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.

UNIT – III

XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your webpages-Grouping styles-extensible markup language (XML)..

UNIT – IV

Dynamic HTML: Document object model (DCOM)- Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding.

JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,

UNIT – V

Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.



Text Books

1. Pankaj Sharma, "Web Technology", SkKataria & Sons Bangalore 2011.
2. Mike Mcgrath, "Java Script", Dream Tech Press 2006, 1st Edition.
3. Achyut S Godbole & Atul Kahate, "Web Technologies", 2002, 2nd Edition.

Reference Books

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, "Mastering HTML, CSS & JavaScript Web Publishing", 2016.
2. DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.

Web Resources

1. NPTEL & MOOC courses titled Web Design and Development.
2. <https://www.geeksforgeeks.org>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1, PO2, PO3, PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	PO2, PO6, PO7



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	2	1
CO2	3	3	2	2	3
CO3	3	3	2	3	3
CO4	3	2	3	2	2
CO5	3	2	2	2	3
Weight age of course contributed to each PSO	15	12	10	11	12

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Skill Based Elective Course – V		Course Code: 23UCS3S03		Course Title: Office Automation
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	2	30	2	100

Course Objectives

1. Understand the basics of computer systems and its components.
2. Understand and apply the basic concepts of a word processing package.
3. Understand and apply the basic concepts of electronic spreadsheet software.
4. Understand and apply the basic concepts of database management system.
5. Understand and create a presentation using PowerPoint tool.

UNIT – I

Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperating systems&itsfeatures:DOS–UNIX–Windows. IntroductiontoProgrammingLanguages.

UNIT – II

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing–Preview,options,merge.

UNIT – III

Spreadsheets:Excel–opening,enteringtextanddata,formatting,navigating; Formulas–entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductionto dataanalytics.

UNIT – IV

Database Concepts: The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching 6 records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).

**UNIT – V**

Power point: Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animationeffects,audioinclusion,timers.

Text Books

1.PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill.

Reference Books

Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.

Web Resources

- 1.<https://www.udemy.com/course/office-automation-certificate-course/>
- 2.<https://www.javatpoint.com/automation-tools>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Develop working knowledge of HTML	PO1,PO2,PO3, PO6,PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3, PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3,PO5,PO7
CO4	Ability to develop a java script	PO3,PO4,PO5, PO7
CO5	An ability to develop web application using Ajax.	PO4,PO6,PO7, PO8



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weight age of course contributed to each PSO	15	14	14	15	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Skill Based Elective Course – VI		Course Code: 23UCS3S04		Course Title: PHP Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	3	45	2	100

Course Objectives

1. To provide the necessary knowledge on basics of PHP.
2. To design and develop dynamic, database-driven web applications using PHP version.
3. To get an experience on various web application development techniques.
4. To learn the necessary concepts for working with the files using PHP.
5. To get a knowledge on OOPS with PHP.

UNIT – I

Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website - Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation

UNIT – II

PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.

UNIT – III

Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.

UNIT – IV

PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.

UNIT – V

Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies - Setting Cookies.



Text Books

1 Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.

2 The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

Reference Books

1. PHP: The Complete Reference-Steven Holzner.

2. DT Editorial Services (Author), —HTML 5 Black Book (Covers CSS3, JavaScript, XML,XHTML, AJAX, PHP, jQuery)ll, Paperback 2016, 2ndEdition.

Web Resources

1.Opensource digital libraries: PHP Programming

2.<https://www.w3schools.com/php/default.asp>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6.



Mapping of COs with PSOs

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weight age of course contributed to each PSO	15	12	10	11	12	13

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Skill Based Elective Course – VII		Course Code: 23UCS3S05		Course Title: Advanced Excel
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	3	45	2	100

Course Objectives

1. Handle large amounts of data
2. Aggregate numeric data and summarize into categories and subcategories
3. Filtering, sorting, and grouping data or subsets of data
4. Create pivot tables to consolidate data from multiple files
5. Presenting data in the form of charts and graphs

UNIT – I

Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLOOKUP to consolidate Data from Multiple Sheets

UNIT – II

Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data - Sorting tables- multiple-level sorting- custom sortingFiltering data for selected view - advanced filter optionsWorking with Reports Creating subtotals- Multiple-level subtotal.

UNIT – III

Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot chartsConsolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific FieldViewing Subtotal under Pivot- Creating Slicers.

**UNIT – IV**

More Functions Date and time functions- Text functions Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager

UNIT – V

Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.

