V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
(Belonging to Virudhunagar Hindu Nadars)
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM REGULATIONS AND SYLLABUS (with effect from Academic Year 2020 - 2021)

V.V.Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 20 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 6 Ph.D. Programmes. The curriculums for all these Programmes, except Ph.D. Programmes, have been framed as per the guidelines given by the University Grants Commission (UGC) under Choice Based Credit System (CBCS) and the guidelines for Outcome Based Education (OBE).

The Departments of Commerce, English, History, Mathematics, Biochemistry and Tamil upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

A. CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose Courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The performance of students is evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

List of Programmes in which CBCS/Elective Course System is implemented

UG PROGRAMMES

Arts & Humanities	:	History (E.M. & T.M.), English, Tamil
Physical & Life Sciences	:	Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology and Computer Applications.
Commerce & Management	:	Commerce, Commerce (Computer Applications), Commerce (Professional Accounting), Business Administration.

PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Chemistry, Zoology, Biochemistry, Home Science - Nutrition and Dietetics, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*)
		* AICTE approved Programmes

PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

OUTLINE OF CHOICE BASED CREDIT SYSTEM – UG

1. Core Courses
2. Discipline Specific Elective Courses (DSEC)
3. Allied Courses
4. Skill Enhancement Courses (SEC)
5. Non Major Elective Courses (NMEC)
6. Ability Enhancement Compulsory Courses (AECC)
7. Generic Elective Courses (GEC)
8. Internship / Field Project
9. Self Study Courses
10. Extra Credit Courses (optional)

List of Non Major Elective Courses (NMEC) Offered

UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்கால நீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi – I	III	Hindi
Basic Hindi – II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude – I	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Lifestyle associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
Spreadsheet	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	

மேல்நிலை கல்வி வரை தமிழை முதன்மை பாடமாக எடுத்து படிக்காத மாணவிகள் கீழ்கண்ட பாடங்களை கட்டாயம் படிக்க வேண்டும்

1. அடிப்படைத் தமிழ் - எழுத்தறிதல்
2. அடிப்படைத் தமிழ் - மொழித்திறனறிதல்

List of Ability Enhancement Compulsory Courses (AECC) &
Generic Elective Courses (GEC) Offered

ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Value Education
2. Environmental Studies

GENERIC ELECTIVE COURSES 1

1. Human Rights
2. Women Studies

GENERIC ELECTIVE COURSES 2

1. Constitution of India
2. Modern Economics
3. Adolescent Psychology
4. Disaster Management

B. OUTCOME BASED EDUCATION (OBE) FRAMEWORK

The core philosophy of Outcome Based Education rests in employing a student - centric learning approach to measure the performance of students based on a set of pre-determined outcomes. The significant advantage of OBE is that it enables a revamp of the curriculum based on the learning outcomes, upgrade of academic resources, quality enhancement in research and integration of technology in the teaching –learning process. It also helps in bringing clarity among students as to what is expected of them after completion of the Programme in general and the Course in particular. The OBE directs the teachers to channelize their teaching methodologies and evaluation strategies to attain the PEOs and fulfil the Vision and Mission of the Institution.

Vision of the Institution

The founding vision of the Institution is to impart Quality Education to the rural womenfolk and to empower them with knowledge and leadership quality.

Mission of the Institution

The mission of the Institution is to impart liberal education committed to quality and excellence. Its quest is to mould learners into globally competent individuals instilling in them life-oriented skills, personal integrity, leadership qualities and service mindedness.

B.1 Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes

It is imperative for the institution to set the Programme Educational Objectives (PEOs), Programme Outcomes (POs) and Course Outcomes (COs), consistent with its Vision and Mission statements. The PEOs and the POs should be driven by the mission of the institution and should provide distinctive paths to achieve the stated goals. The PEOs for each Programme have to fulfil the Vision and Mission of the Department offering the Programme.

Vision of the Department of Computer Science

The Department of Computer Science is envisioned to create industry ready Computer Science students with ardour for personal growth.

Mission of the Department of Computer Science

To create an environment conducive for transforming rural women students into eminent students prepared for a globalized technological era and to instil in them a passion to strive for perpetual personal uplift.

Programme Educational Objectives (PEOs) of B.Sc. Computer Science

PEO1 Students gain knowledge and expertise in advanced domains of Computer Science like website design, mobile apps development and data analytics.

PEO2 The rural women students will emerge as eminent software professionals with team building capacity and leadership quality to suit the modern software industry.

PEO3 The students imbibe moral values and professional ethics to shape themselves as skilled persons to work as an individual with topical updates and as a team to contribute towards the need of industry and society.

Key Components of Mission Statement	**P**rogramme **E**ducational **O**bjectives (**PEOs**)		
	PEO1	**PEO2**	**PEO3**
transforming rural women students		√	
eminent students	√	√	√
prepared for a globalized technological era	√	√	
a passion to strive for perpetual personal uplift			√

B.1.2 Programme Outcomes (POs)

POs shall be based on Graduate Attributes (GAs) of the Programme. The GAs are the attributes expected of a graduate from a Programme in terms of knowledge, skills, attitude and values. The Graduate Attributes include Disciplinary Knowledge, Communication Skills, Critical Thinking, Problem Solving, Analytical Reasoning, Research Related Skills, Co-operation/Team Work, Scientific Reasoning, Reflective Thinking, Information/Digital Literacy, Multicultural Competence, Moral and Ethical Awareness/Reasoning, Leadership Qualities and Lifelong Learning.

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

1 apply effectively the acquired knowledge and skill in the field of Arts, Physical Science, Life Science, Computer Science, Commerce and Management for higher studies and employment. (*Disciplinary Knowledge*)

2 communicate proficiently and confidently with the ability to express original/complex ideas effectively in different situations. (*Communication Skills)*

3 identify, formulate and solve problems in real life situations scientifically / systematically by adapting updated skills in using modern tools and techniques. (*Scientific Reasoning and Problem Solving)*

4 critically analyse, synthesize and evaluate data, theories and ideas to provide valid suggestions for the betterment of the society. (*Critical Thinking and Analytical Reasoning)*

5 use ICT in a variety of self-directed lifelong learning activities to face career challenges in the changing environment. (*Digital Literacy, Self - Directed and Lifelong Learning)*

6 self-manage and function efficiently as a member or a leader in diverse teams in a multicultural society for nation building. (*Co-operation/Team Work and Multicultural Competence)*

7 uphold the imbibed ethical and moral values in personal, professional and social life for sustainable environment. (*Moral and Ethical Awareness)*

B.1.3 Programme Specific Outcomes (PSOs)

Based on the Programme Outcomes, Programme Specific Outcomes are framed for each UG Programme**.** Programme Specific Outcomes denote what the students would be able to do at the time of graduation. They are Programme specific. It is mandatory that each PO should be mapped to the respective PSO.

PROGRAMME SPECIFIC OUTCOMES

On completion of B.Sc. Computer Science programme, the students will be able to

PO1 - *Disciplinary Knowledge*

PSO 1.a: apply principles, methods and techniques of various domains of Computer Science and courses related to Computer Science to a wide range of applications.

PSO 1.b: use modern software development tools, packages and platforms.

PO2 - *Communication Skills*

PSO 2.a: give and receive clear instructions, write effectual reports, design documentation and make remarkable presentations on concepts related to Computer Science.

PSO 2.b: express complex technical ideas effectively to peers, other assemblage like IT community and the entire society.

PO3 - *Scientific Reasoning and Problem Solving*

PSO 3: design and develop computer programs using programming languages efficiently, in the areas related to database management, mobile applications, operating systems and web design.

PO4 - *Critical Thinking and Analytical Reasoning*

PSO 4: analyse real world problems, identify and formulate the computing requirements appropriate to give efficient and constructive solutions in different fields of Computer Science and for environmental sustainability.

PO5 - *Digital Literacy, Self - directed and Lifelong Learning*

PSO 5.a: create high quality e-content for demonstrating complex concepts; pursue the appropriate Massive Open Online Courses.

PSO 5.b: adapt to an ever-changing technological landscape by pursuing higher studies and engaging in independent and life-long learning.

PO6 - *Cooperation/Team Work and Multi-Cultural Competence*

PSO 6: demonstrate the knowledge of technological and management principles to work as a member or leader, with multicultural competence in diverse teams of software projects.

PO7 - *Moral and Ethical Awareness*

PSO 7: develop innovative applications as an employee of a company or an entrepreneur, employing contemporary technologies adhering to ethical, security and legal issues of Internet and Cyber systems.

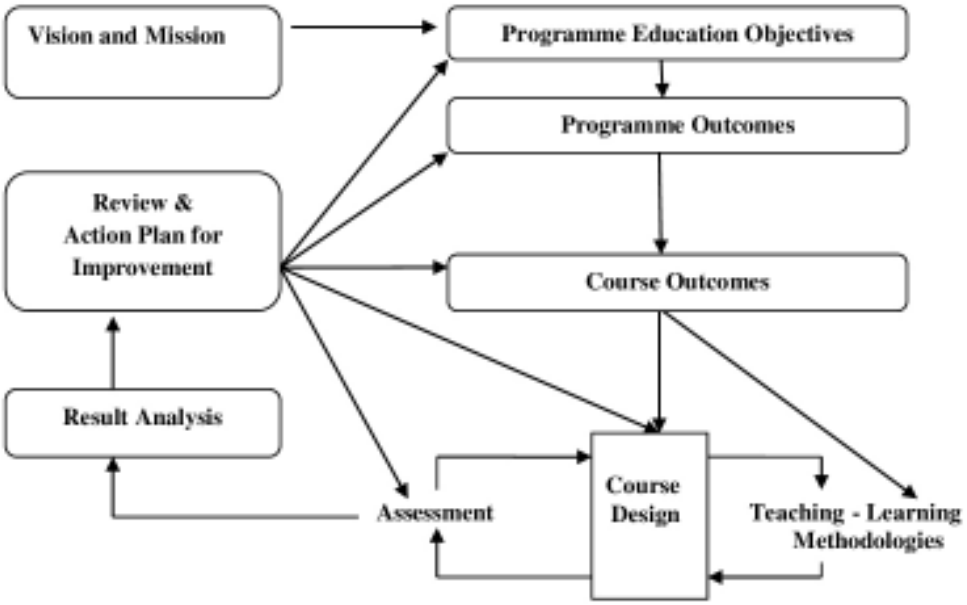
PO-PEO Mapping Matrix

Attainment of PEOs can be measured by a PO-PEO matrix. PEOs should evolve through constant feedback from alumnae, students, industry, management, *etc*. It is mandatory that each PEO should be mapped to at least one of the POs.

PEOs / POs/PSOs	PEO1	PEO2	PEO3
PO1/PSO1	✓	✓	✓
PO2/PSO2	✓	✓	✓
PO3/PSO3	✓	✓	-
PO4/PSO4	✓	✓	✓
PO5/PSO5	✓	✓	-
PO6/PSO6	✓	✓	✓
PO7/PSO7	-	✓	✓

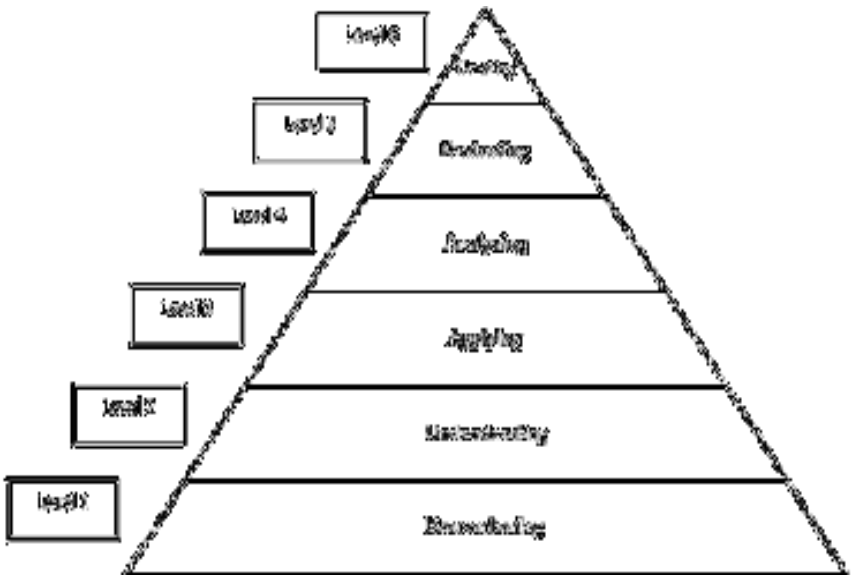
B.1.4 Course Outcomes (COs)

Course Outcomes are narrow statements restricted to the Course contents given in five units. Course Outcomes describe what students would be capable of, after learning the contents of the Course. They reflect the level of knowledge gained, skills acquired and attributes developed by the students after learning of Course contents. COs are measurable, attainable and manageable in number. COs contribute to attain POs in such a way that each CO addresses at least one of the POs and also each PO is reasonably addressed by adequate number of COs.



It is important to determine the methods of assessment. A comprehensive assessment strategy may be outlined using the revised Bloom's Taxonomy levels.

BLOOM'S TAXONOMY



CO – PO Mapping of Courses

After framing the CO statements, the COs framed for each Course is mapped with POs based on the relationship that exists between them. The COs which are not related to any of the POs is indicated with (-), signifying Nil. Measurement Mapping is based on Four Points Scale [High (H), Medium (M), Low (L) and Nil (-)]. For calculating weighted percentage of contribution of each Course in the attainment of the respective POs, the weights assigned for H, M and L are 3, 2and 1 respectively.

CO-PO/PSO Mapping Table (Course Articulation Matrix)

PO/PSOs / COs	PO1/ PSO1	PO2/ PSO2	PO3/ PSO3	PO4/ PSO4	PO5/ PSO5	PO6/ PSO6	PO7/ PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

ELIGIBILITY FOR ADMISSION

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamil Nadu or any other examination accepted by Academic Council with Mathematics as one of the subjects.

DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

MEDIUM OF INSTRUCTION

English

COURSES OFFERED

Part I	:	Tamil/Hindi/Alternate Course
Part II	:	English
Part III	:	Core Courses
	:	Discipline Specific Elective Courses
	:	Allied Courses
	:	Self-Study Course
Part IV	:	Skill Enhancement Courses (SEC)
	:	Field Project/Internship
	:	Non-Major Elective Courses (NMEC)
	:	Ability Enhancement Compulsory Courses (AECC)
	:	Generic Elective Courses (GEC)
	:	Self-Study Course
Part V	:	National Service Scheme/ Physical Education/ Youth Red Cross Society/ Red Ribbon Club/ Science Forum/ Eco Club/ Library and Information Science/ Consumer Forum/ Health and Fitness Club and National Cadet Corps/ Rotaract club

B.2. EVALUATION SCHEME

B.2.1 PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
Total	**:**	**25**

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Periodic Test	:	30
Record and Performance	:	10
Total	**:**	**40**

Three Periodic Tests – Average of the best two will be considered

Question Pattern for Periodic Tests **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q.No.(1- 4)	Multiple Choice	4	4	1	4
B Q.No.(5- 7)	Internal Choice - Either or Type	3	3	7	21
C Q.No.(8-9)	Internal Choice – Either or Type	2	2	10	20
				Total	**45***

*The total marks obtained in the Periodic Test will be calculated for 15 marks

EXTERNAL EXAMINATION

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No. (1- 10)	Multiple Choice	10	10	1	10
B Q. No. (11 -15)	Internal Choice – Either or Type	5	5	7	35
C Q. No. (16-18)	Internal Choice – Either or Type	3	3	10	30
				Total	**75**

PROJECT

Assessment by Internal Examiner only

Distribution of Marks

Mode of Evaluation		Marks
Project Work and Report	:	60
Presentation and Viva -Voce	:	40
Total	**:**	**100**

B.2.2 PART III - SELF STUDY COURSE

Core Courses Quiz – Online

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the Departments.
- No. of Questions to be taken 700.
- Multiple Choice Question pattern is followed.
- Online Test will be conducted in VI Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.3 PART IV - Skill Enhancement Courses & Non Major Elective Courses

INTERNAL ASSESSMENT

Distribution of Marks

Theory

Mode of Evaluation		Marks
Periodic Test	:	25
Assignment	:	10
Quiz	:	5
Total	**:**	**40**

Three Periodic tests - Average of the best two will be considered
Two Assignments - Better of the two will be considered
Three Quiz Tests - Best of the three will be considered

Practical

Mode of Evaluation		Marks
Periodic Test	:	30
Record and Performance	:	10
Total	**:**	**40**

Three Periodic Tests – Average of the best two will be considered

Question Pattern for Periodic Tests **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 3)	Internal Choice (Either-or Type)	3	3	5	15
B Q. No.4	Internal Choice (Either-or Type)	1	1	10	10
				Total	**25**

EXTERNAL EXAMINATION

Question Pattern **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1- 6)	Internal Choice (Either-or Type)	6	6	5	30
B Q. No.(7-9)	Internal Choice (Either-or Type)	3	3	10	30
				Total	**60**

B.2.4 PART IV- Ability Enhancement Compulsory Courses (AECC) & Generic Elective Courses (GEC)

- Assessment by Internal Examiner only
- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty Members of the respective departments will be prescribed.

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	30
Assignment	:	10
Model Examination	:	60
Total	**:**	**100**

Two Periodic tests - Better of the two will be considered

Two Assignments - Better of the two will be considered

Question Pattern for Periodic Test **Duration: 1 Hour**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1-3)	Internal Choice - Either or Type	3	3	6	18
B Q. No.4	Internal Choice - Either or Type	1	1	12	12
				Total	**30**

Question Pattern for Model Examination **Duration: 2 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No. (1-5)	Internal Choice - Either or Type	5	5	6	30
B Q. No. (6-8)	Internal Choice - Either or Type	3	3	10	30
				Total	**60**

B.2.5 SELF STUDY COURSE

Practice for Competitive Examinations

Assessment by Internal Examiner only

- Question Bank prepared by the Faculty Members of the respective Departments will be followed.

- Multiple Choice Question pattern is followed.
- Online Test will be conducted in V Semester for 100 Marks.
- Model Examination is conducted after two periodic tests.

Subject-wise Allotment of Marks

Subject		Marks
Tamil	:	10
English	:	10
History	:	10
Mathematics	:	10
Current affairs	:	10
Commerce, Law & Economics	:	10
Physical Sciences	:	10
Life Sciences	:	15
Computer Science	:	5
Food and Nutrition	:	5
Sports and Games	:	5
Total		**100**

Distribution of Marks

Mode of Evaluation		Marks
Periodic Test	:	40
Model Examination	:	60
Total	**:**	**100**

Two Periodic Tests - Better of the two will be considered

B.2.6 Part V – Extension Activities

Assessment by Internal examiner only

Distribution of Marks

Mode of Evaluation		Marks
Attendance	:	5
Performance	:	10
Report/Assignment/Project/Camp/Practical	:	10
Total	**:**	**25***

*The marks obtained will be calculated for 100 marks

B.2.7 EXTRA CREDIT COURSES (OPTIONAL)

Assessment by Internal Examiner only

Question Pattern **Duration: 3 Hours**

Section	Types of Question	No. of Questions	No. of Questions to be answered	Marks for each Question	Total Marks
A Q. No.(1-10)	Multiple Choice	10	10	1	10
B Q. No.(11-15)	Internal Choice – Either or Type	5	5	9	45
C Q. No.(16-18)	Internal Choice – Either or Type	3	3	15	45
				Total	**100**

ELIGIBILITY FOR THE DEGREE

The candidate will not be eligible for the Degree without completing the prescribed Courses of study, lab work, *etc.,* and a minimum Pass marks in all the Courses.

- No Pass minimum for Internal Theory Assessment.
- Pass minimum for External Examination is 27 marks out of 75 for Core Courses, Discipline Specific Elective Courses and Allied Courses.
- Pass minimum for External Examination is 21 marks out of 60 for Skill Enhancement Courses and Non Major Elective Courses.
- Pass minimum for Internal Practical is 19 marks out of 40.
- The aggregate minimum pass percentage is 40.
- Pass minimum for External Practical Examination is 21 marks out of 60 marks.
- Pass minimum for Ability Enhancement Compulsory Course and Generic Elective Course is 40.
- Pass minimum for Self Study Courses is 40.

