SRI SANKARA ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

ENATHUR, KANCHIPURAM – 631 561.

Learning Outcome-based Curriculum Framework

(LOCF)

for

Bachelor of Computer Application
(BCA)

Choice Based Credit System (CBCS)

REGULATIONS & SYLLABUS

(Effective from the academic year 2023 - 2024)

Choice Based Credit System

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Preamble:

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge inorder to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes- based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome- oriented with well-defined aims, objectives and goals toachieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Application is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other discipline soft basic science and engineering. Computer Application is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Application can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever- evolving discipline of computer Application also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer Application has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Application is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

1. Introduction

Computer has become integral part of life. Tedious manual works are automated/simplified by Computers Machine learning, data science and artificial intelligence allow better decision making. The syllabus focuses on the core fundamentals of computer science, but generally undergoes revision according to the industry requirement with the aim of increasing employment opportunities for students.

BCA programme aims to incorporate the foundation knowledge and advanced concepts such as data science, block chain technology and social media analytics.

The Learning Outcomes-based Curriculum Framework for BCA is structured and developed to facilitate the students to achieve the following:

- To provide thorough understanding of nature, scope and application of computer and computer languages
- Ability to understand the Computing concepts and their applications using the acquired board based knowledge.
- Ability to use the techniques, skills, and modern Software tools for software development.
- Ability to identify and analyze software application problems in multiple aspect including coding, testing and implementation in industrial applications.
- Ability to design, develop and verify software systems to meet desired needs within realistic constraints ensuring quality, reliability, security in addition to satisfying economical, ethical, social and environmental constraints.
- An ability to communicate effectively in diverse groups and exhibit leadership qualities.

2. Learning Outcomes-based Curriculum Framework

2.1 Nature and Extent of the BCA

The undergraduate program in BCA orientation towards logical problem solving and programming. Curriculum of BCA comprises with equal importance for theoretical and practical knowledge with career orientation.

Curriculum and syllabi framework introduces foundation level and takes towards the advanced level. Orientation towards latest technologies such as Data Science, Block chain technologies, Deep Learning and social media analytics. Students are able to think both in abstract and in concreate terms. Syllabus is designed in enhancing the employability and enterprenuership

3. Graduate Attributes:

Graduate Attributes (GA) are the qualities, skills and understandings that students should develop during their graduation. These qualities prove to be the characteristics and defining roles of the graduates. Graduate attribute is a key outcome that underpin curriculum planning and development. The graduate attributes are fostered through meaningful learning experiences made available through the curriculum, college experience and a process of critical and reflective thinking.

The graduate attributes can be viewed as qualities as listed subcategories:

- **Disciplinary knowledge:**

The graduate must demonstrate comprehensive and in-depth knowledge and understanding of the core concepts offered in the curriculum of BCA.

- **Communication skills:**

The Ability to communicate and collaborate with individuals, and with teams in professional and community settings increases the employability of the student.

- **Problem Solving and Design:**

Problem solving skills empower students to find methodical solutions to any real-world problems or real-time problems using computational algorithms and solutions. Problem solvers are most sought-after attributes of the graduates form the field of Computer Science. They should possess the ability to clearly understand the problem, think creatively or out-of-the-box thinking and to convert the problem into a computational model to find a scientific solution backed by the theories.

- **Ethical Practices:**

Ethical practice is a key component of professionalism and needs to be instilled in curricula across courses. Ethical practices give the graduates a sense of discretion and moral responsibility for carrying out their duties in a diverse and fiercely competing society. It shall imbibe cultural diversity, linguistic differences and complex nature of our world.

- **Critical Thinking:**

Critical Thinking gives the capability to apply analytic thought to find a solution to a problem by analysing the problem, evaluating the evidences, identifying the path to the solutions, formulating the methods and procedures to the possible solutions.

3.1 LIST OF GRADUATE ATTRIBUTES FOR BCA:

GA-1: Ability to use a range of programming language and tools develop computer programs and sytems that are effective solutions to problems

GA-2: Ability to demonstrates competence in the practical art of computing in by showing in design an understanding of the practical methods, and using modern design tools competently for comple real-life IT problems.

GA-3: Abilty to identify and to apply relevant problem-solving methodologies.

GA-4: Ability of working in teams to build software systems.

GA-5: Ability to communicate effectively, comprehending and writing effective reports and design documentation, sumarizing information, making effective oral presentations ang giving and receiving clear oral instructions.

4. Qualification Descriptors:

Qualification Descriptors are generic statements that define the outcomes of the graduates. The Qualification descriptors are used as metric by two part:

The first part is the designer of academic programmes who can use the qualification metric to measure the achievement of students for the award of the qualification

The second part is the employers of the graduates who can use the qualification descriptors to assess the qualification descriptors to assess the quality and capabilities of the graduates holding the qualification.