Text Books

1 Excel 2019 All

2 Microsoft Excel 2019 Pivot Table Data Crunching

Reference Books

Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition

Web Resources

1. <https://www.simplilearn.com>

2 <https://www.javatpoint.com>

3 <https://www.w3schools.com>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme outcomes
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8



Mapping of COs with PSOs

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weight age of course contributed to each PSO	15	12	10	15	15	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
SEC – VIII PCSEC		Course Code: 23UCS6S06		Course Title: Robotics and its Applications
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	4	60	2	100

Course Objectives

1. To understand the robotics fundamentals
2. Understand the sensors and matrix methods
3. Understand the Localization: Self-localizations and mapping
4. To study about the concept of Path Planning, Vision system
5. To learn about the concept of robot artificial intelligence.

UNIT – I

Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.

UNIT – II

Actuators and sensors: Types of actuators, stepper - DC-servo- and brushless motors – model of a DC servo motor -types of transmissions – purpose of sensor – internal and external sensor - common sensors - encoders tachometers – strain gauge based force torque sensor – proximity and distance measuring sensors

Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot.

UNIT – III

Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision-based localizations – Ultrasonic based localizations – GPS localization systems.



UNIT – IV

Path Planning: Introduction, path planning – overview - road map path planning – cell decomposition path planning potential field path planning – obstacle avoidance - case studies.
Vision system: Robotic vision systems – image representation – object recognition – and categorization – depth measurement – image data compression – visual inspection – software considerations

UNIT – V

Application: Ariel robots – collision avoidance robots for agriculture – mining – exploration – under water – civilian -and military applications – nuclear applications – space Applications – Industrial robots – artificial intelligence in robots - application of robots in material handling - continuous arc welding - spot welding - spray painting - assembly operation - cleaning - etc.

Text Books

1. Richard D. Klafter, Thomas Achmielewski and Mickael Negin, Robotic Engineering and Integrated Approach, Prentice Hall India – Newdelhi - 2001
2. Saeed B. Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2nd edition 2011

Reference Books

1. Industrial robotic technology-programming and application by M.P. Groover et.al, McGraw hill 2008
2. Robotics technology and flexible automation by S.R. Deb, THH - 2009

Web Reference

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
2. <https://www.geeksforgeeks.org/robotics-introduction/>



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Describe the different physical forms of robot architectures.	PO1
CO2	Kinematically model simple manipulator and mobile robots.	PO1, PO2
CO3	Mathematically describe a kinematic robot system	PO4, PO6
CO4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	PO4, PO5, PO6
CO5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.	PO3, PO8

Mapping of COs with PSOs

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	1	3	-
CO2	2	2	2	3	1	3
CO3	3	2	3	2	1	3
CO4	3	3	2	2	2	1
CO5	3	2	1	3	3	3
Weight age of course contributed to each PSO	13	11	10	11	10	10

3 – Strong

2 – Medium

1 – Low



Non Major Elective (NME)



Programme: B.Sc Computer Science				
Non Major Elective – I		Course Code: 23UCS1N01		Course Title: Understanding Internet
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	2	30	2	100

Course Objectives

1. Knowledge of Internet medium
2. Internet as a mass medium
3. Features of Internet Technology,
4. Internet as a source of infotainment
5. Study of internet audiences and about cyber crime.

UNIT - I

The emergence of internet as a mass medium – the world of world wide web

UNIT - II

Features of internet as a technology.

UNIT - III

Internet as a source of infotainment – classification based on content and style.

UNIT - IV

Demographic and psychographic descriptions of internet audiences – effect of internet on the values and life – styles.

UNIT - V

Present issues such as cybercrime and future possibilities.



Textbooks

1. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.
2. Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.
3. Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd..

Reference Books

1. Acharya, R N [1987] Television in India. Manas Publications, New Delhi.
2. Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP
3. Luthra, H R [1986] Indian Broadcasting. Ministry of I & B, New Delhi.
4. Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.

Web Reference

1. <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
2. <https://www.w3schools.com/html/default.asp>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Knows the basic concept in internet	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Knows the concept of internet as a technology.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6



Mapping of COs with PSOs

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weight age of course contributed to each PSO	14	15	14	14	15	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Non Major Elective – I		Course Code: 23UCS1N02		Course Title: Office Automation
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	2	30	2	100

Course Objectives

1. Understand the basics of computer systems and its components.
2. Understand and apply the basic concepts of a word processing package.
3. Understand and apply the basic concepts of electronic spreadsheet software.
4. Understand and apply the basic concepts of database management system.
5. Understand and create a presentation using PowerPoint tool.