ATTENDANCE

(a) The students who have attended the classes for 76 days (85%) and above are permitted to appear for the Summative Examinations without any condition.

(b) The students who have only 60-75 days (66% - 84%) of attendance are permitted to appear for the Summative Examinations after paying the required fine amount and fulfilling other conditions according to the respective cases.

(c) The students who have attended the classes for 59 days and less - upto 45 days (50%-65%) can appear for the Summative Examinations only after getting special permission from the Principal.

(d) The students who have attended the classes for 44 days or less (50%) cannot appear for the Summative Examinations and have to repeat the whole semester.

- These rules are applicable to UG, PG and M.Phil. Programmes and come into effect from 2020-2021 onwards.
- For Certificate, Diploma, Advanced Diploma and Post Graduate Diploma Programmes, the students require 75% of attendance to appear for the Theory/Practical Examinations.

B.3 ASSESSMENT MANAGEMENT PLAN

An Assessment Management Plan that details the assessment strategy both at the Programme and the Course levels is prepared. The continuous assessment is implemented using an assessment rubric to interpret and grade students.

B.3.1 Assessment Process for CO Attainment

Assessment is one or more processes carried out by the institution that identify, collect and prepare data to evaluate the achievement of Course Outcomes and Programme Outcomes. Course Outcome is evaluated based on the performance of students in the Continuous Internal Assessments and in End Semester Examination of a Course. Target levels of attainment shall be fixed by the Course teacher and Heads of the respective departments.

Direct Assessment (rubric based)-Conventional assessment tools such as Term Test, Assignment, Quiz and End Semester Summative Examination are used.

Indirect Assessment – Done through Course Exit Survey.

CO Assessment Rubrics

For the evaluation and assessment of COs and POs, rubrics are used. Internal assessment contributes 40% and End Semester assessment contributes 60% to the total attainment of a CO for the theory Courses. For the practical Courses, internal assessment

contributes 50% and Semester assessment contributes 50% to the total attainment of a CO. Once the Course Outcome is measured, the PO can be measured using a CO-PO matrix.

CO Attainment

Direct CO Attainment

Course outcomes of all Courses are assessed and the CO – wise marks obtained by all the students are recorded for all the assessment tools. The respective CO attainment level is evaluated based on set attainment rubrics.

Attainment Levels of COs

Assessment Methods	**Attainment Levels**	
Internal Assessment	Level 1	50% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 2	55% of students scoring more than average marks or set target marks in Internal Assessment tools
	Level 3	60% of students scoring more than average marks or set target marks in internal Assessment tools
End Semester Summative Examination	Level 1	50% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 2	55% of students scoring more than average marks or set target marks in End Semester Summative Examination
	Level 3	60% of students scoring more than average marks or set target marks in End Semester Summative Examination

Target Setting for Assessment Method

For setting up the target of internal assessment tools, 55% of the maximum mark is fixed as target. For setting up the target of End Semester Examination, the average mark of the class shall be set as target.

Formula for Attainment for each CO

Attainment = Percentage of students who have scored more than the target marks

$$\text{Percentage of Attainment} = \frac{\text{Number of Students who Scored more than the Target}}{\text{Total Number of Students}} \times 100$$

Indirect CO Attainment

At the end of each Course, an exit survey is conducted to collect the opinion of the students on attainment of Course Outcomes. A questionnaire is designed to reflect the views of the students about the attainment of Course outcomes.

Overall CO Attainment= 75% of Direct CO Attainment + 25 % of Indirect CO Attainment

In each Course, the level of attainment of each CO is compared with the predefined targets. If the target is not reached, the Course teacher takes necessary steps for the improvement to reach the target.

For continuous improvement, if the target is reached, the Course teacher can set the target as a value greater than the CO attainment of the previous year.

B.3.2 Assessment Process for Overall PO Attainment

With the help of CO against PO mapping, the PO attainment is calculated. PO assessment is done by giving 75% weightage to direct assessment and 25% weightage to indirect assessment. Direct assessment is based on CO attainment, where 75% weightage is given to attainment through End Semester examination and 25% weightage is given to attainment through internal assessments. Indirect assessment is done through Graduate Exit Survey and participation of students in Co-curricular/Extra-curricular activities.

PO Assessment Tools

Mode of Assessment	Assessment Tool	Description
Direct Attainment (Weightage -75%)	CO Assessment	This is computed from the calculated CO Attainment value for each Course
Indirect Attainment (Weightage - 25%)	Graduate Exit Survey 10%	At the end of the Programme, Graduate Exit Survey is collected from the students and it gives the opinion of the students on attainment of Programme Outcomes
	Co-curricular / Extracurricular activities 15%	For participation in Co-curricular / Extracurricular activities during the period of their study.

Programme Articulation Matrix (PAM)

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Average Direct PO Attainment									
Direct PO Attainment in percentage									

Indirect Attainment of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Graduate Exit Survey								
Indirect PO Attainment								

Attainments of POs for all Courses

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Direct Attainment (Weightage - 75%)								
Indirect Attainment (Weightage - 25%)								
Overall PO Attainment								

Overall PO Attainment= [75% of Direct PO Attainment +
25% of Indirect PO Attainment (Graduate Exit Survey & Participation in Co- curricular and Extracurricular Activities)]

Expected Level of Attainment for each of the Programme Outcomes

POs	Level of Attainment
Value >= 70%	Excellent
Value >= 60 % and Value < 70%	Very Good
Value >= 50 % and Value < 60%	Good
Value >= 40% and Value < 50%	Satisfactory
Value < 40%	Not Satisfactory

Level of PO attainment

Graduation Batch	Overall PO Attainment (in percentage)	Whether Expected Level of PO is Achieved? (Yes/No)

B.3.3 Assessment Process for PEOs

The curriculum is designed so that all the courses contribute to the achievement of PEOs. The attainment of PEOs is measured after 5 years of completion of the programme only through Indirect methods.

Target for PEO Attainment

Assessment Criteria	Target (UG)	Target (PG)
Record of Employment	25% of the class strength	30% of the class strength
Progression to Higher Education	40% of the class strength	5% of the class strength
Record of Entrepreneurship	2% of the class strength	5% of the class strength

Attainment of PEOs

Assessment Criteria & Tool	Weightage
Record of Employment	10
Progression to Higher Education	20
Record of Entrepreneurship	10
Feedback from Alumnae	30
Feedback from Parents	10
Feedback from Employers	20
Total Attainment	**100**

$$\text{Percentage of PEO Attainment from Employment} = \frac{\text{Number of Students who have got Employment}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Higher Education} = \frac{\text{Number of Students who pursue Higher Education}}{\text{Target}} \times 100$$

$$\text{Percentage of PEO Attainment from Entrepreneurship} = \frac{\text{Number of Students who have become Entrepreneurs}}{\text{Target}} \times 100$$

Expected Level of Attainment for each of the Programme Educational Objectives

POs	Level of Attainment
Value > = 70%	Excellent
Value > = 60 % and Value < 70%	Very Good
Value > = 50 % and Value < 60%	Good
Value > = 40% and Value < 50%	Satisfactory
Value < 40%	Not Satisfactory

Level of PEO Attainment

Graduation Batch	Overall PEO Attainment (in percentage)	Whether Expected Level of PEO is Achieved? (Yes/No)

C. PROCESS OF REDEFINING THE PROGRMME EDUCATIONAL OBJECTIVES

The college has always been involving the key stake holders in collecting information and suggestions with regard to curriculum development and curriculum revision. Based on the information collected the objectives of the Programme are defined, refined and are inscribed in the form of PEOs. The level of attainment of PEOs defined earlier will be analysed and will identify the need for redefining PEOs. Based on identified changes in terms of curriculum, regulations and PEOs, the administrative system like Board of Studies, Academic Council and Governing Body may recommend appropriate actions. As per the Outcome Based Education Framework implemented from the Academic Year 2020 -2021, the following are the Programme Structure, the Programme Contents and the Course Contents of B.Sc. Programme.

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VIRUDHUNAGAR - 626 001

COMPUTER SCIENCE (UG)

Course Structure - Allotment of Hours and Credits

For those who join in the Academic Year 2020 - 2021 and after

Components	Semester						Total Number of Hours / Credits
	I	II	III	IV	V	VI	
Part I: Tamil /Hindi	6(3)	6(3)	5(3)	5 (3)	-	-	22(12)
Part II: English	6(3)	6(3)	6(3)	6 (3)	-	-	24(12)
Part III: Core, Allied and DSEC Courses:							
Core Course	5(4)	5(4)	4(4)	4(4)	5(5)	5 (5)	28(26)
Core Course	-	-	4(3)	-	5 (5)	5 (5)	14(13)
Core Course	-	-	-	-	5 (5)	5 (5)	10(10)
Core Course Practical	5 (3)	5 (3)	4 (2)	4 (2)	5 (2)	4 (2)	27(14)
DSEC	-	-	-	-	4 (4)	5 (4)	9 (8)
DSEC Practical	-	-	-	-	4 (2)	4 (2)	8 (4)
Project					0(1)		0(1)
Allied Course	4 (4)	4 (4)	4 (4)	4 (4)	-	-	16(16)
Self Study Course	-	-	-	-	-	0 (1)	0 (1)
Part IV : Skill Enhancement Courses, Non Major Elective Courses, Ability Enhancement Compulsory Courses, Generic Elective Courses, & Self Study Course							
SEC	2(2)	2(2)	-	2(2)	-	2 (2)	8 (8)
SEC	-	2 (2)	-	2(2)	-	-	4 (4)
Non Major Elective	-	-	2 (2)	2 (2)	-	-	4 (4)
AECC 1 (Value Education)	2(2)	-	-	-	-	-	2 (2)
AECC 2 (Environmental Studies)	-	-	-	-	2(1)	-	2(1)
GEC 1	-	-	1(1)	-	-	-	1(1)
GEC 2	-	-	-	1(1)	-	-	1(1)
Self Study Course	-	-	-	-	0 (1)	-	0 (1)
Part V – Extension Activities	-	-	-	0(1)	-	-	0 (1)
Total	**30 (21)**	**30 (21)**	**30 (22)**	**30 (24)**	**30 (26)**	**30 (26)**	**180 (140)**
Extra Credit Course					0 (2)	-	0 (2)

DSEC: Discipline Specific Elective Course SEC: Skill Enhancement Course
AECC: Ability Enhancement Compulsory Course GEC: Generic Elective Course

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PART I - TAMIL

S.No.	Sem.	Code	Title of Paper	Credits	Marks
1.	I	20UTAG11	பொதுத்தமிழ் தாள் I	3	100
2.	II	20UTAG21	பொதுத்தமிழ் தாள் II	3	100
3.	III	20UTAG31C	கணினி தமிழ் I	3	100
4.	IV	20UTAG41C	கணினி தமிழ் II	3	100
			Total	**12**	**400**

PART I - HINDI

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UHDG11	Hindi Paper I	3	100
2.	II	20UHDG21	Hindi Paper II	3	100
3.	III	20UHDG31	Hindi Paper III	3	100
4.	IV	20UHDG41	Hindi Paper IV	3	100
			Total	**12**	**400**

PART II – ENGLISH

S. No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UENG11	English Paper I	3	100
2.	II	20UENG21	English Paper II	3	100
3.	III	20UENG31	English Paper III	3	100
4.	IV	20UENG41	English Paper IV	3	100
			TOTAL	**12**	**400**

PART III – CORE COURSES, DISCIPLINE SPECIFIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of Paper	Credits	Marks
1	I	20UCSC11	Object Oriented Programming with C++	4	100
2	I	20UCSC11P	Object Oriented Programming using C++ Lab	3	100
3	II	20UCSC21	Data Structures	4	100
4	II	20UCSC21P	Data Structures using C++ Lab	3	100
5	III	20UCSC31	Programming with Java	4	100
6	III	20UCSC32	Computer Organization	3	100
7	III	20UCSC31P	Programming using Java Lab	2	100
8	IV	20UCSC41	Web Programming	4	100
9	IV	20UCSC41P	Web Programming Lab	2	100
10	V	20UCSC51	Database Management System Concepts	5	100
11	V	20UCSC52	Computer Algorithms	5	100
12	V	20UCSC53	Computer Networks	5	100
13	V	20UCSC51P	Database Management Systems Lab	2	100
14	V	20UCSE51	Introduction to MATLAB and Digital Image Processing	4	100
		20UCSE52	ASP.NET Programming (or)		
		20UCSE53	Multimedia		
15	V	20UCSE51P	Mathematical Applications Lab(or)	2	100
		20UCSE52P	ASP.NET Programming Lab (or)		
		20UCSE53P	Multimedia Lab		
16	V	20UCSC5PR	Project	1	100
17	VI	20UCSC61	Mobile Applications Development	5	100
18	VI	20UCSC62	Operating System Concepts	5	100
19	VI	20UCSC63	Introduction to Data Mining	5	100
20	VI	20UCSC61P	Mobile Applications Development Lab	2	100
21	VI	20UCSE61	Computer Graphics	4	100
		20UCSE62	Introduction to Internet of Things (or)		
		20UCSE63	Introduction to Big Data		
22	VI	20UCSE61P	Computer Graphics Lab (or)	2	100
		20UCSE62P	Animation using Animate and Maya Lab (or)		
		20UCSE63P	Data Science Lab		
23	VI	20UCSQ61	Core Courses Quiz	1	100
			Total	**77**	**2300**

PART III – ALLIED COURSES

S.No.	Sem.	Code	Title of Paper	Credits	Marks
1.	I	20UCSA11	Numerical Methods	4	100
2.	II	20UCSA21	Probability and Statistics	4	100
3.	III	20UCSA31	Resource Management Techniques	4	100
4.	IV	20UCSA41	Quantitative Aptitude	4	100
			Total	**16**	**400**

PART IV – SKILL ENHANCEMENT COURSES

S.No.	Sem.	Code	Title of Paper	Credits	Marks
1.	I	20UCSS11P	DTP Lab	2	100
2.	II	20UCSS21	Digital Principles	2	100
3.	II	20UCSS21P	Web Design Lab	2	100
4.	IV	20UCSS41	Software Engineering	2	100
5.	IV	20UCSS41P	Python Programming Lab	2	100
6.	VI	20UCSS61P	PHP and MySQL Lab	2	100
			Total	**12**	**600**

PART IV – NON MAJOR ELECTIVE COURSES

S.No.	Sem.	Code	Title of Paper	Credits	Marks
1	III	20UCSN31	Introduction to Computers and Office Automation	2	100
2	IV	20UCSN41	Introduction to Internet and HTML 5	2	100
			Total	**4**	**200**

PART IV– ABILITY ENHANCEMENT COMPULSORY COURSES AND GENERIC ELECTIVE COURSES

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	20UGVE11	Value Education	2	100
	V	20UGES51	Environmental Studies	1	100
2.	III	20UGEH31 20UGEW32	Human Rights / Women Studies	1	100
3.	IV	20UGEC41/	Constitution of India /	1	100
		20UGEM42/	Modern Economics /		
		20UGEA43/	Adolescent Psychology /		
		20UGED44	Disaster Management		
4.	V	20UGCE51	Practice for Competitive Examinations - Online	1	100
5.	I, II, III & IV	PART V	Extension Activities	1	100
			Total	**7**	**600**

PART V - EXTENSION ACTIVITIES

S.No.	Sem.	Code	Extension Activity	Credit
1	I, II, III & IV	20UVNS1, 20UVNS2	National Service Scheme	1
2		20UVPE1	Physical Education	
3		20UVYR1 20UVYR2	Youth Red Cross Society	
4		20UVRR1	Red Ribbon Club	
5		20UVSF1	Science Forum	
6		20UVEC1	Eco Club	
7		20UVLI1	Library and Information Science	
8		20UVCC1	Consumer Club	
9		20UVHF1	Health and Fitness Club	
10		20UVNC1, 20UVNC2	National Cadet Corps	
11		20UVRO1	Rotaract Club	

EXTRA CREDIT COURSES (Optional)

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	V	20UCSO51	C and C++ Aptitude	2	100
2	V	20UCSO52	Introduction to Microcontrollers	2	100

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B.Sc. COMPUTER SCIENCE

SEMESTER I

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	**Part I**	20UTAG11/ 20UHDG11	Tamil / Hindi Course I	6	3	25	75
2	**Part II**	20UENG11	English Course I	6	3	25	75
3	**Part III**	20UCSC11	**Core Course 1** Object Oriented Programming with C++	5	4	25	75
4		20UCSC11P	**Core Course Practical I** Object Oriented Programming using C++ Lab	5	3	40	60
5		20UCSA11	**Allied Course 1** Numerical Methods	4	4	25	75
6	**Part IV**	20UCSS11P	**Skill Enhancement Course 1 (SEC 1) Practical I** DTP Lab	1 T*+ 1P'	2	40	60
7		20UGVE11	**Ability Enhancement Compulsory Course 1 (AECC1)** Value Education	2	2	100	-
			Total	**30**	**21**	**700**	

T* - Tutorial P' - Practical

SEMESTER II

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	**Part I**	20UTAG21/ 20UHDG21	Tamil / Hindi Course II	6	3	25	75
2	**Part II**	20UENG21	English Course II	6	3	25	75
3	**Part III**	20UCSC21	**Core Course 2** Data Structures	5	4	25	75
4		20UCSC21P	**Core Course Practical II** Data Structures using C++ Lab	5	3	40	60
5		20UCSA21	**Allied Course 2** Probability and Statistics	4	4	25	75
6	**Part IV**	20UCSS21	**Skill Enhancement Course 2 (SEC 2)** Digital Principles	2	2	40	60
7		20UCSS21P	**Skill Enhancement Course 3 (SEC 3) Practical II** Web Design Lab	1 T*+1P'	2	40	60
			Total	**30**	**21**	**700**	

T* - Tutorial P' - Practical

SEMESTER III

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	**Part I**	20UTAG31C/ 20UHDG31	Tamil / Hindi Course III	5	3	25	75
2	**Part II**	20UENG31	English Course III	6	3	25	75
3	**Part III**	20UCSC31	**Core Course 3** Programming with Java	4	4	25	75
4		20UCSC32	**Core Course 4** Computer Organization	4	3	25	75
5		20UCSC31P	**Core Course Practical III** Programming using Java Lab	4	2	40	60
6		20UCSA31	**Allied Course 3** Resource Management Techniques	4	4	25	75
7	**Part IV**	20UCSN31	**NMEC 1** Introduction to Computers and Office Automation	2	2	40	60
8		20UGEH31 20UGEW32	**GEC1** 1.Human Rights/ 2. Women Studies	1	1	100	-
			Total	**30**	**22**	**800**	

SEMESTER IV

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	**Part I**	20UTAG41C/ 20UHDG41	Tamil / Hindi Course IV	5	3	25	75
2	**Part II**	20UENG41	English Course IV	6	3	25	75
3	**Part III**	20UCSC41	**Core Course 5** Web Programming	4	4	25	75
4		20UCSC41P	**Core Course Practical IV** Web Programming Lab	4	2	40	60
5		20UCSA41	**Allied Course 4** Quantitative Aptitude	4	4	25	75
6	**Part IV**	20UCSS41	**Skill Enhancement Course 4 (SEC 4)** Software Engineering	2	2	40	60
7		20UCSS41P	**Skill Enhancement Course 5 (SEC 5) Practical IV** Python Programming Lab	1T*+1P'	2	40	60
8		20UCSN41	**NMEC2** Introduction to Internet and HTML 5	2	2	40	60
9		20UGEC41/ 20UGEM42/ 20UGEA43/ 20UGED44	**GEC2** 1. Constitution of India/ 2. Modern Economics/ 3. Adolescent Psychology/ 4. Disaster Management	1	1	100	-
10	**Part V**		Extension Activities	-	1	100	
			Total	**30**	**24**	**1000**	

T* - Tutorial P' - Practical

SEMESTER V

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	Part III	20UCSC51	**Core Course 6** Database Management System Concepts	5	5	25	75
2		20UCSC52	**Core Course 7** Computer Algorithms	5	5	25	75
3		20UCSC53	**Core Course 8** Computer Networks	5	5	25	75
4		20UCSC51P	**Core Course Practical V** Database Management Systems Lab	5	2	40	60
5		20UCSE51	**Discipline Specific Elective Course 1 (DSEC 1)** Introduction to MATLAB and Digital Image Processing	4	4	25	75
		20UCSE52	ASP.NET Programming (or)				
		20UCSE53	Multimedia				
6		20UCSE51P	**Discipline Specific Elective Course 2 (DSEC 2) Practical I** Mathematical Applications Lab (or)	4	2	40	60
		20UCSE52P	ASP.NET Programming Lab (or)				
		20UCSE53P	Multimedia Lab				
		20UCSC5PR	**Core Course 9** Project	0	1	100	
7	Part IV	20UGCE51	**Self Study Course** Practice for Competitive Examinations - Online	-	1	100	-
8		20UGES51	Environmental Studies	2	1	100	
			Total	**30**	**26**	**800**	

SEMESTER VI

S.No.	Components	Course Code	Title of the Course	Hours per week	Credits	Marks	
						Int.	Ext.
1	Part III	20UCSC61	**Core Course 10** Mobile Applications Development	5	5	25	75
2		20UCSC62	**Core Course 11** Operating System Concepts	5	5	25	75
3		20UCSC63	**Core Course 12** Introduction to Data Mining	5	5	25	75
4		20UCSC61P	**Core Course Practical VI** Mobile Applications Development Lab	4	2	40	60
5		20UCSQ61	Core Courses Quiz	-	1	100	-
6		20UCSE61	**Discipline Specific Elective Course 3 (DSEC 3)** Computer Graphics (or)	5	4	25	75
		20UCSE62	Introduction to Internet of Things (or)				
		20UCSE63	Introduction to Big Data				
7		20UCSE61P	**Discipline Specific Elective Course 4 (DSEC 4) Practical II** Computer Graphics Lab (or)	4	2	40	60
		20UCSE62P	Animation using Animate and Maya Lab (or)				
		20UCSE63P	Data Science Lab				
8	**Part IV**	20UCSS61P	**Skill Enhancement Course 6 (SEC 6) Practical IV** PHP and MySQL Lab	1 T*+1P'	2	40	60
			Total	**30**	**26**	**800**	

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester I	**OBJECT ORIENTED PROGRAMMING WITH C++**	Hours/Week: 5	
Core Course 1		Credits: 4	
Course Code **20UCSC11**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the features of object oriented paradigm. [K1]

CO2: describe constructor, friend function, inline function and virtual function. [K2]

CO3: discuss overloading, inheritance and polymorphism. [K2]

CO4: summarize the concepts of manipulators, pointers, data hiding and data reusability. [K3]

CO5: demonstrate the object oriented programming concepts through C++ programs. [K4]

UNIT I

Principles of Object Oriented Programming: Basic Concepts of Object Oriented Programming – Benefits of OOP.