4.1 Qualification descriptors for BCA

On Completion of BCA, the expected learning outcomes that a student should be able to demonstrate are the following:

QD01: Study the principles and practise of computing. They learn to program by writing computer code.

QD02: Understand to develop computer based solutions to problems using algorithms and high level programming language

QD03: Have sound knowledge of the fundamentals of computer science and are able to apply these in a context related manner

QDO4: Have ability to evaluate exemplery methods by implementing and analysing them.

QD05: Skills required for identifying problems and issues relating to the disciplinary area and field of study

5. Programme Outcomes (PO) of B.C.A degree programme

Computer Application is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra,Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics.

The Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhancetheir employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

5.1 Programme Outcomes (PO) of BCA

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

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design / Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

6. Programme Specific Outcomes of B.C.A Programme

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to anAddress issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)

PO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

Sl.No	Level	Parameter	Description
1	K1	Knowledge / Remembering	It is the ability to remember the previously learned
2	K2	Comprehension / Understanding	The learner explains ideas or concepts
3	K3	Application / Applying	The learner uses the information in a new way
4	K4	Analysis / Analysing	The learner distinguishes among different concepts
5	K5	Evaluation / Evaluating	The learner justifies a stand or decision
6	K6	Synthesis / Creating	The learner creates a new product of point of view

7.1 ELIGIBILITY FOR ADMISSION:

Candidates for admission to the first year of the Degree of Bachelor of Computer Application courses shall be required to have passed the Higher Secondary Examinations with a Computer Science / Mathematics / Business Mathematics (Academic Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereof by the Syndicate of the University of Madras is eligible for admission to the first semester. A candidate shall be selected based on a selection test as prescribed by this Institution from time to time. The selection test shall test the general aptitude, logical reasoning and analytical abilities and basic arithmetical skills of the candidate..

7.2 STRUCTURE OF THE COURSE

The course is organized on semester basis with a total of six semesters. Each student will opt for a comprehensive, interactive course with one of the faculty member. The topic of specialization and course content will be determined by the Department/Course Advisor.

Core practical **Laboratory:** Independent system shall be provided for the each student. It is recommended that the practical training be organized as an exercise rather than simple demonstration. The student must actually perform the experiments.

7.3 ELIGIBILITY FOR THE AWARD OF DEGREE

A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in an Autonomous College for a period of not less than three academic years, passed the examinations of all the Six Semesters prescribed earning **140** credits in Parts-I, II, III, IV, V & VI and fulfilled such conditions as have been prescribed therefore.

The parent University will award Degrees to the students evaluated and recommended by Autonomous colleges. The Degree certificates will be in a common format devised by the University. The name of the College will be mentioned in the Degree Certificate, if so desired. The declaration of results was decided by the Examination Committee.

7.4 DURATION:

Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year the third and fourth semesters and the third academic year the fifth and sixth semesters respectively.

The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for

each semester exclusive of the days for the conduct of semester examinations.

In each semester, Papers are administered in 15 teaching weeks and another 5 weeks are utilized for evaluation and grading purposes. Each week has 30 working hours spread over in a 5 day week. Depending upon the content and specialization, a paper may have 1 to 6 credits. Total number of teaching hours in a semester will be 450 hrs. One credit of each theory paper is equal to 15 hrs of lectures or 30 hrs of practical works.

7.5 MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMMES

The candidates shall complete the B.C.A Degree Programmes within 6 years from the date of admission. The term completing the programmes means passing all the prescribed examinations of the programme to become eligible for the Degree. No candidate shall be permitted to appear for the examinations after the prescribed period for completing the programme.

7.6 COURSE OF STUDY

A Bachelor's programme consists of a number of papers. The term Course is used to indicate logical part of a subject matter of the programme. In each of Bacherlor's programmes, there will be a prescription of (i) language –I (Tamil, Sanskrit or other languages), (ii) language – II (English), (iii) a set of compulsory courses (called core subjects), some optional courses (called elective / allied subjects) and projects, (iv) a set of papers recommended by UGC and TANSCHE (Advanced Tamil / Soft skill / Environmental Studies / Value education) and (v) Extension activities.

The detail of the Study for Bachelor Degree Courses shall consist of the following:

PART – I Language Courses (LC) [Tamil / Other Languages]

PART–II English Language Courses (ELC)

PART – III Core Subjects

Allied Subjects

Projects / Field work

PART – IV

1. (a) Those who have not studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Tamil comprising of two papers (level will

beat 6th Standard).

(b) Those who have studies Tamil up to XII Std. and taken a Non-Tamil Languageunder Part- I shall take Advanced Tamil comprising of two papers.

(c) Others who do not come under a + b can choose non-major elective comprising of two papers.

2. Skill Based Subjects - Soft Skills

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed papers on Soft Skills. For three years UG degree Programme, a candidate must undergo a minimum of 4 papers (4 x 2 = 8 credits). Papers will be finalized in due course.