UNIT – I

Introductory concepts: Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS – UNIX – Windows. Introduction to Programming Languages.

UNIT – II

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing – Preview, options, merge.

UNIT – III

Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying; Charts – creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.



UNIT – IV

Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS–Access).

UNIT – V

Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.

Text Books

1. Peter Norton, Introduction to Computers –Tata McGraw-Hill.

Reference Books

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, Microsoft 2003, Tata McGraw Hill.

Web Reference

1. <https://www.udemy.com/course/office-automation-certificate-course/>
2. <https://www.javatpoint.com/automation-tools>



Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Possess the knowledge on the basics of computers and its components	PO1, PO2, PO3, PO6, PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1, PO2, PO3, PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3, PO5, PO7
CO4	Demonstrate the understanding of different automation tools.	PO3, PO4, PO5, PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4, PO6, PO7, PO8

Mapping of COs with PSOs

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	3	1
CO2	3	1	2	3	3	3
CO3	3	2	1	2	1	3
CO4	3	3	2	2	2	1
CO5	2	2	1	3	1	3
Weight age of course contributed to each PSO	13	10	8	13	10	11

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Non Major Elective – II		Course Code: 23UCS2N03		Course Title: Introduction to HTML
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	2	30	2	100

Course Objectives

1. Insert a graphic with in a webpage.
2. Create a link with in a webpage.
3. Create a table with in a webpage.
4. Insert heading levels within a webpage.
5. Insert ordered and unordered lists with in a web page. Create a webpage.

UNIT – I

Introduction: WebBasics: What is Internet – Web browsers – What is Webpage – HTML Basics: Understanding tags.

UNIT – II

Tags for Document structure (HTML, Head,Body Tag). Block level text elements: Headings paragraph (<p>tag) – Font style elements: (bold, italic, font, small, strong, strike, bigtags)

UNIT – III

Lists: Types of lists: Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, BR - Using Images – Creating Hyperlinks.

UNIT – IV

Tables: Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan – Cell padding.

UNIT – V

Frames: Frameset – Targeted Links – No frame – Forms: Input, Textarea, Select, Option.



Text Books

1. Mastering HTML5 and CSS3 Made Easy”, Teach UComp Inc., 2014.
2. Thomas Michaud, Foundations of Web Design: Introduction to HTML & CSS

Web Reference

1. <https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf>
2. <https://www.w3schools.com/html/default.asp>

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6



Mapping of COs with PSOs

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weight age of course contributed to each PSO	14	15	14	14	15	15

3 – Strong

2 – Medium

1 – Low



Programme: B.Sc Computer Science				
Non Major Elective – II		Course Code: 23UCS2N04		Course Title: Web Designing
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	2	30	2	100

Course Objectives

1. Understand the basics of HTML and its components
2. To study about the Graphics in HTML
3. Understand and apply the concepts of XML and DHTML
4. Understand the concept of JavaScript
5. To identify and understand the goals and objectives of the Ajax.

UNIT – I

HTML: HTML - Introduction - tag basics - page structure - adding comments working with texts, paragraphs and line break. Emphasizing text- heading and horizontal rules - list - font size, face and color - alignment links - tables - frames.

UNIT – II

Forms & Images Using Html: Graphics: Introduction - How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.

UNIT – III

XML & DHTML: Cascading style sheet (CSS) - what is CSS - Why we use CSS - adding CSS to your webpages - Grouping styles - extensible markup language (XML).

UNIT – IV

Dynamic HTML: Document object model (DCOM)- Accessing HTML & CSS through DCOM Dynamic content styles & positioning - Event bubbling - data binding. JavaScript: Client-



side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

UNIT – V

Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.

Text Books

1. Pankaj Sharma, “Web Technology”, Sk Kataria & Sons Bangalore 2011.
2. Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition.
3. Achyut S Godbole & AtulKahate, “Web Technologies”, 2002, 2nd Edition.

Reference Books

1. Laura Lemay, RafeColburn, Jennifer Kyrnin, “Mastering HTML, CSS & Javascript Web Publishing”, 2016.
2. DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Programme Outcomes
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1, PO2, PO3, PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	PO2, PO6, PO7



Mapping of COs with PSOs

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	-	2	1	1
CO2	3	3	-	2	-	1
CO3	3	3	-	2	2	1
CO4	3	3	-	2	-	1
CO5	3	3	3	2	-	1
Weight age of course contributed to each PSO	15	15	3	10	3	4

3 – Strong

2 – Medium

1 – Low