Beginning with C++: What is C++? – A Simple C++ Program – Comments – Output Operator – Namespace – Return Type of main() –More C++ Statements - Structure of C++ Program.

Tokens, Data Types : Tokens - Keywords - Identifiers and Constants - Basic Data types – User Defined Data Types –Storage Classes – Derived Data Types.

Expressions and Control Structures: Symbolic Constants – Type Compatibility - Declaration of Variables- Dynamic Initialization of Variables- Reference Variables - Operators in C++ - Scope Resolution Operator - Type Cast Operator - Expressions and their types-Control structures. (15 Hours)

UNIT II

Functions in C++: Introduction- The Main function–Function Prototyping – Call by Reference- Return by Reference -Inline Functions - Default Arguments - Function Overloading –Math Library Functions.

Classes and Objects: Specifying a Class - Defining Member Functions – C++ Program with Class - Nesting of Member Functions -Private Member Functions- Arrays within a Class- Memory Allocation for Objects-Arrays of Objects - Friendly functions.

(15 Hours)

UNIT III

Constructors and Destructors: Introduction - Constructors - Parameterized Constructors –Constructor with Default Arguments - Copy Constructor –Dynamic Constructors – Destructors.

Operator Overloading : Introduction - Defining Operator Overloading - Overloading Unary Operators - Overloading Binary Operators - Overloading Binary Operators using Friends-Rules for Overloading Operators.

(15 Hours)

UNIT IV

Inheritance: Extending Classes: Introduction - Defining Derived Classes- Single Inheritance - Making a Private Member Inheritable-Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance

Pointers, Virtual Functions and Polymorphism: Pointers - Pointers to Objects - this Pointer - Virtual Functions**.** (15 Hours)

UNIT V

Managing Console I/O Operations: Introduction - C++ Streams - C++ Stream Classes - Unformatted I/O Operations - Formatted Console I/O Operations - Managing Output with Manipulators.

Manipulating Strings: Creating (string) Objects - Manipulating String Objects - Relational Operations - String Characteristics - Accessing Characters in Strings - Comparing and Swapping. (15 Hours)

SELF-STUDY: (Not included for Examination)

Implicit Conversions	Chapter 3	Page No: 56 - 57
Objects as Function Arguments	Chapter 5	Page No. 111 - 113
Returning Objects	Chapter 5	Page No. 118 - 120

TEXT BOOK

E.Balagurusamy (2018), *Object Oriented Programming with C++*, 7th Edition, McGraw Hill Education Private Ltd., India.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.5, 1.6**
	2	**2.1, 2.3, 2.4, 2.6**
	3	**3.2 - 3.15, 3.19 - 3.20, 3.25**
II	**4**	**4.1 - 4.7, 4.10, 4.12**
	5	**5.3 - 5.5, 5.7 - 5.10, 5.13, 5.15**
III	**6**	**6.1 - 6.3, 6.5, 6.7 - 6.8, 6.11**
	7	**7.1 - 7.5, 7.8**
IV	**8**	**8.1 - 8.8**
	9	**9.2 - 9.4, 9.7**
V	**10**	**10.2 - 10.6**
	15	**15.2 - 15.7**

REFERENCE BOOKS

1. K.R.Venugopal, RajkumarBuyya (2017), *Mastering C++*, 2nd Edition, McGraw Hill Education Private Limited, India.
2. Herbert Schildt (2003), *C++: The Complete Reference*, 4th Edition, Tata McGraw-Hill, India.
3. D.S.Malik (2017), *C++ Programming: From Problem Analysis to Program Design*, 8th Edition, CENGAGE Learning, USA.

Course Code 20UCSC11	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	L	L	-	L	L	-	L	-	-
CO2	H	M	M	M	M	L	-	L	-	-
CO3	H	M	H	M	M	M	M	M	-	L
CO4	H	M	H	M	M	M	M	M	-	L
CO5	H	M	H	H	H	M	M	M	-	M

Dr. G. Karthigai Lakshmi
Mrs. P. Aruna Devi
Heads of the Departments

Mrs. K. AnnbuSelvi
Mrs. P. Aruna Devi
Course Designers

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester I	**OBJECT ORIENTED PROGRAMMING USING C++ LAB**	Hours/Week: 5	
Core Course Practical I		Credits: 3	
Course Code **20UCSC11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: illustrate basic concepts of object oriented programming using C++ programs. [K3]

CO2: write C++ programs to implement the concepts of classes, objects, function overloading and operator overloading. [K3]

CO3: execute C++ modules to exhibit object oriented programming concepts like inheritance and polymorphism. [K3]

CO4: select appropriate formatted console input and output functions for neat output and take printout. [K3]

CO5: detect applications of object oriented programming in real life. [K4]

Write C++ programs for the following

1. To swap two numbers without using intermediate variable.
2. To convert temperature from Fahrenheit to Celsius degree.
3. To check if a number is prime, using objects.
4. To check if the number is amicable using inline function.
5. To calculate simple interest using function (Use rate of interest as default argument).
6. To perform area calculation using function overloading (Minimum three functions).
7. To swap two values between two classes objects using friend function.
8. To find minimum of two numbers between two class objects using friend function.
9. To find the sum of the digit of a given number using constructor.
10. To overload unary minus operator to change sign of given 3 numbers.

11. To overload Binary plus operator to add two complex numbers.
12. To create telephone directory using Single Inheritance.
13. To prepare a student's mark sheet using Multiple Inheritance.
14. To prepare pay slip of an employee using Hierarchical Inheritance.
15. To create a programmer class derived from employee class which itself is derived from person class using Multilevel Inheritance.
16. To create bank account for a customer using Multilevel Inheritance.
17. To prepare EB bill for a customer using Hybrid Inheritance.
18. To format the output using system defined manipulators.
19. To perform String manipulation (any three string operations) using function overloading.
20. To demonstrate the use of virtual functions.

Course Code 20UCSC11P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	M	L	M	L	L	-	L	-
CO2	H	H	H	M	H	M	L	-	L	-
CO3	H	M	H	M	M	M	M	M	M	L
CO4	H	L	H	M	M	L	M	M	M	M
CO5	H	H	H	M	H	H	M	H	M	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester I	**NUMERICAL METHODS**	Hours/Week: 4	
Allied Course 1		Credits: 4	
Course Code **20UCSA11**		Internal 25	External 75

Course Outcomes:

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

CO1: define the fundamental concepts in numerical methods. [K1]

CO2: explain appropriate numerical methods for solving problems in other disciplines. [K2]

CO3: solve differential equations and find the missing data using numerical methods. [K3]

CO4: apply numerical methods for obtaining the approximate solutions of algebraic, transcendental, simultaneous, and differential equations. [K3]

CO5: analyze the numerical solutions and solutions obtained by ordinary methods. [K4]

UNIT I

Algebraic and Transcendental Equations: Introduction-Errors in Numerical Computation-Iteration Method – Bisection Method – Regula Falsi Method–Newton- Raphson Method (12 Hours)

UNIT II

Simultaneous Equations: Introduction – Simultaneous Equations – Back Substitution –Gauss Elimination Method – Gauss – Jordan Elimination Method –Gauss – Seidel Iteration Method. (12 Hours)

UNIT III

Interpolation: Introduction - Newton's Interpolation Formulae – Central Difference Interpolation Formulae – Lagrange's Interpolation Formula – Inverse Interpolation. (12 Hours)

UNIT IV

Numerical Differentiation : Introduction –Derivatives using Newton's forward difference Formula, Derivatives using Newton's back ward difference Formula – Derivatives using central difference Formulae

Numerical Integration: Newton - Cote's Quadrature Formula – Trapezoidal Rule – Simpson's one thirdrule- Simpson's three eight rule (Omitting Weddle's rule, Romberg's method) (12 Hours)

UNIT V

Numerical Solutions of Ordinary Differential Equations: Introduction - Taylor's Series Method – Picard's Method – Euler's Method – Runge – Kutta Methods

(12 Hours)

TEXT BOOK

Arumugam.S and Thangapandi Isaac.A. (2006). *Numerical Methods*, 2nd Edition, Chennai: SciTech Publications (India) Pvt.Ltd.

UNIT	CHAPTERS	SECTIONS
I	**3**	**3.0 - 3.5**
II	**4**	**4.1 - 4.4, 4.8**
III	**7**	**7.0 - 7.3, 7.6**
IV	**8**	**8.0 - 8.3, 8.5**
V	**10**	**10.0 - 10.4**

Course Code 20UCSA11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	H	H	H	-
CO2	H	M	H	H	H	L	-
CO3	H	M	H	H	H	H	-
CO4	H	H	H	H	H	L	-
CO5	H	H	H	H	H	M	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester I	**DTP LAB**	Hours/Week: 1 T + 1 P	
SEC 1 Practical I		Credits: 2	
Course Code **20UCSS11P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: list out various tools of Photoshop and CorelDraw. [K3]

CO2: write steps to apply various Photoshop tools, filters and effects. [K3]

CO3: show the skill of working with multiple layers in Photoshop and multiple pages in CorelDraw. [K3]

CO4: layout invitations, greeting cards, visiting cards, logos and pamphlets and prepare record. [K3]

CO5: identify the Photoshop and CorelDraw tools employed in a pamphlet. [K4]

Photoshop

1. Use of basic Photoshop Tools and Techniques.
2. Filters in Photoshop.
3. Create Rainbow, Rain Effects.
4. Animate the flame of a Candle.
5. Product Advertisement.

CorelDraw

1. Design a CD label.
2. Design a Visiting Card.
3. Design a Logo of a Company.
4. Design a Greeting Card.

Course Code 20UCSS11P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	M	M	M	-	-	M	-	L	-
CO2	H	M	M	M	-	-	M	-	-	-
CO3	H	H	H	M	-	-	M	-	L	-
CO4	H	M	H	M	-	M	M	M	L	L
CO5	H	H	H	M	-	M	M	M	-	M

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Semester I	**VALUE EDUCATION (2020 -21 onwards)**	Hours/Week: 2	
		Credits: 2	
Course Code **20UGVE11**		Internal 100	External -

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: describe the general human values and their associated values that are essential to make them committed and responsible individuals. [K1]

CO2: indicate the importance and benefits of upholding human values. [K2]

CO3: explain the steps to be taken for upholding human values and human rights. [K2]

CO4: practice the individual values needed for maintaining harmonious relationship with members of family, institution, organization or society for preserving and transmitting its tradition and culture. [K3]

CO5: uphold the legal, moral, ethical and spiritual values for nurturing health and happiness leading to national integrity and peace and for the existence of human beings with humanity. [K3]

Unit I Values of Life: An Introduction

Definition of Values - Significance of Values - Classification of Values - Need for Value Education.

Unit II Values for Individual Welfare

Honesty and Integrity - Punctuality - Positive Thinking - Commitment at the Workplace.

Unit III Values for Familial Welfare/Peace

Respect and Love for Elders - Truthfulness - Harmonious Relationship - Hospitality.

Unit IV Values for Social Welfare/Prosperity

Patriotism and Non-violence - Human rights - Women's rights .

Unit V Values for Spiritual Welfare/Well being

Faith in God - Meditation - Purity - Self Surrender.

TEXT BOOK

Maithili.B, Thilakam.C et al.(2014), *Value Education*, New Century Book House (P) Ltd., Chennai.

Course Code 20UGVE11	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	-	-	L	-	H
CO2	H	M	-	-	L	-	H
CO3	H	M	-	-	L	-	H
CO4	H	M	-	-	H	H	H
CO5	H	M	-	-	L	H	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester II	**DATA STRUCTURES**	Hours/Week: 5	
Core Course 2		Credits: 4	
Course Code **20UCSC21**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: define the data structures used to represent data in memory. [K1]

CO2: explain the linear and non-linear data structures as ADT. [K2]

CO3: apply operations specified in ADT of linear and non-linear data structures through algorithms. [K3]

CO4: use suitable data structures for solving problems. [K3]

CO5: analyse the data structures and their performance. [K4]

UNIT I

Pointers and Array-based Lists: The Pointer Data Type and Pointer variables: Declaring Pointer Variables - Address of Operator (&) - Dereferencing Operator (*) - Pointers and Classes - Initializing Pointer Variables - Dynamic Variables - Operator new - Operator delete - Operations on Pointer Variables - Dynamic Arrays – Array Name : A Constant Pointer - Functions and Pointers - Pointers and Function Return Values - Dynamic Two-Dimensional Arrays - Shallow Vs. Deep Copy and Pointers.

Array-Based Lists: Search - Insert - Remove - Time Complexity of List Operations.

(15 Hours)

UNIT II

Linked Lists: Some Properties - Item Insertion and Deletion - Building a Linked List - Linked List as an ADT - Structure of Linked List Nodes - Member Variables of the class linked List Type - Linked List Iterators - Default Constructor - Destroy the List - Initialize the List - Print the List - Length of a List - Retrieve the Data of the First Node - Retrieve the Data of the Last Node - Begin and End - Copy the List – Destructor.

Unordered Linked Lists: Search the List - Insert the First Node - Insert the Last Node. **Ordered Linked Lists:** Search the List - Insert a Node - Insert First and Insert Last - Delete a Node.

Definition of Doubly and Circular linked list (15 Hours)

UNIT III

Stacks: Implementation of Stacks as Arrays: Initialize Stack - Empty Stack - Full Stack - Push - Return the Top Element - Pop - Copy Stack - Constructor and Destructor.

Linked Implementation of Stacks: Default Constructor - Empty Stack and Full Stack - Initialize Stack – Push - Return the Top Element - Pop - Copy Stack - Constructors and Destructors.

(15 Hours)

UNIT IV

Recursion: Recursive Definitions: Direct and Indirect Recursion - Infinite Recursion- Problem Solving Using Recursion - Largest Element in an Array - Print a Linked List in Reverse Order - Fibonacci Number.

Queues: **Queue Operations:** Implementation of Queues as Arrays - Empty Queue and Full - Queue - Initialize Queue - Front - Back - Add Queue - Delete Queue - Constructors and Destructors.

Linked Implementation of Queues: Empty and Full Queue - Initialize Queue - addQueue, front, back, and deleteQueue Operations. (15 Hours)

UNIT V

Binary Trees: Binary Trees - Copy Tree - Binary Tree Traversal - Inorder Traversal - Preorder Traversal - Postorder Traversal - Implementing Binary Trees - Binary Search Trees - Search - Insert – Delete.

Graphs: Introduction - Graph Definitions and Notations - Graph Representation - Adjacency Matrices - Adjacency Lists - Operations on Graphs - Graphs as ADTs - Graph Traversals - Depth-First Traversal - Breadth-First Traversal. (15 Hours)

SELF-STUDY: (Not included for Examination)

Application of Stacks**:** Postfix Expressions Calculator - Removing Recursion: Non recursive Algorithm to Print a Linked List Backward - STL Class stack – Pages: 428 - 441

TEXT BOOK

D.S. Malik (2009), *Data Structures Using C++*, 2nd Edition, Cengage Learning, India.

UNIT	CHAPTERS	PAGES
I	**3**	**131 - 155, 170 - 194**
II	**5**	**265 - 310, 326**
III	**7**	**395 - 410, 415 - 427**
IV	**6**	**355 - 369**
	8	**451 - 472**
V	**11**	**599 - 626**
	12	**685 - 699**

REFERENCE BOOKS

1. ISRD Group (2011), *Data Structures through C++*, 1st Edition, McGraw-Hill Company.
2. John R.Hubbard (April 2000), *Data Structures with C++*, 2nd Edition, Schaum's Outline.
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, (June 2006), *Fundamentals of Data Structures in C++*, 2nd Edition, Silicon Press.

Course Code 20UCSC21	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	L	L	-	L	-	-	-	-	-
CO2	H	M	M	L	M	M	M	M	-	-
CO3	H	M	M	M	M	M	M	M	-	-
CO4	H	M	M	M	M	H	M	M	-	-
CO5	H	M	M	M	M	H	M	M	-	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester II	**DATA STRUCTURES USING C++ LAB**	Hours/Week: 5	
Core Course Practical II		Credits: 3	
Course Code **20UCSC21P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1 : illustrate linear and non-linear data structures. [K3]

CO2 : implement operations like search, merge, insertion and deletion on various data structures. [K3]

CO3 : execute programs using data structures to solve real life problems. [K3]

CO4 : prepare record with formatted outputs. [K3]

CO5 : analyse performance of array and linked list representations of data structures. [K4]

Write C++ programs for the following

1. To perform insertion and deletion operation in the given one dimensional dynamic array.
2. To search an element in the given one dimensional dynamic array using Binary search.
3. To change the sign of node values in a singly Linked list.
4. To count number of odd and even values in a singly linked list.
5. To perform the insertion operation in a singly Linked list.
6. To perform the deletion operation in a singly Linked list.

7. To perform search operation in a singly linked list.

8. For merging two singly linked lists.

9. To reverse the given singly linked list – using Recursion.

10. To perform push and pop operations in a stack – (represent stack as array).

11. To perform push and pop operations in a stack – (represent stack as linked list).

12. To perform push and pop operations in a queue – (represent queue as array).

13. To perform push and pop operations in a queue – (represent queue as linked list).

14. To traverse a binary search tree – (Inorder , Preorder, Postorder).

15. To count number of leaf nodes in the given binary search tree.

Course Code 20UCSC21P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	L	M	M	M	M	M	M	M	-
CO2	H	H	M	M	M	M	M	M	M	L
CO3	H	H	M	M	M	M	M	M	M	L
CO4	L	L	H	-	-	-	L	-	-	-
CO5	H	H	M	M	H	H	M	M	M	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester II	**PROBABILITY AND STATISTICS**	Hours/Week: 4	
Allied Course 2		Credits: 4	
Course Code **20UCSA21**		Internal 25	External 75

COURSE OUTCOMES

On completion of this course, students will be able to

CO1: define the basic concepts in Probability and Statistics. [K1]

CO2: explain the statistical tools used in data analysis. [K2]

CO3: calculate some statistical constants to get statistical inference. [K3]

CO4: apply the statistical methods to solve real life problems. [K3]

CO5: analyze the statistical data to draw conclusion in Probabilities, Correlation, Regression and in testing of hypothesis. [K4]

UNIT I

Skewness, Moments &Kurtosis: Introduction, Skewness Defined, Tests of Skewness, Measures of Skewness, Moments, Kurtosis. (12 Hours)

UNIT II

Correlation Analysis: Types of Correlation, Methods of Studying Correlation, Karl Pearson's coefficient of correlation, Interpreting Coefficient of Correlation, Coefficient of Correlation and Probable Error, Rank Correlation.

Regression Analysis: Regression Lines, Regression Equations, Deviation taken from Arithmetic Means of X and Y- Deviation taken from Assumed Means (Except Graphing Regression Lines) (12 Hours)

UNIT III

Probability& Expected Value: Calculation of Probability, Theorems of Probability, Conditional Probability, Bayes Theorem, Mathematical Expectation. (12 Hours)

UNIT IV

tatistical Inference–Tests of Hypotheses: Student's, t-Distribution-Properties of t-Distribution-The t-Table– Application of the t-Distribution. (12 Hours)

UNIT V

Chi–Square Test and Goodness of Fit: The Chi-Square Distribution – Constants of Chi-Square Distribution- the Chi-Square test-when the degrees of freedom Exceed 30-Grouping When Individual Frequencies are Small- Uses of Chi-Square Test.

(12 Hours)

TEXT BOOK

Gupta. S.P. (2004). *Statistical Methods*, 32nd Revised Edition, Sultan Chand and Sons.

UNIT	VOLUME	CHAPTER	PAGES
I	**I**	**9**	**330 - 370 (Up to Problem No: 40)**
II	**I**	**10**	**381 - 394 (Up to Problem No: 11)**
			399 - 411 (Up to Problem No: 22)
	I	**11**	**439 – 451**
III	**II**	**1**	**759 - 792 (Up to Problem No: 59)**
IV	**II**	**3**	**911 - 926 (Up to Problem No: 45)**
V	**II**	**4**	**957 - 992 (Up to Problem No: 40)**

Course Code 20UCSA21	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	H	H	H	L	-
CO2	H	H	H	H	H	L	-
CO3	H	H	H	H	H	L	-
CO4	H	M	H	H	H	H	-
CO5	H	M	H	M	H	H	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester II	**DIGITAL PRINCIPLES**	Hours/Week: 2	
SEC 2		Credits: 2	
Course Code **20UCSS21**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: review the various number systems, digital circuits, logic gates, Boolean laws and theorems. [K1]

CO2: discuss the functioning of gates, combinational logic circuits, data processing circuits, arithmetic circuits, Flip Flops, Registers, Counters and number systems. [K2]

CO3: demonstrate various digital circuits and number conversions. [K3]

CO4: apply Boolean laws and Karnaugh Map for simplification of Boolean expressions. [K3]

CO5: explore different digital circuits. [K4]

UNIT I

Number Systems and Codes: Binary Number System – Binary-to-Decimal Conversion – Decimal-to-Binary Conversion – Octal Numbers – Hexadecimal Numbers

Digital Logic: The Basic Gates – NOT, OR, AND Gates – Universal Logic Gates – NOR, NAND – AND–OR–Invert Gates. (6 Hours)

UNIT II

Combinational Logic Circuits: Boolean Laws and Theorems – Sum-of-Products Method – Truth Table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh Simplifications – Don't Care Conditions - Product-of-sums Method – Product-of-sums Simplifications. (6 Hours)

UNIT III

Data Processing Circuits: Multiplexers– Demultiplexers – 1-of-16 Decoders – BCD-to-decimal Decoders –Encoders – Exclusive-OR gates.

Arithmetic Circuits: Binary Addition – Binary Subtraction - 2's Complement Representation-2's Complement Arithmetic – Arithmetic Building Blocks.

(6 Hours)

UNIT IV

Flip-Flops: RS Flip-Flops– Basic Idea – NOR-Gate Latch - Gated Flip-Flops – Edge-triggered RS Flip-Flops – Edge-triggered D Flip-Flops – Edge-triggered JK Flip-Flops - JK Master-Slave Flip-Flops.

(6 Hours)

UNIT V

Registers: Types of Registers – Serial In-Serial Out – Serial In-Parallel Out – Parallel In-Serial Out – Parallel In-Parallel Out.

Counters: Asynchronous Counters – Synchronous Counters- Mod-8 binary counter with parallel clock input – Synchronous 4–bit up-down counter. (6 Hours)

SELF-STUDY: (Not included for examination)

The ASCII Code - The Excess 3 Code - The Gray Code – Pages: 190 - 194

TEXT BOOK

Albert Paul Malvino, Donald P.Leach & GoutamSaha (2011), *Digital Principles and Applications,* 7th Edition, Tata McGraw-Hill, New Delhi.

UNIT	CHAPTER	SECTIONS
I	**5**	**5.1 - 5.5**
	2	**2.1 - 2.3**
II	**3**	**3.1 – 3.8**
III	**4**	**4.1 - 4.4, 4.6 - 4.7**
	6	**6.1 - 6.2, 6.5 - 6.7**
IV	**8**	**8.1 - 8.5, 8.8**
V	**9**	**9.1 - 9.5**
	10	**10.1, 10.3**

REFERENCE BOOKS

1. Raj Kamal (2012), *Digital Systems: Principles and Design,* Pearson Education India.
2. John F. Wakerly (2007), *Digital Design Principles and Practices,* 4th Edition, Pearson Education.
3. Morris Mano M., Michael D. Ciletti (2008), *Digital Design,* 4th Edition, Pearson Education.

Course Code 20UCSS21	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	H	-	-	-	H	M	-	-
CO2	H	-	H	-	-	-	H	M	-	-
CO3	H	-	H	H	L	-	H	M	-	-
CO4	H	-	H	-	L	M	H	M	-	-
CO5	H	-	M	-	-	H	H	H	-	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester II	**WEB DESIGN LAB**	Hours/Week: 1 T + 1P	
SEC 3 Practical II		Credits: 2	
Course Code **20UCSS21P**		Internal 40	External 60

COURSE OUTCOMES
On completion of the course, the students will be able to

CO1: write programs using various HTML elements. [K3]
CO2: write programs using different types of CSS stylesheets. [K3]
CO3: demonstrate appropriate transition and animation effects on objects in web page. [K3]
CO4: create forms in a neat format and prepare record with outputs of different programs. [K3]
CO5: plan simple unique personal and business web pages using HTML and CSS. [K4]

With Dreamweaver, write HTML Programs

1. To display class time table.
2. To display calendar for the current year.
3. To display department details with a background image in header and navigate using buttons.
4. To design application form.
5. To embed image, audio and video in a HTML page.
6. To design a website with 5 pages and navigate using tabs.

CSS Exercises

1. Demonstrate the use of various selectors.
2. Demonstrate the use of transforms.
3. Demonstrate the use of animation.
4. Demonstrate the use of gradient.

5. Design a table using CSS.
6. Design a web page using Grid.
7. Design web pages using inline style sheet.
8. Design web pages using internal style sheet.
9. Design web pages using external style sheet.

Course Code 20UCSS21P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	M	-	-	M	-	M	L	-	-
CO2	M	M	M	M	H	-	H	L	-	-
CO3	H	H	M	-	L	M	M	M	L	-
CO4	H	H	M	M	H	M	M	H	-	-
CO5	H	H	M	M	H	H	H	H	M	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester III	**PROGRAMMING WITH JAVA**	Hours/Week: 4	
Core Course 3		Credits: 4	
Course Code **20UCSC31**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe data types, operators, expressions, control statements and object oriented paradigm. [K1]

CO2: infer user-defined packages, interface, applet, multi-threads and exceptions. [K2]

CO3: demonstrate arrays, strings, vectors, polymorphism, user-defined packages, interface, multi-threads and applets. [K3]

CO4: differentiate applets from Java console applications, built-in exceptions and user defined exceptions. [K4]

CO5: assess various types of exceptions and use of object oriented paradigm. [K5]

UNIT I

Overview of Java Language: Introduction - Simple Java program - More of Java - An Application with two classes - Java Program Structure - Java Tokens - Java Statements - Implementing a Java Program - Java Virtual Machine - Command Line Arguments.

Constants, Variables and Data Types: Introduction - Constants - Variables - Data Types - Declaration of Variables - Giving Values to Variables - Scope of Variables- Symbolic Constants - Type Casting - Getting Values of Variables - Standard Default Values.

Operators and Expressions: Introduction - Arithmetic Operators - Relational Operators -Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators - Special Operators - Arithmetic Expressions- Evaluation of Expressions - Precedence of Arithmetic Operators - Type Conversion in

Expressions - Operator Precedence and Associativity - Mathematical Functions.

(12 Hours)

UNIT II

Decision Making and Branching: Introduction - Decision Making with If Statement -Simple If Statement - The If…Else Statement - Nesting of If…Else Statements - The Else If Ladder - The Switch Statement -The ?: Operator.

Decision Making and Looping: Introduction - while Statement - do Statement - for statement - Jumps in Loops - Labeled Loops.

Classes, Objects and Methods: Introduction - Defining a Class - Fields Declaration -Methods Declaration- Creating Objects - Accessing Class Members - Constructors - Method Overloading - Static Members - Nesting of Methods - **Inheritance:** Extending a Class.

(10 Hours)

UNIT III

Arrays, Strings and Vectors: Introduction - One-dimensional Arrays - Creating an Array - Two-dimensional Arrays - Strings - Vectors - Enumerated types.

Interfaces: Multiple Inheritance: Introduction - Defining Interfaces - Extending Interfaces -Implementing Interfaces - Accessing Interface Variables.

Packages: Putting Classes Together: Introduction - Java API Packages - Using System Packages - Naming Conventions - Creating Packages - Accessing a Package - Using a Package - Adding a Class to a Package. (12 Hours)

UNIT IV

Multithreaded Programming: Introduction - Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Thread Exceptions.

Managing Errors and Exceptions: Introduction - Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using finally Statement - Throwing Our Own Exceptions. (14 Hours)

UNIT V

Applet Programming: Introduction - How Applets differ from Applications – Preparing to write Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet - Designing a Webpage - Applet Tag - Adding Applet to HTML File - Running the Applet. (12 Hours)

SELF-STUDY: (Not included for Examination)

Java Evolution – Pages: 10 - 21

TEXT BOOK

E.Balagurusamy (2015), *Programming with Java - A Primer,* 5th Edition, McGraw Hill Company, India.

UNIT	CHAPTER	SECTIONS
I	**3**	**3.1 - 3.7, 3.9 -3.11**
	4	
	5	
II	**6,7**	
	8	**8.1 - 8.11**
III	**9**	**9.1 - 9.6, 9.8**
	10	
	11	**11.1 - 11.8**
IV	**12**	**12.1 - 12.7**
	13	**13.1 - 13.7**
V	**14**	**14.1 - 14.10**

REFERENCE BOOKS

1. Debasish Jana (2008), *Java and Object-Oriented Programming Paradigm*, Prentice Hall of India Private Limited, New Delhi.
2. Patrick Naughton, Herbert Schildt (2006), *The Complete Reference Java 2*, 5th Edition, McGraw Hill, India.
3. Dr. Somasundaram (2013), *Introduction to Java Programming,* 1st Edition, Jaico Publishing House, India.

Course Code 20UCSC31	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	M	L	M	M	M	-	-
CO2	H	H	L	H	M	H	H	H	-	-
CO3	H	H	M	H	M	H	H	H	-	-
CO4	H	H	L	H	H	H	H	H	-	M
CO5	H	H	L	H	H	H	M	H	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester III	**COMPUTER ORGANIZATION**	Hours/Week: 4	
Core Course 4		Credits: 3	
Course Code **20UCSC32**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: observe the basic components and architecture of computing systems. [K1]

CO2: explain the functionality of Central Processing, Control, Memory and Input/Output units. [K2]

CO3: examine the arithmetic algorithms using different data representations. [K3]

CO4: compare the various types of Input/Output, Memory and Multiprocessor systems. [K4]

CO5: appraise the recent computer systems in terms of speed, technology, cost and performance. [K5]

UNIT I

Basic Computer Organization and Design: Instruction Codes – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle. (12 Hours)

UNIT II

Microprogrammed Control: Control Memory – Address Sequencing.

Central Processing Unit - General Register Organization – Stack Organization – Instruction Formats. (12 Hours)

UNIT III

Central Processing Unit: Addressing Modes – Data Transfer and Manipulation - Program Control.

Computer Arithmetic: Introduction – Addition and Subtraction - Multiplication Algorithms. (12 Hours)

UNIT IV

Input-Output Organization: Input-Output Interface – Asynchronous Data Transfer – Modes of Transfer – Priority Interrupt – Direct Memory Access. (12 Hours)

UNIT V

Memory Organization: Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory.

Multiprocessors: Characteristics of Multiprocessors – Interconnection Structures – Time-Shared Common Bus – Multiport Memory – Crossbar Switch – Hypercube Interconnection. (12 Hours)

SELF-STUDY: (Not included for Examination)

Memory Management Hardware – Pages: 476 - 482

TEXT BOOK

M. Morris Mano (2003), *Computer System Architecture*, 3rd Edition, Prentice Hall of India., India.

UNIT	CHAPTER	SECTIONS
I	**5**	**5.1 - 5.5**
II	**7**	**7.1, 7.2**
	8	**8.2 - 8.4**
III	**8**	**8.5 - 8.7**
	10	**10.1 - 10.3**
IV	**11**	**11.2 - 11.6**
V	**12**	**12.1- 12.6**
	13	**13.1, 13.2 (Excluding Multistage Switching Network)**

REFERENCE BOOKS

1. V.Carl Hamacher, Zronko G Vranesic, S, Softwat G. Zaky (2014), *Computer Organization*, 5th Edition, McGraw Hill International Standard Edition, New York, USA.
2. William Stallings (2016), *Computer Organization and Architecture Designing for Performance,* 10th Edition, Pearson Education, India.

3. Mostafa Abd-El-Barr, Hesham El-Rewini (2005), *Fundamentals of Computer Organization and Architecture,* A John Wiley & Sons, Inc Publication, New Jersey, Canada.

Course Code 20UCSC32	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	L	L	-	L	H	M	-	-
CO2	H	-	M	M	L	L	M	M	-	-
CO3	H	M	L	L	L	L	M	M	-	-
CO4	H	L	M	M	L	M	M	M	-	L
CO5	H	L	L	M	M	H	L	H	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester III	**PROGRAMMING USING JAVA LAB**	Hours/Week: 4	
Core Course Practical III		Credits: 2	
Course Code **20UCSC31P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: implement control structures, arrays, strings, functions, inheritance, interface and threads in Java programs. [K3]

CO2: write Java programs using built-in functions and exceptions. [K3]

CO3: execute Java programs for various inputs. [K3]

CO4: prepare record with Java programs using basic object oriented programming concepts, user-defined packages, multi-threads and exception concepts. [K3]

CO5: examine implementation of simple graphical methods using Java applets. [K4]

Write Java programs for the following

1. To display default value of all primitive data types of Java.
2. To reverse the digits of the given number and check whether the given number is palindrome or not.
3. To check if the number is perfect, weird or abundant number.
4. To print the Pascal triangle.
5. To count odd and even numbers in the given array of numbers.
6. To transpose the given matrix.
7. To calculate volume of three shapes implementing Method Overloading concept.
8. To perform the following string operations using String Class
   i. Convert Upper Case String to Lower Case.
   ii. Convert Lower Case String to Upper Case.
9. To perform the following string operations using String Class

i. Concatenation of two strings.

ii. Comparison of two strings.

10. To prepare student mark sheet using Single Inheritance concept.
11. To prepare an EB bill of a customer using Multilevel Inheritance concept.
12. To prepare a pay bill of an employee using Interface concept.
13. To perform number checking (Prime & Perfect) using package (Single package & single class file).
14. To perform number checking (positive/negative/zero & even/odd) using package (Single package & two separate class files).
15. To perform number checking (Prime &Perfect) using two packages.
16. To generate odd, even numbers and factorial of integers using thread.
17. To generate prime, perfect and Fibonacci series using Runnable Interface.
18. To throw NumberFormatException & ArithmeticException.
19. To Throw User defined Exception Negative Factorial is not possible.
20. Write an Applet program to draw a Night Lamp in the AppletViewer Screen.
21. To draw our national flag in the AppletViewer screen.

Course Code 20UCSC31P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	M	M	M	H	L	L	L	-	-
CO2	H	M	H	M	H	M	L	M	-	L
CO3	H	M	H	M	M	M	M	M	M	-
CO4	H	M	H	L	M	M	L	M	-	-
CO5	H	H	H	M	H	M	H	H	M	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester III	**RESOURCE MANAGEMENT TECHNIQUES**	Hours/Week: 4	
Allied Course 3		Credits: 4	
Course Code **20UCSA31**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: define the basic concepts in transportation, queuing theory, inventory control and network routing problems. [K1]

CO2: explain various methodologies involved in resource management techniques. [K2]

CO3: apply the acquired skills to formulate the problems in real life situations. [K3]

CO4: solve the problems in transportation, inventory control, queuing model and network scheduling in various domains. [K3]

CO5: analyze the solutions to various problems using optimization techniques. [K4]

UNIT I

Transportation Problem : Introduction–LP Formulation of the Transportation Problem – Existence of Solution in T. P–The Transportation Table–Loops in Transportation Table–Solution of a Transportation Problem–Finding an Initial Basic Feasible Solution–Test for Optimality –Degeneracy in Transportation Problem–Transportation Algorithm (MODI Method) –Some Exceptional Cases.

(12 Hours)

UNIT II

Inventory Control –I: Introduction–Types of Inventories – Reasons for Carrying Inventories –The Inventory Decisions–Objectives of Scientific Inventory Control - Costs Associated with Inventories–Factors Affecting Inventory Control–An Inventory Control Problem–The Concept of EOQ–Deterministic Inventory Problems with No Shortages.

(12 Hours)

UNIT III

Queueing Theory: Introduction – Queueing System –Elements of a Queueing System – Operating Characteristics of a Queueing System–Deterministic Queueing System– Probability Distributions in Queueing Systems–Classification of Queueing Models– Definition of Transient and Steady States–Poisson QueueingSystem (Model Iand Model III).

(12 Hours)

UNIT IV

Network Routing Problems: Minimal Spanning Tree Problem–Some Applications of the Minimal Spanning Tree Problem–Minimal Spanning Tree Algorithm–Shortest Route Problem–The Dijkstra's Shortest Path Algorithm.

(12 Hours)

UNIT V

Network Scheduling by PERT / CPM : Introduction – Network: Basic Components – Logical Sequencing – Rules of Network Construction – Critical Path Analysis.

(12 Hours)

TEXT BOOK

KantiSwarup, Gupta. P. K, ManMohan. (Reprint 2011). *Operations Research*, Sultan Chand & Sons.

UNIT	CHAPTER	SECTIONS
I	**10**	**10. 1 - 10. 3, 10. 5, 10. 6, 10. 8 - 10. 10, 10. 12, 10. 13, 10. 15**
II	**19**	**19. 1 – 19. 10**
III	**21**	**21. 1 – 21 .9 (Models I and III only)**
IV	**24**	**24. 3, 24. 3. 1, 24. 3. 2, 24. 4, 24. 4. 1**
V	**25**	**25. 1 – 25. 4, 25. 6**

Course Code 20UCSA31	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	H	M	L	H	M	L	-
CO2	H	M	-	H	M	L	-
CO3	H	M	L	H	M	L	-
CO4	H	M	L	H	M	L	-
CO5	H	M	L	H	M	L	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester IV	**WEB PROGRAMMING**	Hours/Week: 4	
Core Course 5		Credits: 4	
Course Code **20UCSC41**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize fundamentals of Internet, JavaScript, XML, Ajax and PHP. [K1]

CO2: infer Java Script, XML, Ajax programming concepts and PHP scripts to handle HTML Forms. [K2]

CO3: implement programs using HTML, JavaScript, Ajax and PHP. [K3]

CO4: examine interaction between HTML, JavaScript, Ajax and PHP. [K4]

CO5: assess various functionalities of JavaScript, XML, Ajax and PHP. [K5]

UNIT I

Introduction to Computers and the Internet – Introduction - The Internet in Industry and Research - HTML5, CSS3, JavaScript, Canvas and jQuery – Demos - Evolution of the Internet and World Wide Web - Web Basics - Multitier Application Architecture - Client-Side Scripting versus Server-Side Scripting - World Wide Web Consortium (W3C) - Web 2.0: Going Social Data Hierarchy - Operating Systems - Desktop and Notebook Operating Systems - Mobile Operating Systems.

JavaScript: Introduction to Scripting – Introduction - Your First Script - Modifying Your First Script - Obtaining User Input with prompt Dialogs - Memory Concepts – Arithmetic - Decision Making: Equality and Relational Operators.

(10 Hours)

UNIT II

JavaScript: Control Statements I – Introduction – Algorithms - Control Statements- if Selection Statement - if…else Selection Statement -while Repetition Statement - Formulating Algorithms: Counter-Controlled Repetition- Formulating Algorithms: Sentinel-Controlled Repetition - Formulating Algorithms: Nested Control Statements - Assignment Operators - Increment and Decrement Operators.

JavaScript: Control Statements II – Introduction - Essentials of Counter-Controlled – Repetition for Repetition Statement Examples Using the for Statement - switch Multiple-Selection Statement do…while Repetition Statement break and continue Statements Logical Operators. (10 Hours)

UNIT III

JavaScript : Functions - Introduction - Program Modules in JavaScript - Function Definitions - Programmer-Defined Function *square* - Programmer-Defined Function *maximum* - Random Number Generation- Scaling and Shifting Random Numbers - Scope Rules -JavaScript Global Functions - Recursion - Recursion vs. Iteration.

JavaScript: Arrays - Introduction – Arrays - Declaring and Allocating Arrays - Examples Using Arrays - Creating, Initializing and Growing Arrays.

JavaScript: Objects –Introduction - Math Object- String Object – Date Object - document Object. (12 Hours)

UNIT IV

XML: Introduction – XML Basics – Structuring Data – XML Namespaces – Document Type Definitions (DTDs) – W3C XML Schema Documents – XML Vocabularies: MathML™ – Other Markup Languages – Extensible Stylesheet Language and XSL Transformations – Document Object Model (DOM) – Web Resources.

Ajax – Enabled Rich Internet Applications with XML and JSON: Introduction – Rich Internet Applications (RIAs) with Ajax – History of Ajax – "Raw" Ajax Example using the XMLHttpRequest Object – Using XML and the DOM – Creating a Full-Scale Ajax-Enabled Application. (16 Hours)

UNIT V

PHP – Introduction - Simple PHP Program - Converting Between Data Types - Arithmetic Operators - Initializing and Manipulating Arrays - String Comparisons - Using PHP to Process HTML5 Forms. (12 Hours)

SELF-STUDY: (Not included for Examination)

SQL – Pages: 655 - 664

TEXT BOOK

Paul Deitel, Harvey Deitel, Abbey Deitel (2018), *Internet and World Wide Web – How to Program,* 5th Edition, Pearson India Education, India.

UNIT	CHAPTER	SECTIONS
I	**1**	**1.1 - 1.12**
	6	**6.1 - 6.7**
II	**7**	**7.1 - 7.2, 7.4 - 7.12**
	8	**8.1 - 8.8**
III	**9**	**9.1 - 9.3, 9.5.1, 9.7 - 9.10**
	10	**10.1 - 10.4.1**
	11	**11.1 - 11.4, 11.6**
IV	**15**	**15.1 - 15.10**
	16	**16.1 - 16.6**
V	**19**	**19.1 - 19.6, 19.8.2**

Course Code 20UCSC41	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	M	-	L	M	-	M	M	-	-
CO2	H	H	M	M	M	L	M	M	-	-
CO3	H	H	M	M	H	L	M	M	-	-
CO4	H	H	M	M	H	M	M	M	-	-
CO5	H	H	M	M	H	M	M	M	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester IV	**WEB PROGRAMMING LAB**	Hours/Week: 4	
Core Course Practical IV		Credits: 2	
Course Code **20UCSC41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write JavaScript programs using conditional statements, looping statements, built-in objects, functions and control structures. [K3]

CO2: develop interactive JavaScript programs and database manipulation programs using PHP and MySQL. [K3]

CO3: enter and execute JavaScript, PHP and MySQL programs. [K3]

CO4: prepare output of interactive JavaScript programs and database manipulations. [K3]

CO5: plan dynamic webpages using HTML and JavaScript. [K4]

Write JavaScript Programs for the following

1. Usage of Arithmetic operators and Alert box.
2. Get input from the user and perform number manipulation.
3. Display Greeting depending on time - if statement.
4. Display Grade for 10 students - while statement.
5. Calculate average of floating point values in an array - for statement.
6. Calculate sum of even and odd elements of an array - for statement.
7. Demonstrate three different CSS list formats using switch statement.
8. Display each of the six different HTML 5 Heading types with do…while statement.
9. Get five numbers between 1 and 30. For each number, output a line with the number and that number of adjacent asterisks in the same line.

10. Using function, calculate the distance between the two points and slope of the line formed by those points. Get the co-ordinates of points from a HTML Form.
11. Using function, find the maximum of three numbers. Get the numbers through HTML Form.
12. Using recursive function, calculate GCD of two positive integers.
13. Initialize arrays with initializer list.
14. Demonstrate the use of Math Object.
15. Show the use of Date Object.
16. Implement searching methods of String Object.
17. Create a table, insert rows, update and delete rows with MySQL.

Course Code 20UCSC41P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	H	M	H	M	L	L	-	-
CO2	H	H	M	M	H	H	M	M	L	L
CO3	H	M	M	-	H	H	L	M	-	-
CO4	H	M	H	-	-	-	L	L	-	-
CO5	H	H	M	M	H	H	M	M	M	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 -2021 onwards)

Semester IV	**QUANTITATIVE APTITUDE**	Hours/Week: 4	
Allied Course 4		Credits: 4	
Course Code **20UCSA41**		Internal 25	External 75

COURSE OUTCOMES

On completion of the course, students will be able to

CO1: define the basic concepts needed for arithmetic calculations. [K1]

CO2: explain various shortcut methods involved in aptitude problems. [K2]

CO3: apply the acquired computational skills in solving problems. [K3]

CO4: find solutions to various aptitude problems. [K3]

CO5: analyze problems using shortcut methods. [K4]

UNIT I

Numbers - HCF & LCM of numbers - Decimal fraction. (11 Hours)

UNIT II

Average - Problems on numbers - Problems on Ages. (11 Hours)

UNIT III

Percentage - Profit &loss- Ratio & Proportion. (12 Hours)

UNIT IV

Time &work - Time & Distance - Problems on Trains. (13 Hours)

UNIT V

Simple Interest - Compound Interest - Permutation & Combination. (13 Hours)

TEXT BOOK

Aggarwal.R.S.(Reprint 2008). S.Chand Publications, *Quantitative Aptitude for Competitive Examinations*, New Delhi: Seventh Revised Edition.

UNIT	PAGE NO. FOR SOLVED PROBLEMS	EXERCISE NO.	PROBLEMS
	1 - 9	**1**	**1 - 140**
I	**30 - 34**	**2**	**1 - 83**
	46 - 50	**3**	**1 - 119**
	139 - 141	**6A**	**1 - 25**
II	**161 - 163**	**7A**	**1 - 25**
	182 - 183	**8A**	**21 - 40**
	208 - 215	**10**	**194 - 203**
III	**251 - 256**	**11A**	**150 - 160**
	294 - 296	**12**	**1 - 40**
	341 - 344	**15A**	**21 - 40**
IV	**384 - 386**	**17**	**1 - 25**
	405 - 407	**18A**	**31 - 48**
	445 - 447	**21A**	**51 - 70**
V	**466 - 470**	**22A**	**21 - 41**
	613 - 615	**30**	**1 - 21**

Course Code 20UCSA41	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M	M	M	H	M	L	-
CO2	M	M	M	H	M	L	-
CO3	M	M	M	H	M	L	-
CO4	M	M	M	H	M	L	-
CO5	M	M	L	H	M	L	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester IV	**SOFTWARE ENGINEERING**	Hours/Week: 2	
SEC 4		Credits: 2	
Course Code **20UCSS41**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: describe the fundamental concepts of software engineering. [K1]

CO2: discuss the goals, user needs, project requirements, size, design, coding, testing and different models in the software development life cycle. [K2]

CO3: explore design, testing and management of software project. [K3]

CO4: apply Software Engineering design concepts and techniques for software project development. [K3]

CO5: compare software lifecycle model's extensions, design techniques, project estimation techniques. [K4]

UNIT I

Introduction: Evolution – Software Development Projects – Exploratory Style of Software – Emergence of Software Engineering.

Software Life Cycle Models: Few basic concepts – Waterfall Model and its Extensions.

(6 Hours)

UNIT II

Software Project Management: Software Project Management Complexities – Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO-A Heuristic Estimation Technique – Halstead's Software Science-An Analytical Technique – Staffing Level Estimation – Scheduling – Organisation and Team Structures – Staffing. (6 Hours)

UNIT III

Requirements Analysis and Specification: Requirements Gathering and Analysis – Software Requirements Specification – Formal System Specification. (6 Hours)

UNIT IV

Software Design: Overview of the Design Process –Characterization of a Good Software Design– Cohesion and Coupling – Layered Arrangement of Modules – Approaches to Software Design. (6 Hours)

UNIT V

Coding and Testing: Coding – Code Review – Software Documentation – Testing – Black-Box Testing – White-Box Testing – Debugging – Program Analysis Tools - Integration Testing. (6 Hours)

SELF-STUDY: (Not included for Examination)

Testing Object Oriented Programs, Smoke Testing – Pages: 432-439

TEXT BOOK

Rajib Mall(2014)**,** *Fundamentals of Software Engineering***,** 4th Edition, PHI Learning Private Ltd., India.

UNIT	CHAPTER	SECTIONS
I	**1,2**	**1.1 - 1.4, 2.1, 2.2**
II	**3**	**3.1 - 3.12**
III	**4**	**4.1 - 4.3**
IV	**5**	**5.1 - 5.5**
V	**10**	**10.1 - 10.10**

REFERENCE BOOKS

1. Jawadekar, *Software Engineering*, Tata McGraw-Hill book Company, 2004.
2. Roger S Pressman, *Software Engineering a Practitioner's Approach*, Tata McGraw-Hill book Company, 6th Edition, 2005.

Course Code 20UCSS41	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	M	-	-	-	L	L	-	-
CO2	H	-	H	L	M	M	L	M	-	-
CO3	H	-	H	M	M	M	L	M	-	-
CO4	H	M	M	M	H	H	M	M	-	H
CO5	H	-	M	M	H	H	M	M	-	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester IV	**PYTHON PROGRAMMING LAB**	Hours/Week: 1 T + 1P	
SEC 5 Practical IV		Credits: 2	
Course Code **20UCSS41P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write Python programs for various control structures of Python. [K3]

CO2: draw flow chart and write programs for various program structures of Python. [K3]

CO3: demonstrate data representation using List, Tuple and GUI applications in Python. [K3]

CO4: print formatted output for various data types of Python and draw the output for GUI applications. [K3]

CO5: explore the uses of Python programs. [K4]

Write Python Programs for the following

1. To check if the input number is odd or even.
2. To find the sum and mean of natural numbers up to n where n is provided by user - while.
3. To calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria:
    a. Grade A: Percentage >=80.
    b. Grade B: Percentage>=70 and <80.
    c. Grade C: Percentage>=60 and <70.
    d. Grade D: Percentage>=40 and <60.
    e. Grade E: Percentage<40.
4. To transpose a matrix using nested loop.

5. To implement following built-in string methods
   lower( ),upper ( ), isnumeric ( ), swapcase ( ).
6. To implement following built-in string methods
   find( ), encode( ), count( ), replace( ), index( ).
7. To perform different set operations similar to Mathematics using the operators - |, &, -, ^.
8. To manipulate list using following built-in methods
   len( ), add( ), update( ), remove( ).
9. To manipulate a set using following built-in methods
   difference( ), intersection( ), isdisjoint( ).
10. To manipulate a tuple using following keywords and built-in methods
    a. Keywords – in, del.
    b. Methods - len( ), index( ), count( ).
11. To manipulate a set using following built-in methods
    len( ), reverse( ), append( ), insert( ),sort( ).
12. To manipulate a dictionary using following keywords and built in methods
    a. Keywords : in, del.
    b. Methods : len( ), pop( ), clear( ), values( ).
13. To devise a simple calculator that can add, subtract, multiply and divide using functions.
14. Using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.

Write Visual Python Programs for the following

15. Menu-driven program to create 3D mathematical objects
    i. curve
    ii. sphere
    iii. cone
    iv. ring
    v. cylinder
16. To read n integers and display them as a histogram.
17. To display sine, cosine, polynomial and exponential curves.
18. To plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.

WEB REFERENCE:

http://www.glowscript.org/docs/GlowScriptDocs/index.html

Course Code 20UCSS41P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	L	M	M	M	L	L	-
CO2	H	H	M	L	M	M	M	L	L	-
CO3	H	H	M	M	M	M	H	M	L	-
CO4	H	H	M	L	L	L	L	L	L	-
CO5	H	H	H	H	H	H	M	H	H	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester V	**DATABASE MANAGEMENT SYSTEM CONCEPTS**	Hours/Week: 5	
Core Course 6		Credits: 5	
Course Code **20UCSC51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: identify the need, features, architecture and concepts of database systems, database models and database definition. [K1]

CO2: describe the principles of relational database design, transaction, concurrency control and recovery mechanism. [K2]

CO3: demonstrate database design using E-R model and normalization techniques, database operations using relational algebra and SQL. [K3]

CO4: examine the goodness of the database design using various Normal Forms, the effectiveness of various relational algebra operations using SQL and ACID properties of a transaction. [K4]

CO5: appraise the concepts of database management systems to solve any real database application. [K5]

UNIT I

Introduction: Database System Applications - Purpose of Database Systems - View of Data - Database Languages – Database Engine - Database and Application Architecture. **Introduction to the Relational Model:** Structure of Relational Databases - Database Schema – Keys – Schema Diagrams – Relational Query Languages – The Relational Algebra.

(14 Hours)

UNIT II

Introduction to SQL: Overview of the SQL Query Language – SQL Data Definition – Basic structure of SQL queries – Additional Basic Operations - Set Operations – NULL values – Aggregate Functions - Nested Subqueries – Modification of the Database.

(14 Hours)

UNIT III

Database Design Using the E-R Model: Overview of the design process - The Entity-Relationship Model – Complex Attributes - Mapping Cardinalities – Primary Key. **Relational Database Design:** Features of Good Relational Designs - Decomposition using Functional Dependencies – Normal Forms - Functional Dependency Theory - Atomic Domains and First Normal Form. (16 Hours)

UNIT IV

Transactions: Transaction Concept – A Simple Transaction Model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Transaction Isolation and Atomicity. **Concurrency Control:** Lock based Protocols – Deadlock Handling - Timestamp Based Protocols- Validation Based Protocol. (16 Hours)

UNIT V

Recovery System: Failure Classification - Storage - Recovery and Atomicity – Recovery Algorithm. **Database-System Architectures:** Centralized Database Systems – Server System Architectures – Parallel Systems – Distributed Systems. (15 Hours)

SELF-STUDY: (Not included for Examination)

Database users and administrators – Pages: 24, 25

TEXT BOOK

Abraham Silberschatz, Henry F. Korth, Sudarshan, S. (2020). *Database System Concepts*, 7th Edition, McGraw Hill Education Private Limited, India.

UNIT	CHAPTER	SECTIONS
I	**1**	**1.1-1.4, 1.6-1.7**
	2	**2.1-2.6**
II	**3**	**3.1-3.9**
III	**6**	**6.1-6.5**
	7	**7.1-7.4,7.8**
IV	**17**	**17.1-17.7**
	18	**18.1-18.2, 18.5-18.6**
V	**19**	**19.1 – 19.4**
	20	**20.2 - 20.5**

REFERENCE BOOKS

1. Dr. Rajiv Chopra (2016). *Database Management Systems (DBMS): A Practical Approach*, 5th Edition, S. Chand Publishing, India.

2. Ramez Elmasri, Shamkant B. Navathe (2016). *Fundamentals of Database Systems,* 7th Edition, Pearson Education Pvt. Ltd, India.

Course Code 20UCSC51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	L	H	L	L	L	M	M	L	-
CO2	M	H	H	L	M	M	M	H	L	-
CO3	H	H	M	M	H	M	H	M	L	-
CO4	H	M	M	M	L	H	H	H	M	-
CO5	H	H	M	H	H	H	H	H	M	L

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester V	**COMPUTER ALGORITHMS**	Hours/Week: 5	
Core Course 7		Credits: 5	
Course Code **20UCSC52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: discuss various algorithmic design techniques. [K1]

CO2: describe the concepts of asymptotic analysis of algorithms, Divide and Conquer, Greedy Approach, Dynamic Programming and Backtracking techniques. [K2]

CO3: solve the problems like sorting, searching, finding shortest paths, constructing Minimum Spanning Tree and n-Queens with suitable algorithms. [K3]

CO4: analyse the complexity of algorithms using asymptotic analysis and compare algorithms used in solving similar problems. [K4]

CO5: select an appropriate technique and procedure for solving a given problem in an efficient manner. [K5]

UNIT I

Algorithms: Efficiency, Analysis and Order: Algorithms – The Importance of Developing Efficient Algorithms: Sequential Search versus Binary Search – The Fibonacci Sequence –Analysis of Algorithms: Complexity Analysis – Order: An Intuitive Introduction to Order. (13 Hours)

UNIT II

Divide and Conquer: Introduction – Binary Search – Merge sort – The Divide-and-Conquer Approach – Quicksort (Partition Exchange Sort) – Arithmetic with Large Numbers. (14 Hours)

UNIT III

The Greedy Approach (Lemma and Theorems are not included): Introduction – Minimum Spanning Trees: Prim's Algorithm – Kruskal's Algorithm – Comparing Prim's Algorithm with Kruskal's Algorithm – Final Discussion – Dijkstra's Algorithm for Single Source Shortest Paths – Scheduling: Minimizing Total Time in the System – Scheduling with Deadlines – Huffman Code: Prefix Codes – Huffman's Algorithms. (16 Hours)

UNIT IV

Dynamic Programming: Introduction – The Binomial Coefficient – Floyd's Algorithm for Shortest Paths – Dynamic Programming and Optimization Problems – Optimal Binary Search Trees – The Travelling Salesperson Problem. (16 Hours)

UNIT V

Backtracking: Introduction – The Backtracking Technique – The n-Queens Problem – The Sum-of- Subsets Problem – Graph Coloring – The Hamiltonian Circuits Problem. (16 Hours)

SELF-STUDY: (Not included for Examination)

Chained Matrix Multiplication **(Pages: 107 - 116)**

TEXT BOOK

Richard Neapolitan & Kumarss Naimipour (2008). *Foundations of Algorithms Using C++ Pseudocode*. 3rd Edition. Jones and Bartlett Publishers, Inc, Sudbury, MA, United States.

UNIT	CHAPTER	SECTIONS
I	**1**	**1.1 – 1.2, 1.3.1, 1.4.1**
II	**2**	**2.1 - 2.4, 2.6**
III	**4**	**4.1 - 4.4**
IV	**3**	**3.1 - 3.3, 3.5, 3.6**
V	**5**	**5.1, 5.2, 5.4 - 5.6**

REFERENCE BOOKS

1. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran (2005). *Fundamentals of Computer Algorithms.* Galgotia Publications, India.
2. Clifford Stein, Thomas H. Cormen, Charles E. Leiserson & Ronald L.Rivest (2006). *Introduction to Algorithms*. Prentice Hall, India.

Course Code 20UCSC52	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	M	-	M	M	-	-	M	-	-	-
CO2	M	L	H	H	-	-	H	-	-	-
CO3	H	H	H	H	H	-	H	L	L	-
CO4	H	H	H	H	H	H	H	-	-	-
CO5	H	H	-	-	L	H	M	-	-	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester V	**COMPUTER NETWORKS**	Hours/Week: 5	
Core Course 8		Credits: 5	
Course Code **20UCSC53**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe the Computer Network basics, architecture, functions and protocols of layers of ISO/OSI Reference Model. [K1]

CO2: discuss the architecture of Computer Network, design issues, services, applications and protocols of layers. [K2]

CO3: choose appropriate media for data transmission, routing algorithms, error handling methods and protocols for data transmission. [K3]

CO4: compare connectionless and connection oriented service, design issues, protocols and services of layers, routing algorithms and compression techniques. [K4]

CO5: evaluate error correction, error detection, framing methods, the importance of routing algorithms and domain name system. [K5]

UNIT I

Introduction: Uses of Computer Networks – Network Hardware – Network Software **Reference Models:** The OSI Reference Model – The TCP/IP Reference Model (14 Hours)

UNIT II

The Physical Layer: Guided Transmission Media – Wireless Transmission. **The Data Link Layer:** Data Link Layer Design Issues – Error Detection and Correction – Elementary Data Link Protocols - **Sliding Window Protocols**: A One-Bit Sliding Window Protocol. (16 Hours)

UNIT III

The Medium Access Control Sublayer: The Channel Allocation Problem- **Multiple Access Protocols:** ALOHA – Carrier Sense Multiple Access Protocols – Collision-Free Protocols. **The Network Layer:** Network Layer Design Issues – **Routing Algorithms:** The Optimality Principle – Shortest Path Routing – Flooding – Hierarchical Routing – Broadcast Routing. (14 Hours)

UNIT IV

The Transport Layer: The Transport Service: Services provided to the Upper Layers – Transport Service Primitives – Elements of Transport Protocols. **The Application layer:** DNS. (14 Hours)

UNIT V

The Application Layer: Electronic Mail: Architecture and Services – The User Agent – Message Transfer – Final Delivery - **The World Wide Web:** Architectural Overview- **Streaming Audio and Video:** Digital Audio – Audio Compression - Digital Video – Video Compression (JPEG Standard Only) – Streaming Live Media. (17 Hours)

SELF-STUDY: (Not included for Examination)

Cyber Law in India (Material will be provided)

TEXT BOOK

Andrew S.Tanenbaum & David J. Wetherall (2016). *Computer Networks*, 5th Edition, Pearson India Education Services Pvt. Ltd.

UNIT	CHAPTER	PAGES
I	**1**	**3- 48**
II	**2**	**95 – 116**
	3	**193 – 232**
III	**4**	**257 – 273**
	5	**355 – 370, 378 - 382**
IV	**6**	**495 – 500, 507 - 530**
	7	**611 – 623**
V	**7**	**623 –662, 697 – 709, 721- 724**

REFERENCE BOOKS

1. Forouzan (2003). *Data Communications and Networking*, 2nd Edition, Tata McGraw Hill.
2. William Stallings (2003). *Data and Computer Communications*, 8th Edition, Pearson Education.

Course Code 20UCSC53	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	M	L	M	-	L	-	M	-	-	-
CO2	H	L	M	L	L	M	M	M	-	-
CO3	H	L	M	L	M	M	M	M	-	-
CO4	H	M	M	L	M	H	M	M	-	-
CO5	H	M	M	L	M	H	M	M	-	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020-21 onwards)

Semester V	**DATABASE MANAGEMENT SYSTEMS LAB**	Hours/Week: 5	
Core Course Practical V		Credits: 2	
Course Code **20UCSC51P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write SQL statements to create and manipulate tables using DDL and DML and display using DQL statements. [K3]

CO2: write PL/SQL programs using functions, procedures, Exceptions, cursors and Triggers and user-interactive programs using any script language. [K3]

CO3: enter and execute programs for different database and interactive user inputs. [K3]

CO4: generate the results and prepare the output in the required format. [K3]

CO5: examine the results of database query statements in various environments such as Command prompt, admin window and user-interactive programs. [K4]

SQL

1. Create and manipulate the Employee pay details using DDL and DML commands.
2. Perform string operations using built-in function.
3. Manipulate students mark details using aggregate functions.
4. Apply nested queries on employee details.
5. Use group by having clause.

PL/SQL

6. Program using 7 string functions.
7. Program using 5 date functions.
8. Calculate the student grade using case statement.
9. Print the number of products whose price between 0 to Rs. 50, Rs. 51 to Rs. 100, Rs 101 to Rs. 150 and Rs. 151 to Rs. 200.
10. Handle user-defined Exception for Inventory details.
11. Use built-in exception for Bank details.
12. Update the Employee's salary using implicit cursor.
13. Find highest salary of an Employee using explicit cursor.
14. Calculate Simple and Compound Interest using function.
15. Generation of a trigger after every insertion and deletion.
16. Prepare EB-Bill using procedure**.**
17. Calculate Employee's netpay using package.

Forms and Report Generation using VB.Net

18. Design a Form for student database and generate report.
19. Design a Form for the employee details and generate report.
20. Create email account after validating personal details using validation control.
21. Display Department profile using Master page.

Course Code 20UCSC51P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	H	L	M	H	M	M	L	L	M
CO2	H	H	M	M	H	M	M	M	L	L
CO3	L	H	L	L	L	L	L	L	L	-
CO4	L	L	H	L	L	L	L	L	L	-
CO5	H	H	H	M	H	H	M	H	L	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester V	**INTRODUCTION TO MATLAB AND DIGITAL IMAGE PROCESSING**	Hours/Week: 4	
DSEC 1		Credits: 4	
Course Code **20UCSE51**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: outline the MATLAB window, multi-dimensional data, operators and control structures, handling of files, functions and image processing using MATLAB. [K1]

CO2: describe arrays, matrices, 2D plots, the representation and manipulation of images in MATLAB. [K2]

CO3: manipulate the data using scripts, built-in and user-defined functions and to improve the images using filtering techniques. [K3]

CO4: discriminate different types of plots and the outputs obtained from enhancement and edge-detection methods for colour and grey images. [K4]

CO5: determine the appropriate plot to visualize data and the methods to filter and enhance the image. [K5]

UNIT I

Starting with MATLAB: Starting MATLAB, MATLAB Windows – Working in the Command Window – Arithmetic Operations with scalars – Display formats – Elementary Math Built-in Functions – Defining scalar variables – Script files. **Creating Arrays:** Creating a One-Dimensional array – Creating a Two-Dimensional array – The transpose operator – Array addressing – Using a colon: In addressing arrays – Adding elements to existing variables – Deleting elements – Built-in functions for handling arrays – Strings and strings as variables - **Mathematical Operations with Arrays:** Addition and subtraction – Array

multiplication – Array division – Element-by-Element operations – Using arrays in MATLAB - Built-in Math functions – Built-in Functions for analysing arrays – Generation of Random Numbers. (12 Hours)

UNIT II

Using Script Files and Managing Data: The MATLAB Workspace and the Workspace Window – Input to a script file – Output Commands – The save and load commands – Importing and exporting data. **Two-Dimensional Plots:** The Plot command – The fplot command – Plotting multiple graphs in the same plot – Formatting a plot – Plots with Logarithmic axes – Plots with error bars – Plots with special graphics – Histograms – Polar plots – Plotting using the plots Toolstrip. (12 Hours)

UNIT III

Programming in MATLAB: Relational and logical operators – Conditional Statements – The Switch-case statement – Loops – Nested loops and nested conditional statements – The break and continue commands. **User-Defined Functions and Function Files:** Creating a function file – Structure of a function file – Local and Global variables – Saving a function file – Using a user-defined function – Examples of simple user-defined functions – Comparison between script files and function files – Anonymous functions – Function functions – Subfunctions – nested functions. (12 Hours)

UNIT IV

Representation: Image definition – Resolution and Quantization – Image formats – Colour spaces – Images in MATLAB - Formation**:** Image formation – The Mathematics of image formation – The Engineering of image formation. (12 Hours)

UNIT V

Pixels: Pixel definition – Operations upon pixels– Point-based operations on images– Pixel distributions: Histograms - **Enhancement:** Need for enhancement – Pixel neighbourhoods – Filter kernels and the mechanics of linear filtering – Filtering for noise removal – Filtering for Edge detection – Edge enhancement. (12 Hours)

SELF-STUDY: (Not included for Examination)

Two-Dimensional Plots: Putting multiple plots on the same page, Multiple figure windows (Text Book: 1, Section: 5.10, 5.11)

TEXT BOOKS

1. Amos Gilat (2017). *MATLAB An Introduction with Applications*, 6th Edition, Wiley.
2. Chris Solomon, Toby Breckon (2011). *Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab*, Wiley.

UNIT	TEXT BOOK	CHAPTER	SECTIONS
I	**1**	**1**	**1.1–1.6, 1.8**
		2	**2.1 – 2.2, 2.4 - 2.10**
		3	**3.1-3.7**
II	**1**	**4**	**4.1–4.5**
		5	**5.1– 5.9, 5.12**
III	**1**	**6**	**6.1 –6.6**
		7	**7.1 –7.11**
IV	**2**	**1**	**1.1 – 1.5**
		2	**2.1– 2.3**
V	**2**	**3**	**3.1–3.4**
		4	**4.1– 4.6**

REFERENCE BOOKS

1. Rudra Pratap (2001). *Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers*, Oxford University Press, New York.
2. Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, with Kevin R. Coombes, John E. Osborn, and Garrett J. Stuck (2014). *A Guide to MATLAB for Beginners and Experienced Users*, 3rd Edition, Cambridge University Press, New York.
3. Poornima Thangam I (2014). *Digital Image Processing*, Charulatha Publications, Chennai.
4. Rafael C. Gonzalez & Richard E. Woods (2018). *Digital Image Processing*, 4th Edition Pearson Education Limited.

Course Code 20UCSE51	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	M	L	L	M	L	L	M	-	-
CO2	H	H	L	M	M	M	L	H	-	-
CO3	H	M	M	H	H	H	M	H	-	-
CO4	H	H	M	H	H	H	M	H	L	L
CO5	H	L	L	H	H	H	M	H	L	L

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 21 onwards)

Semester V	**ASP.NET PROGRAMMING**	Hours/Week: 4	
DSEC 1		Credits: 4	
Course Code **20UCSE52**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe .NET framework, visual studio, web forms and controls, data access, data binding, XML concepts, Master page creation and Site Map. [K1]

CO2: discuss ASP.NET code behind web form, web controls and data controls, ADO Data access, Master page and Site Map. [K2]

CO3: determine the controls to be used, ADO.NET connection with SQL and method of accessing data in ASP.NET programs. [K3]

CO4: examine ASP.NET controls, interaction between ASP.NET and XML, SQL statements to create and manipulate the database. [K4]

CO5: choose appropriate validation controls, SQL statements and XML data file to build dynamic web applications. [K5]

UNIT I

Introduction to ASP.NET 2.0: A Little Bit of History –The Goals of ASP.NET 2.0 – Additional New Features of ASP.NET2.0 – New IDE for building ASP.NET 2.0 Pages.- **Visual Studio 2005:** The Document Window –The Toolbox –The Solution Explorer –The Server Explorer – The Properties Window – Lost Windows – Other Common Visual Studio Activities- **Changes to ASP.NET 1.0 Controls:** Label Server Control – Button, LinkButton, and ImageButton Server Controls – DropDownList, ListBox, CheckBoxList, and RadioButtonList Server Controls – ImageServer Control – Table Server Control – Literal

Server Control –AdRotator Server Control – Panel Server Control – Validation Server Controls. (12 Hours)

UNIT II

Application and Page Frameworks: Application Location Options –The ASP.NET Page Structure options – New Page Directives – New Page Events – Cross-Page Posting – New Application Folders – Compilation.- **New Ways to Handle Data:** The New Data Source Controls –The Data-Bound Server Controls –The SqlDataSource and Gridview Controls –The AccessDataSource and DetailsView Controls – XmlDataSource Control – ObjectDataSource Control – SiteMapDataSource Control – DataSetDataSource Control – Visual Studio 2005 – Connection Strings. (12 Hours)

UNIT III

Working with Data – Overview of ADO.NET: ADO.NET and data management-Characteristics of ADO.NET - ADO.NET object model.- **ADO.NET Data Access:** SQL Basics– Select, Update, Insert, Delete Statements- Accessing Data- Creating a Connection-Using a Command with a DataReader - Accessing Disconnected Data-Selecting Multiple Tables – Updating Disconnected Data. (12 Hours)

UNIT IV

Data Binding: Single-Value Data Binding – Repeated-Value Data Binding - Data Binding with Databases - **DataList, DataGrid, Repeater:** Data Binding with Multiple Templates, Comparing the Template Controls, Selecting Items, Editing Items.- **Using XML**: XML Classes – XML Validation – XML in ADO.NET (12 Hours)

UNIT V

Site Navigation: Site Maps – SiteMapPath Server Control – TreeView Server Control – Menu Server Control – SiteMap Data Provider – SiteMap API.- **Working with Master Pages:** Need for Master Pages –The Basics of Master Pages – Coding a Master Page – Coding a Content Page – Specifying Default Content in the Master Page – Nesting Master Pages – Container-Specific Master Pages – Event Ordering – Caching with Master Pages.
(12 Hours)

SELF-STUDY: (Not included for Examination)

Handling Exceptions (Text Book 2 - Pages: 314 - 320)

TEXT BOOKS

1. Bill Evjen (2004). *ASP.NET 2.0 Beta Preview*, WILEY Dreamtech India Pvt. Ltd., New Delhi.
2. Matthew MacDonald (2002). *The Complete Reference ASP.NET*, India: Tata McGraw Hill Education Private Limited, New Delhi.

UNIT	TEXT BOOK	CHAPTERS
I	**1**	**1,2,13**
II	**1**	**3,4**
III	**2**	**12,13**
IV	**2**	**14,15,17**
V	**1**	**5,6**

REFERENCE BOOKS

1. Matt J. Crouch (2002). *ASP.NET and VB.NET Web Programming*, Addison Wesley.
2. Dan Maharry, Dan Hurwitz, Jesse Liberty (2008). *Programming ASP.NET 3.5*, 4th Edition, O'Reilly Media, Inc.

Course Code 20UCSE52	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	H	M	-	-	M	-	-	-
CO2	H	M	M	H	-	-	H	-	-	-
CO3	H	H	M	H	L	-	H	M	L	H
CO4	H	H	M	H	M	H	H	M	-	-
CO5	M	L	-	-	L	H	M	L	-	-

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Virudhunagar - 626 001

B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester V	**MULTIMEDIA**	Hours/Week: 4	
DSEC 1		Credits: 4	
Course Code **20UCSE53**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: discuss building blocks of Multimedia. [K1]

CO2: describe the components of Multimedia, types of compression techniques and Multimedia authoring tools. [K2]

CO3: use appropriate tools for design, creation and development of Multimedia. [K3]

CO4: analyse the essential features of text, graphics, images, video, file formats and color models. [K4]

CO5: evaluate existing Multimedia projects based on media quality. [K5]

UNIT I

Multimedia : Definitions – Multimedia Applications - Delivering Multimedia. **Text:** About Fonts and Faces – Using Text in Multimedia – Computers and Text - Font Editing and Design Tools – Hypermedia and Hypertext. (11 Hours)

UNIT II

Images: Making Still Images – Color 89 - Image File Formats - **Sound:** Digital Audio **-** MIDI Audio - MIDI vs. Digital Audio - Multimedia System Sounds - Audio File Formats - Adding Sound to Your Multimedia Project. (13 Hours)

UNIT III

Video: Using Video – Working with Video and Display of Video - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video. **Making Multimedia:** The Stages of a Multimedia Project - Hardware - Software - Authoring Systems.

(12 Hours)

UNIT IV

Animation: Introduction – Historical Background – Uses of Animation – Traditional Animation – Principles of Animation – Computer -based Animation – Animation on the Web – 3D Animation – Rendering Algorithms – Animation File Formats – Animation Software.

(11 Hours)

UNIT V

Compression: Introduction – Basic Concepts – Image Compression - Audio Compression – Video Compression – MPEG Standards Overview (13 Hours)

SELF-STUDY (Not included for Examination):

Lossless Compression Techniques (Text Book 2 – Pages 432-441)

TEXT BOOKS

1. Tay Vaughan (2016). *Multimedia: Making It Work,* 9th Edition, McGraw Hill Education Private Limited, India.
2. Ranjan Parekh (2013). *Principles of Multimedia,* 2nd Edition, McGraw Hill Education Private Limited, India.

UNIT	TEXT BOOK	CHAPTER	PAGES
I	**1**	**1**	**1 – 14**
		2	**18 - 60**
II	**1**	**3**	**70 - 99**
		4	**108 - 135**
III	**1**	**6**	**166 - 190**
		7	**196 - 240**
IV	**2**	**7**	**399 – 426**
V	**2**	**8**	**428 – 429, 454 - 499**

REFERENCE BOOKS

1. Ze-Nian Li, Mark S.Drew (2013). *Fundamentals of Multimedia***,** Pearson Education International.
2. Ralf Steinmetz, Klara Nahrstedt (2011). *Multimedia: Computing, Communications & Applications,* Pearson Education.

Course Code 20UCSE53	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	M	M	M	M	M	L	-
CO2	H	H	L	M	M	H	M	M	L	-
CO3	H	H	M	M	M	M	H	H	L	L
CO4	H	H	H	M	H	H	H	H	M	M
CO5	H	H	H	H	H	H	H	H	H	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester V	**MATHEMATICAL APPLICATIONS LAB**	Hours/Week: 4	
DSEC 2 Practical I		Credits: 2	
Course Code **20UCSE51P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the formula, input and algorithm for the specified problem. [K3]

CO2: implement the algorithm in MATLAB. [K3]

CO3: enter and execute the MATLAB code with proper input. [K3]

CO4: record and generate the output in required format. [K3]

CO5: analyse the actual output with the expected output. [K4]

Write MATLAB code for the following

1. Generate numeric sequences.
2. Generate vector, matrices and diagonal matrices.
3. Generate frequency table.
4. Calculate minimum, maximum, mean, median and mode for the given set of data.
5. Calculate Euclidean distance for the given set of data.
6. Perform vector operations.
7. Perform various matrix operations.
8. Plot 2D and 3D graphs.
9. Plot multiple functions using plot and ezplot.
10. Plot logarithmic functions.
11. Overlay two Bar Graphs.

12. Plot the values of different trigonometric functions using subplots.
13. Analysis of Statistical Data using various tests.
14. Convert from one Image type to another.
15. Apply mask and hide the existing objects in an image.
16. Combine the objects from two or more images using Matrix operations.
17. Enhance the grey images using various filtering methods.
18. Extract edges from grey level images.
19. Obtain image histogram, stretch and shrink the histogram.
20. Sharpen the image using threshold.

Course Code 20UCSE51P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	M	H	H	H	L	L	L	L	L
CO2	H	H	M	M	H	L	L	M	-	L
CO3	M	H	L	-	L	-	-	-	-	-
CO4	L	-	-	-	-	-	-	-	-	-
CO5	H	M	L	H	L	M	-	L	L	L

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B.Sc. COMPUTER SCIENCE

(2020-21 onwards)

Semester V	**ASP.NET PROGRAMMING LAB**	Hours/Week:4	
DSEC 2 Practical I		Credits: 2	
Course Code **20UCSE52P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write the controls used in the ASP.NET programs with their property values. [K3]

CO2: design web applications using ASP.NET server controls and database. [K3]

CO3: enter and execute ASP.NET programs with appropriate tools. [K3]

CO4: publish web pages and prepare record with ASP.NET programs. [K3]

CO5: select the controls that suit an application and use them in web pages built with ASP.NET programs. [K4]

Write ASP.NET programs for the following

1. Change the Foreground color and Background color of the Textbox.
2. Generate Multiplication Table.
3. Display courses offered in our college using Bulleted List.
4. Use Calendar control.
5. Create online application without validation control.
6. Create an account registration form and perform the following validation:
    I. User name (Required Field Validator)
    II. Password
    III. Retype Password(Compare Validator)
    IV. Gender(Required Field Validator)
    V. Email-Id

VI. Date of Birth(Regular Expression Validator)

VII. Mobile(Regular Expression Validator)

7. Create and validate a Facebook account.
8. Read and display Book details from XML File.
9. Design e-tutorial.
10. Display Android Versions using Site Map.
11. Create a Master page with Site Navigation.
12. Display the country details in TreeView control from XML File.
13. Develop an ASP.NET application to implement data binding in data grid using ADO.Net.
14. Create Advertisements using AdRotator
15. Display Images using Image control.
16. Display students' details from the database (DataList Control).

Course Code 20UCSE52P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	H	M	M	M	-	H	M	H	-
CO2	H	H	M	M	M	-	H	H	H	-
CO3	H	H	H	M	M	-	M	H	H	-
CO4	H	H	H	M	M	-	M	H	H	-
CO5	H	H	H	M	H	H	L	H	M	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 2021 onwards)

Semester V	**MULTIMEDIA LAB**	Hours/Week: 4	
DSEC 2 Practical I		Credits: 2	
Course Code **20UCSE53P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: implement text and image effects in a multimedia project. [K3]

CO2: develop multimedia applications with audio, video and textual multimedia elements. [K3]

CO3: execute multimedia programs using ActionScript. [K3]

CO4: prepare record with procedures for designing multimedia applications. [K3]

CO5: examine the proper usage of components in multimedia programs. [K4]

Write Flash Programs for the following

Movie Creation:

1. Implement Text effects with Zooming, Rotating and Jumping.
2. Perform
   i) frame by frame animation
   ii) animation using guided path.
3. Perform bouncing ball on steps animation using Motion Tweening.
4. Create and animate a Globe using multilayer concept.
5. Create a wind mill object and animate using multilayer concept.
6. Perform count down animation using Shape Tweening.
7. Perform
   i) Image Morphing.
   ii) Text Morphing.
8. Create an animation to represent the growing moon.

9. Simulate movement of a cloud.
10. Draw the fan blades and give proper animation.
11. Design a Commercial advertisement banner.
12. Create Photo slides show.
13. To simulate a ball hitting another ball.
14. Design digital clock using Action Script.

Video making:

15. Develop an e–content for any topic of your course to promote on social media.
    (Note: Your e–content must have audio with narration)

Course Code 20UCSE53P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	M	M	M	M	M	L	-
CO2	H	H	L	M	M	H	M	M	L	-
CO3	H	H	M	M	M	M	H	H	L	L
CO4	H	H	H	M	H	H	H	H	M	M
CO5	H	H	H	H	H	H	H	H	H	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 21 onwards)

Semester V	**PROJECT**	0 Hour
Core Course 9		Credits: 1
Course Code **20UCSC5PR**		Internal : 100 Marks

COURSE OUTCOMES

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

CO1 : determine problem for the project by surveying variety of domains of Computer Science. [K3]

CO2 : perform requirement analysis and identify design methodologies based on the theoretical knowledge gained. [K3]

CO3 : apply advanced programming techniques to implement a solution for the problem. [K3]

CO4 : analyse the outcome of the project using suitable tools. [K4]

CO5 : assess the project work based on world of work and societal needs. [K5]

Students are expected to select a project in the field of Computer Science or related interdisciplinary fields. Two students can do one project. Minimum pages for project report should be 20. A copy of the project report will be submitted to the Controller of Examinations through the Head of the Department in the month of November during V semester. Evaluation will be done internally.

Project work & Report - 60 marks

Presentation & Viva-voce - 40 marks

Course Code 20UCSC5PR	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	H	M	M	L	M	M	M	M
CO2	H	H	H	M	H	L	M	M	M	M
CO3	H	H	M	H	H	M	H	M	M	M
CO4	H	H	H	H	H	H	H	M	M	M
CO5	H	H	H	H	H	H	H	M	M	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 21 onwards)

Semester V	**C and C++ Aptitude**	Credits: 2
Extra Credit Course 1		
Course Code **20UCSO51**		Internal Marks 100

COURSE OUTCOMES

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

CO1: describe data types, expressions and user defined functions in C.

CO2: explore the merits of object oriented programming

CO3: discuss dynamic memory management techniques using pointers, constructors, destructors.

CO4: use virtual functions and templates efficiently

CO5: analyse an object oriented concept that suits an application

UNIT I

Expressions in C – Floating Point Issues – Functions – The C Preprocessor

UNIT II

Pointers in C – Pointers and Arrays – Pointers and Strings – Pointers and Structures

UNIT III

Classes in C++ - Memory management in C++ - Inheritance

UNIT IV

Virtual Functions in C++

UNIT V

Class Templates, function Templates in C++

REFERENCE BOOKS

1. Yashwant Kanetkar (2005). *Test Your C Skills*, BPB Publications, New Delhi, India.
2. Yashwant Kanetkar (2019). *Understanding Pointers in C & C++,* BPB Publications, New Delhi, India.
3. Yashwant Kanetkar (2006). *Test Your C++ Skills*, BPB Publications, New Delhi, India.
4. Herbert Schildt (2002). *C++ Complete Reference,* McGraw Hill Education, New Delhi, India.

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 - 21 onwards)

Semester V	**INTRODUCTION TO MICROCONTROLLERS**	Credits: 2
Extra Credit Course 2		
Course Code **20UCSO52**		Internal Marks 100

COURSE OUTCOMES

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

CO1: describe architecture and interfaces of microcontrollers.

CO2: explore the addressing modes, instructions, pin diagrams of microcontrollers and their interfaces.

CO3: use timers, microcontrollers and their interfaces in different applications.

CO4: select the interface for a particular domain.

CO5: appraise PIC and ARM microcontrollers.

UNIT I

Microprocessor vs Microcontroller: Embedded Systems – Embedded Microcontrollers 8051 Architecture – Registers – Pin diagram – I/O ports functions – Internal Memory organization – External Memory (ROM & RAM) interfacing.

UNIT II

8051 Instruction Set: Addressing Modes – Data Transfer instructions – Arithmetic instructions – Logical instructions – Branch instructions – Bit manipulation instructions - Simple Assembly language program examples (without loops) to use these instructions.

UNIT III

8051 Stack - I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops – Delay subroutine – Factorial of an 8 bit number (result maximum 8 bit) – Block move without overlap – Addition of N 8 bit numbers – Picking smallest/largest of N 8 bit numbers. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.

UNIT IV

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode – 1 and a square wave using Mode – 2 on a port pin. 8051 Serial Communication – Basics of Serial Data Communication – RS-232 standard – 9 pin RS232 signals – Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.

UNIT V

8051 Interrupts and Interfacing Applications: 8051 Interrupts – 8051 Assembly language programming to generate an external interrupt using a switch- 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, LCD and Stepper motor and their 8051 Assembly language interfacing programming.

TEXT BOOKS

1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, Rollin D. McKinlay (2006). *The 8051 Microcontroller and Embedded Systems – using Assembly and C*, Pearson Education.
2. Kenneth J. Ayala (1996) *The 8051 Microcontroller*, Thomson/Cengage Learning, 3rd Edition.

REFERENCE BOOKS

1. Manish K Patel (2014). *The 8051 Microcontroller Based Embedded Systems*, McGraw Hill.
2. Raj Kamal (2005). *Microcontrollers: Architecture, Programming, Interfacing and System Design*, Pearson Education.

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT**	Hours/Week: 5	
Core Course 10		Credits: 5	
Course Code **20UCSC61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the basic android widgets and other Android application components. [K1]

CO2: describe the attributes and methods of Android widgets, layouts, dialogs, menus and databases. [K2]

CO3: use android widgets, dialogs, menus, databases, content providers and animations in Android programs. [K3]

CO4: classify widgets, layouts and other significant components that can be used in Android applications. [K4]

CO5: choose appropriate widgets, layouts, menus, resources, dialogs and database queries for creating Android applications. [K5]

UNIT I

Introduction to Android: Understanding the Android Software Stack - Installing the Android SDK - Installing Eclipse - Creating the First Android Project -- Using the TextView Control - Using the Android Emulator - Launching Android Applications on a Handset

Basic Widgets: Overview of the Android Project Files - Understanding Activities - Role of the Android Manifest File - Creating the User Interface - Commonly Used Layouts and Controls - Event Handling - Displaying Messages Through Toast - Creating and Starting an Activity - Using the EditText Control - Choosing Options with CheckBox - Choosing Mutually Exclusive Items Using RadioButtons.

(15 Hours)

UNIT II

Laying Out Controls in Containers: Introduction to Layouts - LinearLayout - RelativeLayout – AbsoluteLayout - Using ImageView- FrameLayout - TableLayout - GridLayout **Utilizing Resources and Media:** Resources - Creating Values Resources - Using Drawable Resources - Switching States with ToggleButtons. (15 Hours)

UNIT III

Some Widgets: Creating an Image Switcher Application - Scrolling Through ScrollView -Playing Audio - Displaying Progress with ProgressBar **Using Selection Widgets:** Using ListView - Using the Spinner Control - AutoCompleteTextView - Using the GridView Control - Creating an Image Gallery Using the ViewPager Control. **Displaying and Fetching Information Using Dialogs:** Dialogs - Selecting the Date and Time in One Application. (15 Hours)

UNIT IV

Creating Interactive Menus: Menus and Their Types - Creating Menus Through XML- Creating Menus Through Coding - Applying a ContextMenu to a ListView. **Using Databases:** Using the SQLiteOpenHelper Class - Accessing the Database Through Menus - Creating a Data Entry Form. (15 Hours)

UNIT V

Implementing Drawing and Animation: Drawing on the Screen - Animations - Applying Interpolators. **Creating and Using Content Providers:** What Is a Content Provider - Understanding the Android Content URI - Using Content Providers.

(15 Hours)

SELF-STUDY: (Not included for Examination)

Playing Video	: Pages 195 – 199
Using Asserts	: Pages 204– 207

TEXT BOOK

Harwani.B.M. (2013). *Android Programming Unleashed*, First Edition, Pearson, Noida (U.P), India.

UNIT	CHAPTER	SECTIONS
I	**1**	**9,11,20-21,27-47,50**
	2	**57-97**
II	**3**	**101-138**
	4	**147-178**
III	**4**	**179-195, 199-203**
	5	**209-239**
	6	**259-281**
IV	**7**	**323-357**
	8	**385-393, 398-416**
V	**9**	**421-472**
	12	**559-565**

REFERENCE BOOKS

1. Reto Meier (2012). *Professional Android 4 Application development*, John Wiley and Sons, Inc.
2. Grant Alle (2011). *Beginning Android 4*, Apress.
3. Prasanna Kumar Dixit (2014). *Android,* Vikas Publishing House Private Ltd, India.
4. John Horton (2015). *Android Programming for beginners,* First Edition, Packt Publishing, Birmingham, Mumbai, India.

Course Code 20UCSC61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	M	M	H	M	H	H	-	-
CO2	H	H	M	M	H	M	H	H	-	-
CO3	H	H	M	H	H	M	H	H	M	-
CO4	H	H	M	H	H	H	H	H	M	M
CO5	H	H	M	H	H	H	H	H	M	H

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Virudhunagar - 626 001

B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 -21 onwards)

Semester VI	**OPERATING SYSTEM CONCEPTS**	Hours/Week: 5	
Core Course 11		Credits: 5	
Course Code **20UCSC62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe role of operating system, its services and structure. [K1]

CO2: explore the concept of deadlock, process management, memory management, file management and disk management. [K2]

CO3: determine scheduling algorithms, deadlock avoidance algorithms, memory management techniques and file allocation methods suitable for different scenarios. [K3]

CO4: analyse the various functions of operating system. [K4]

CO5: compare various views of operating system, scheduling algorithms, virtual memory management techniques and file allocation methods. [K5]

UNIT I

Introduction: Role of Operating System –Computer System Organization-Computer System Architecture - Operating System Structure- Operating System Operations. **System Structures:** Operating System Services –System Calls - Types of System Calls. **Process Concept:** Process Concept – Process Scheduling – Operations on Processes. (15 Hours)

UNIT II

Process Scheduling: Basic Concepts - Scheduling Criteria – Scheduling Algorithms **Synchronization:** Background – The Critical-Section Problem – Semaphores. (12 Hours)

UNIT III

Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention– Deadlock Avoidance–Deadlock Detection – Recovery from Deadlock. **Memory Management Strategies:** Background – Swapping – Contiguous Memory Allocation – Segmentation– Paging (Basic Method-Protection). (16 Hours)

UNIT IV

Virtual Memory Management: Background – Demand Paging- Page Replacement. **File-System:** Access Methods –Directory and Disk Structure: Single Level Directory – Two Level Directory – Tree Structured Directories– Acyclic Graph Directories – General Graph Directories (15 Hours)

UNIT V

Implementing File-Systems: Directory Implementation–Allocation Methods(Contiguous, Linked and Indexed Allocation Methods).**Mass-Storage Structure:** Overview of Mass Storage Structure-Disk Structure – Disk Scheduling–Disk Management– Swap Space Management – RAID Structure. (17 Hours)

SELF-STUDY: (Not included for Examination)

File Sharing in File System. (Pages 480 - 485)

TEXT BOOK

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. (2014). *Operating System Concepts*, 9th Edition, Wiley India (P.) Ltd. India.

UNIT	CHAPTER	SECTIONS
I	**1,2,3**	**1.1 - 1.5, 2.1, 2.3,2.4, 3.1 - 3.3**
II	**5,6**	**5.1, 5.2, 5.3, 6.1, 6.2, 6.6**
III	**7,8**	**7.1-7.7,8.1 - 8.4, 8.5.1,8.5.3**
IV	**9,10**	**9.1,9.2,9.4,10.2,10.3.3-10.3.7**
V	**11,12**	**11.3,11.4.1-11.4.3,12.1,12.2,12.4-12.7**

REFERENCE BOOKS

1. Milan Milenkovic (2005).*Operating Systems – Concepts and Design*, 2nd Edition, Tata McGraw Hill.
2. H.M.Deitel (2005). *Operating Systems,* 2nd Edition, Pearson Education.
3. Gary Nutt (2002). *Operating Systems – A Modern Perspective*, 2nd Edition, Pearson Education.

Course Code 20UCSC62	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	M	M	H	-	H	H	-	-
CO2	H	-	M	M	H	-	H	H	-	-
CO3	H	M	H	H	H	L	H	H	L	-
CO4	H	H	H	H	H	M	H	H	L	M
CO5	H	M	H	H	H	M	H	H	L	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 2021 onwards)

Semester VI	**INTRODUCTION TO DATA MINING**	Hours/Week: 5	
Core Course 12		Credits: 5	
Course Code **20UCSC63**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: recognize the fundamental concepts of Data Warehousing, Data Mining techniques, web mining, Data Cube Implementation and OLAP. [K1]

CO2: interpret the working of various data mining algorithms, data warehousing , data pre-processing and functions of search engines. [K2]

CO3: implement data pre-processing and Data Mining algorithms in real time application, data cube operations, ranking of web pages and query mining. [K3]

CO4: compare various frequent pattern generation algorithms, classification algorithms, clustering methods, web data mining. [K4]

CO5: assess various types of data, outlier detection methods, Data Mining techniques and ranking of web pages. [K5]

UNIT I

Introduction: Introduction – Data Mining definition – Need for Data Mining – The Data Mining Process–Software Development Approach – The Data Mining Process - the CRISP – DM Approach– Data Mining Applications –Data Mining Techniques – Practical Example of Data Mining – The Future of Data Mining – Guidelines for successful Data Mining – Limitations of Data Mining. (15 Hours)

UNIT II

Data Understanding and Data Preparation: Introduction – Data Collection and Pre-Processing – Outlier – Mining Outliers – Missing Data – Types of Data. **Data Warehousing**: Introduction – Operational Data Stores– Data Warehouses – Data Warehouse Design – Data Warehouse Metadata – Software for ODS and Data Warehousing. (13 Hours)

UNIT III

Association Rules Mining: Introduction – Basics – the Apriori Algorithm - Improving the Efficiency of the Apriori Algorithm – APRIORI-TID – Direct Hashing and Pruning– Mining Frequent Patterns without Candidate Generation (FP-Growth).**Classification**: Introduction – Decision tree – Building a Decision Tree – The Tree Induction Algorithm – Split Algorithm based on Information Theory - Split Algorithm Based on Gini Index- Overfitting and Pruning – Decision Tree Rules – Decision Tree Summary. (17 Hours)

UNIT IV

Cluster Analysis: Introduction – Desired Features of Cluster Analysis – Types of Cluster Analysis Methods – Partitional Methods – Hierarchical Methods. **On-line Analytical Processing:** Introduction – OLAP – Characteristics of OLAP Systems – Motivations of using OLAP –Multidimensional View and Data Cube - Data Cube Operations. (14 Hours)

UNIT V

Web Data Mining: Introduction – Web Mining – Web Content Mining – Web Usage Mining – Web Structure Mining. **Search Engines and Query Mining:** Introduction – Differences between Web Search and Information Retrieval – Characteristics of Search Engines– Search Engine Functionality – Search Engine Architecture – Ranking of Web Pages. (16 Hours)

SELF-STUDY: (Not included for Examination)

Data Warehouse Metadata, Software for ODS and Data Warehousing (Pages: 398 - 400)

TEXT BOOK

Gupta, G.K. (2014). *Introduction to Data Mining with Case Studies*, 3rd Edition, PHI Learning Private Limited, Delhi, India.

UNIT	CHAPTERS	SECTIONS
I	**1**	**1.1-1.11**
II	**2,8**	**2.1-2.6, 8.1 to 8.4,8.6,8.7**
III	**3, 4**	**3.1, 3.2,3.4-3.7, 3.9, 4.1-4.8**
IV	**5**	**5.1-5.5,9.1-9.5,9.7**
V	**6,7**	**6.1-6.2,6.5-6.7,7.1 -7.6**

REFERENCE BOOKS

1. Bharat Bhushan Agarwal, Sumit Prakash Tayal (2012). *Data Mining and Data Warehousing*, University Science Press (An Imprint of Laxmi Publications Pvt. Ltd.), New Delhi, India.
2. Jiawei Han, Micheline Kamber (2012). *Data Mining Concepts and Techniques,* 2nd Edition, Morgan Kaufmann Publishers (An imprint of Elsevier), USA.
3. Arun K. Pujari (2013). *Data Mining*, 3rd Edition, Universities Press Private Limited, Hyderabad, India.

Course Code 20UCSC63	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	-	H	M	-	-	M	L	-	-
CO2	H	-	M	M	-	-	M	M	-	-
CO3	H	M	M	H	L	H	H	H	L	M
CO4	H	L	M	H	L	H	H	H	-	M
CO5	M	L	M	H	L	H	H	H	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)

(2020 -21 onwards)

Semester VI	**MOBILE APPLICATIONS DEVELOPMENT LAB**	Hours/Week: 4	
Core Course Practical VI		Credits: 2	
Course Code 20UCSC61P		Internal 40	External 60

COURSE OUTCOMES

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

CO1: implement layouts and widgets in Android projects. [K3]

CO2: develop Android applications with Spinner, Date/TimePicker, menus, ListView, GridView. [K3]

CO3: execute Android projects using intent, database. [K3]

CO4: prepare record with procedures for designing Mobile applications. [K3]

CO5: examine the proper usage of layouts, widgets, listeners and Android components in Android projects. [K4]

Develop Android applications for the following

1. Displaying Android Architecture.
2. Login module. (Username and Password).
3. Arithmetic operations.
4. String operations.
5. Facebook Account Creation
6. Zoom in and Zoom out animation.
7. Fade in and Fade out animation.
8. Demonstration of Spinner widget.
9. Transformations

10. Frame animation.
11. Image Gallery using ImageView
12. Image Gallery using ViewAnimator
13. Display the current time using Timepicker.
14. Display the current date using Datepicker.
15. CountDown Timer.
16. Page navigation using intent.
17. Demonstration of ListView and GridView.
18. Creation of student database, insert rows and view student database.

Course Code 20UCSC61P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	L	H	M	M	M	L	M
CO2	H	H	L	L	H	M	H	M	L	M
CO3	H	H	M	L	H	M	H	M	L	H
CO4	H	H	H	M	H	M	H	M	M	M
CO5	H	H	M	M	H	H	H	H	H	H

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester VI	**COMPUTER GRAPHICS**	Hours/Week: 5	
DSEC 3		Credits: 4	
Course Code **20UCSE61**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: enumerate the graphical output devices, uses of computer graphics, properties and views of graphical objects, co-ordinate systems and Graphical User Interface. [K1]

CO2: discuss the applications of Computer Graphics, graphical devices, output primitives and their attributes, adjustment of the graphical objects to fit the view and interactive input methods. [K2]

CO3: implement various graphical object creation, attribute setting and manipulation algorithms. [K3]

CO4: analyse different graphical devices, geometrical transformations, clipping methods and interactive picture construction techniques. [K4]

CO5: assess data structures, techniques and algorithms used in computer graphics. [K5]

UNIT I

A Survey of Computer Graphics: Computer-Aided Design – Presentation Graphics – Computer Art – Entertainment – Education and Training – Visualization – Image Processing – Graphical User Interfaces. **Overview of Graphics Systems:** Video Display Devices (Refresh Cathode-Ray Tubes, Raster-Scan Displays and Random-Scan Displays) – Raster-Scan Systems – Random-Scan Systems – Graphics Monitors and Workstations.

(14 Hours)

UNIT II

Overview of Graphics Systems: Input Devices (Keyboards, Mouse and Image Scanners) – Graphics Software. **Output Primitives:** Points and Lines. **Line-Drawing Algorithms:** DDA Algorithm – Bresenham's Line Algorithm – Circle-Generating Algorithms – Pixel Addressing – Character Generation**.** (16 Hours)

UNIT III

Attributes of Output Primitives: Line Attributes – Color and Gray scale Levels – Character Attributes**. Two-Dimensional Geometric Transformations:** Basic Transformations – Matrix Representations and Homogenous Coordinates – General Pivot-Point Rotation, General Fixed-Point Scaling- Other Transformations.

(15 Hours)

UNIT IV

Two-Dimensional Viewing: The Viewing Pipeline – Viewing Coordinate Reference Frame – Window-to-Viewport Coordinate Transformation – Clipping Operations – Point Clipping – Line Clipping - Cohen Sutherland Line Clipping – Liang-Barsky Line Clipping – Text Clipping. (15 Hours)

UNIT V

Graphical User Interfaces and Interactive Input Methods: The User Dialogue – Input of Graphical Data – Input Functions – Interactive Picture – Construction Techniques.

(15 Hours)

SELF-STUDY: (Not included for Examination)

Ellipse generating algorithm and properties of ellipse

TEXT BOOK

Donald Hearn, D., Pauline Baker, M. (2014). *Computer Graphics C version,* 2nd Indian Reprint, Pearson Education.

UNIT	CHAPTER	SECTIONS
I	**1**	**1.1 - 1.8**
	2	**2.1 (Pages 56-62), 2.2 – 2.4**
II	**2**	**2.5 (Pages 80-83,87), 2.7**
	3	**3.1, 3.2 (Pages 104 -112), 3.5, 3.10, 3.14**
III	**4**	**4.1, 4.3, 4.5**
	5	**5.1 ,5.2, 5.4**
IV	**6**	**6.1 - 6.3, 6.5 - 6.7 (Pages 245 - 250), 6.10**
V	**8**	**8.1-8.3, 8.5**

REFERENCE BOOKS

1. Roy A Plastock, Zhigang Xiang (2015). *Schaum's outline of Computer Graphics,* 2nd Edition, Tata McGraw Hill, India.

2. John F. Hughes, Andries Van Dam, Morgan Mc Guire (2013). *Computer Graphics: Principles and Practice*, 3rd Edition, Addison-Wesley Professional.

Course Code 20UCSE61	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	M	H	H	H	L	H	L	-	-
CO2	H	M	H	H	H	L	H	L	-	-
CO3	H	M	L	H	H	M	H	L	-	-
CO4	H	M	L	H	H	H	H	L	-	-
CO5	H	M	L	H	H	H	H	M	-	-

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B.Sc.COMPUTER SCIENCE (SEMESTER)
(2020 - 21 onwards)

Semester VI	**INTRODUCTION TO INTERNET OF THINGS**	Hours/Week: 5	
DSEC 3		Credits: 4	
Course Code **20UCSE62**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe the fundamental concepts, domain specific applications of IoT, physical devices, IoT protocols, design methodology, IoT tools. [K1]

CO2: recognize IoT applications, physical devices used for IoT, types of protocols, IoT tools. [K2]

CO3: demonstrate control structures, functions, arrays in Arduino, Raspberry pi commands, python program on Raspberry pi , design dynamic web application using JavaScript and Mongo DB. [K3]

CO4: compare the different IoT physical devices, endpoints and analyse the IoT web applications and various tools for IoT. [K4]

CO5: assess transducers, sensors, actuators and various IoT protocols. [K5]

UNIT I

Introduction to Internet of Things: Introduction – IoT Ecosystem – IoT Reference model – **Domain Specific IoT** – Introduction – Home automation – Smart Cities - Environment – Retail- Health and Lifestyle . (16 Hours)

UNIT II

Transducers, Sensors and Actuators: Defining Transducers, Sensors and Actuators – Introduction to Transducers – Introduction to Sensors – Introduction to Actuators – Interfacing Concepts to Embedded System – Wireless Sensor networks and its Technologies. **IoT Protocols:** Protocol Classification – MQTT – XMPP – DDS – AMQP. Arduino – Temperature Humidity Sensors, Interface Arduino with LED. (15 Hours)

UNIT III

IoT Platform Design Methodology - IoT Physical Devices and Endpoints Arduino UNO: Define Arduino –Exploring Arduino Uno learning Board–Installing Software – Fundamentals of Arduino Programming– Introduction to Communications.

(15 Hours)

UNIT IV

IoT Physical Devices and Endpoints Raspberry Pi: Define Raspberry Pi – Exploring Raspberry Pi learning Board – Raspberry Pi Operating Systems – Operating System setup on Raspberry Pi – Raspberry Pi Comments – Programming Raspberry Pi with Python – **IoT Physical Devices and Endpoints Intel Galileo:** Intel Edison Board– Intel Galileo– Installing the Arduino IDE Software– Example modules on Intel Galileo.

(15 Hours)

UNIT V

IoT Web Application Development: Introduction– HTML – CSS –JavaScript – MongoDB - **Tools for IoT:** Introduction – Chef – Puppet. (14 Hours)

SELF-STUDY: (Not included for Examination)

Logical Design using Python–control flow, Functions, Modules, Packages, File Handling (Pages 141-154)

TEXT BOOK

Srinivasa K.G, Siddesh G.M, Hanumantha Raju R. (2019). *Internet of Things*, Cengage Learning India Pvt. Ltd. Delhi.

UNIT	CHAPTER	SECTIONS
I	**1**	**1.1 - 1.3**
	4	**4.1 - 4.5,4.8**
II	**2**	**2.1- 2.6**
	3	**3.1- 3.5**
III	**5**	**5.1- 5.11**
	7	**7.1-7.5**
IV	**8**	**8.1- 8.6**
	9	**9.1- 9.4**
V	**10**	**10.1-10.5**
	11	**11.1- 11.3**

REFERENCE BOOKS

1. Arshdeep Bahga, Vijay Madisetti (2015).*Internet of Things: A Hands-On Approach*, Orient Blackswan Private Limited.
2. Raj Kamal (2017). *Internet of Things - Architecture and Design Principles*, McGraw Hill.

Course Code 20UCSE62	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	-	L	L	-	L	H	M	-	-
CO2	H	-	M	M	L	L	M	M	-	-
CO3	H	M	L	L	M	L	M	M	-	-
CO4	H	M	M	M	M	M	M	M	-	L
CO5	H	M	L	M	M	H	L	H	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020 -21 onwards)

Semester VI	**INTRODUCTION TO BIG DATA**	Hours/Week: 5	
DSEC 3		Credits: 4	
Course Code **20UCSE63**		Internal 25	External 75

COURSE OUTCOMES

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

CO1: describe Big Data, its sources, architecture, dataset of R, data management and graphs in R. [K1]

CO2: explore Big Data Analytics, Big Data Stack, Dataset management, data manipulation and graph plotting in R. [K2]

CO3: use the Analytics method, data structures and graphs appropriate for domain specific applications. [K3]

CO4: examine the Data Analytics using R. [K4]

CO5: select suitable analytics flow, data management and visualisation methods for an application. [K5]

UNIT I

Introduction to Big Data: Definition of Analytics – Big Data - Characteristics of Big Data - Domain Specific Examples of Big Data - Analytics Flow for Big Data.

(15 Hours)

UNIT II

Big Data Stack - Raw Data Sources - Data Access Connectors - Data Storage - Batch Analytics - Real-time Analytics - Interactive Querying - Serving Databases, Web & Visualization Frameworks - Case Study: Weather Data Analysis. (15 Hours)

UNIT III

Introduction to R: Usage of R - Working with R - Packages – Using output as input: reusing results - Working With Large Datasets. **Creating Dataset:** Understanding Datasets - Data Structures - Data Input - Annotating datasets - Useful functions for working

with data objects. **Getting started with graphs:** Working with graphs - A Simple example - Graphical Parameters - Adding text, customized axes and legends - Combining graphs.

(15 Hours)

UNIT IV

Basic Data Management: Creating new variables - Recoding variables - Renaming variables - Missing values - Date values - Type Conversions - sorting data - Merging datasets - Subsetting datasets - Using SQL Statements to manipulate data. **Advanced Data Management:** Numerical & Character functions - Control flow - User-written functions - Aggregation and reshaping. (15 Hours)

UNIT V

Basic graphs: Bar Plots - Pie charts – Histograms - Kernel density plots - Box Plots - Dot plots. **Basic Statistics:** Descriptive Statistics – Frequency and contingency tables – Correlations. (15 Hours)

SELF-STUDY: (Not included for Examination)

Text Book 2

T-Test : Pages 158 – 160

Nonparametric tests of group differences: Pages 160 – 163

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti (2019). *Big Data Analytics: A Hands-On Approach,* Published by Arshdeep Bahga & Vijay Madisetti.
2. Robert I. Kabacoff (2015). *R in Action Data analysis and graphics with R*, 2nd Edition, Dreamtech press, New Delhi.

UNIT	TEXT BOOK	CHAPTER	SECTIONS
I	**1**	**1**	**1.1-1.5**
II	**1**	**1**	**1.6, 1.9**
III	**2**	**1**	**1.1,1.3, 1.4,1.6,1.7**
		2	**2.1-2.5**
		3	**3.1-3.5**
IV	**2**	**4**	**4.2- 4.11**
		5	**5.2, 5.4-5.6**
V	**2**	**6**	**6.1 - 6.6**
		7	**7.1-7.3**

REFERENCE BOOKS

1. DT Editorial Services (2016). *Big Data Black Book,* Dreamtech press, New Delhi.
2. EMC Education Services. (2017).*Data Science and Big Data Analytics*, Wiley, New Delhi.
3. Nitin Upadhyay. (2018). *Big Data Management and Analytics*, Cengage Learning India Pvt. Ltd., Delhi.
4. Hadley Wickham & Garrett Grolemund. *R for Data Science,* 1st Edition, O'Reilly.

Course Code 20UCSE63	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	M	M	L	M	M	M	M	-	L
CO2	H	H	H	L	M	M	M	M	-	L
CO3	H	H	H	L	M	H	M	M	-	L
CO4	H	H	H	M	H	H	M	H	-	M
CO5	H	H	H	M	H	H	M	H	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)
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Semester VI	**COMPUTER GRAPHICS LAB**	Hours/Week: 4	
DSEC 4 Practical II		Credits: 2	
Course Code **20UCSE61P**		Internal 40	External 60

COURSE OUTCOMES

On completion of the course, the learners will be able to

CO1: write C programs for plotting graphics primitives and objects . [K3]

CO2: apply transformation and clipping techniques to graphical objects. [K3]

CO3: execute C programs using built-in graphical functions. [K3]

CO4: prepare record with graphics programs. [K3]

CO5: examine the merits, demerits and space complexity of different graphical algorithms. [K4]

Write Programs for

1. Line Drawing using DDA.
2. Line Drawing using Bresenham's algorithm.
3. Circle Drawing.
4. Displaying National flag.
5. Displaying Traffic signal.
6. Drawing house.
7. Draw a color cube and spin it.
8. 2D Transformations.
9. Reflection.
10. Shearing.
11. Bouncing Ball animation.
12. Moving Car with Background.

13. Cohen-Sutherland line clipping algorithm.
14. Fill a Polygon using scan line fill algorithm.

Course Code 20UCSE61P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	H	H	H	H	M	M	H	M	M
CO2	H	H	H	H	H	M	M	H	H	M
CO3	M	M	M	L	M	-	-	-	-	-
CO4	L	L	M	L	L	-	-	-	-	-
CO5	H	H	H	H	H	H	M	H	H	H

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Heads of the Departments

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V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai
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Virudhunagar - 626 001

B.Sc. COMPUTER SCIENCE

(2020-21 onwards)

Semester VI	**ANIMATION USING ANIMATE AND MAYA LAB**	Hours/Week: 4	
DSEC 4 Practical II		Credits: 2	
Course Code **20UCSE62P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: implement the timeline and scenes in a movie. [K3]

CO2: create animation using Tweening and Morphing. [K3]

CO3: explore multi layer animations. [K3]

CO4: prepare record with Flash and MAYA programs using basic animation, multilayer animation, Tween and Marphing. [K3]

CO5: examine implementation of animations using 2D and 3D characters. [K4]

Exercises using Animate

1. Create a Movie which includes Text Effects (Zooming, Rotating. Jumping)
2. Create a Movie which includes
   (i) frame by frame animation
   (ii) animation using guided path
3. Create a movie which includes an object animation using Motion Tweening (Bouncing Ball).
4. Create a movie which includes Animation using Multi-Layer (Globe Animation).
5. Create a movie which includes Animation using Multi-Layer (Wind Mill Animation).
6. Create a movie using shape Tweening (Countdown animation).
7. Create a movie which includes Image / Text Morphing.
8. Design a Commercial advertisement banner.

Exercises using Maya

9. Create a 2D character.
10. Create a 3D character.
11. Create Background Scene.
12. Create a 3D flower vase.
13. Create a 3D table.
14. Create Text.
15. Flying Arrows.
16. Model a Screw Driver.

Course Code 20UCSE62P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	H	H	L	M	-	M	-	-	M
CO2	H	H	H	M	M	-	M	-	-	M
CO3	H	H	H	M	H	-	M	M	-	M
CO4	H	H	H	H	H	-	M	M	-	M
CO5	H	H	M	M	H	-	M	L	-	M

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020-21 onwards)

Semester VI	**DATA SCIENCE LAB**	Hours/Week: 4	
DSEC 4 Practical II		Credits:2	
Course Code **20UCSE63P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: write programs in R using basic concepts like vector, array, matrix and functions. [K3]

CO2: write R programs to perform statistical analysis on the data and visualize the output. [K3]

CO3: enter and execute R programs in an IDE with various inputs and sample dataset. [K3]

CO4: generate results and record outputs in an appropriate format. [K3]

CO5: analyse the results of the same problem with different procedures and methods. [K4]

Write R Program for the following:

1. Find the sum of natural numbers from 1 to N.
2. Print the multiplication table for given number.
3. Check whether a string is palindrome or not.
4. Find the largest element in a vector using function.
5. Write an infix function %div% and check if the left hand side divides right hand side. (For example 3 %div% 42 -->true)
6. Compute and plot the running totals of a vector using function.
7. Implement Linear & Binary search in a vector.
8. Perform month wise and sales person wise analysis of sales data for one year.
9. Create a 3-dimensional array using dim ( ) and array( ) function.

10. Bind two matrices row wise and column wise.

11. Find the mean, median and mode for set of values.

12. Consider the following frequency distribution table of systolic blood pressure. Compute all the measures of dispersion.

Range	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180
Frequency	10	8	7	12	3	19	10	15	18

13. Obtain probability distribution of X, where X is number of spots showing when a six-sided symmetric die (i.e. all six faces of the die are equally likely) is rolled. Simulate random samples of sizes 40, 70 and 100 respectively and verify the frequency interpretation of probability.

14. Find the probability distribution for the set of colors & to pick 3 colors with the restriction that the same colors are not picked more than once.

15. Create data frame and perform the following operations:

a. Access
b. Modify
c. Add components
d. Delete components

16. Create data frame and find frequency count, proportion within row & column and proportion within entire data tale.

17. Create data frame and perform subset operation using slice ( ) & filter ( ).

18. Make visual representations of any data using base, lattice and ggplot2 packages in R.

19. Draw Boxplot for the Iris data set in R and do the following

a. Add notches to the boxes in the plot.
b. Increase the distance between boxes in the plot.
c. Add the title to the boxplot.

Course Code 20UCSE63P	PO1		PO2		PO3	PO4	PO5		PO6	PO7
	PSO 1.a	PSO 1.b	PSO 2.a	PSO 2.b	PSO 3	PSO 4	PSO 5.a	PSO 5.b	PSO 6	PSO 7
CO1	H	H	L	L	H	L	-	-	-	-
CO2	H	H	L	M	H	M	M	M	-	-
CO3	H	H	H	-	-	-	-	-	L	-
CO4	H	H	H	-	-	-	-	-	L	-
CO5	H	H	L	M	H	H	M	M	L	-

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B.Sc. COMPUTER SCIENCE (SEMESTER)
(2020-21 onwards)

Semester VI	**PHP AND MYSQL LAB**	Hours/Week: 1 T + 1 P	
SEC 6 Practical IV		Credits: 2	
Course Code **20UCSS61P**		Internal 40	External 60

COURSE OUTCOMES

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

CO1: formulate and write user interactive web pages with necessary validations. [K3]

CO2: design and develop the web pages using databases, COOKIES, and SESSIONS. [K3]

CO3: demonstrate the user interactive webpages with the help of real time inputs. [K3]

CO4: prepare output of interactive web pages and database manipulations. [K3]

CO5: develop web pages for personal and business applications to satisfy real life requirements. [K4]

Write PHP Program for the following:

1. Display the Resume (Use PHP code to calculate Age).
2. Display Student Mark details (Use variables and constants in PHP to assign the marks and to calculate total, average and result).
3. Design a webpage that performs various Number Manipulation operations (Use Ordered list to display choice).
4. Design a webpage that performs various Number Checking operations (Use combo box to display choice and PHP functions to implement Checking).
5. Design a webpage that supports various String Operations (Use radio button to display the choices and use PHP string functions).
6. Design E-tutorial for Logic Gates (Use Image map to display the E-tutorial content).
7. Design a webpage to display the details of each district in Tamil Nadu (Use Image map).

8. Implement English to English Dictionary (Use Associative Array).
9. Design the webpage for User Login (Use MYSQL).
10. Design the webpage for Alumnae Registration and also perform validation (Use MYSQL).
11. Design the webpage to get the Register Number and display the mark details of a student (Use select statement to read data from database).
12. Display the student details by getting the register number (Use select and join statement).
13. Implement the Bank transactions 'Deposit' and 'Withdraw' (Use update statement).
14. Store the current date and time in a COOKIE and display the information about the 'Last Visit'.
15. Store the number of visits on a web page in SESSION and to show it on the webpage. (Increment the count on each refresh of the web page).

Course Code 20UCSS61P	**PO1**		**PO2**		**PO3**	**PO4**	**PO5**		**PO6**	**PO7**
	PSO 1.a	**PSO 1.b**	**PSO 2.a**	**PSO 2.b**	**PSO 3**	**PSO 4**	**PSO 5.a**	**PSO 5.b**	**PSO 6**	**PSO 7**
CO1	H	H	H	H	H	M	M	H	M	M
CO2	H	H	H	H	H	M	M	H	H	M
CO3	M	M	M	L	M	-	-	-	-	-
CO4	L	L	M	L	L	-	-	-	-	-
CO5	H	H	H	H	H	H	M	H	H	H

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