3. Environmental Studies

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed paper on Environmental studies. For three years UG degree Programme, a candidate must undergo environmental studies during third semester of second year (2 credits). Syllabus is common to all UG courses.

PART – V Extension Activities

A candidate shall be awarded a maximum of 1 Credits for Compulsory Extension Service. All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Rotract / Youth Red cross or any other service organizations in the college and shall have to put in Compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the college before 31st March in a year. If a student LACKS 40 HOURS ATTENDANCE in the First year,

he/she shall have to compensate the same during the subsequent years. Students those who complete minimum attendance of 40 hours in One year will get HALF A CREDIT and those who complete the attendance of 80 or more hours in Two Years will ONE CREDIT. Literacy and population Education Field Work shall be compulsory components in the above extension service activities. The working hours should not overlaps the normal teaching hours.

Student advisor

All teachers of the Department shall function as student advisors. There will be more or less an equal number of students assigned to each student advisor of a Department. The student advisor will help the students in choosing core and elective papers of study. The student advisor shall be responsible for registration of papers (subjects) by his students. The student advisor will offer all possible student support services

7.7 CREDITS

The term credit is used to describe the quantum of syllabus for various programmes in terms of periods of study. It indicates differential weightage given according to the contents duration of the courses in the curriculum design. The minimum credit requirement for a three year Bacherlor's programme shall be **140** credits. Each subject (course) is designed variously under lectures / tutorials / laboratory work / seminar / project work etc., to meet effective teaching and learning needs and credits are assigned suitably.

One credit for each lecture / tutorial / project work period per week shall be alloted. One credit for two laboratory hours per week shall be alloted. In practical, each credit should cover minimum of six experiments. Thus normally, in each of the subject, credits will be assigned on the basis of the lectures / tutorials / laboratory work / project work and other forms of learning in a 15 week schedule.

7.8 SCHEME OF EXAMINATION

There shall be continuous, comprehensive evaluation of students through internal and external examination. At least 2 internal examinations (Sessional Tests) per semester and 1 semester ending examination should be conducted.

Sessional Test I will he held during sixth week for syllabi covered till then. Sessional Test I will be a combination of a variety of tools such as class test, assignment, papr presentation etc., that would be suitable for the paper. This required an element of openness. The students are to be informed in advance about the nature of assessment and the procedures.

However the tests are compulsory. Test I may be for one hour duration. The pattern of question paper will be decided by the respective board of studies.

Sessional Test I will carry 20% of marks of the entire paper.

Sessional Test II will he held during eleventh week for syllabi covered between seventh and eleventh weeks. Sessional Test I will be a combination of a variety of tools such as class test, assignment, paper presentation etc. that would be suitable for the paper. It will also have an element of openness. The students are to be informed in advance about the nature of assessment and the procedures. However the tests are compulsory. Test II may be for one hour duration. The pattern of question paper will be decided by the respective board of studies.

Sessional Test II will carry 20% of marks of the entire paper.

There will be one End Semester examination of 2 - 3 hours duration in each paper. The End semester examination will cover all the syllabi of the paper for 60% of Marks.

A dissertation may be offered in lieu of one / two papers / practicals. It shall be evaluated by two examiners one external and one internal appointed by the Controller of Examination. Wherever there is viva-voce, it shall be conducted by the common Viva Board consisting of the Chairman and internal members of the Board of Examination in the concerned subject, internal guide and one external expert as approved by the Controller of Examinations

End semester practical examinations shall be held before the theory examinations to benefit the students to undertake examinations of other departments.

Every course offered will have three components associated with the teaching-learning process of the course, namely (i) Lecture - L (ii) Tutorial - T (iii) Practicals - P, (iv) Self study - S where

L stands Lecture session. **T** stands Tutorial session consisting participatory discussion / self study / desk work / brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands Practice session and it consists of Hands on experience / Laboratory Experiments / Field Studies / Case studies that equip students to acquire the much required skill component.

S stands Self study session consisting participatory discussion by student with the guidance of faculty. This session is not included in the weekly hour plan.

In terms of credits, every one hour session of L amounts to 1 credit per semester, a minimum of two hour session of T or P amounts to 1 credit per semester and no credits alloted to self study hour, over a period of one semester of 15 weeks for teaching-learning process. The total duration of a semester is 20 weeks inclusive of semester-end examination.

A course shall have either or all the three components. That means a course may have only lecture component, or only practical component or combination of any two or all the three components. The total credits earned by a student at the end of the semester upon successfully completing the course are L + T + P + S. The credit pattern of the course is indicated as L: T: P: S. For example: a theory course with a L-T-P-S schedule of 4-0-0-2 will be assigned 4 credits, and a lab practical course with a L-T-P-S schedule of 0-0-3-0 will be assigned 3 credits.

For B.C.A courses Part I, Part II and Part IV subjects will be provided to first and second sem

esters.In third to sixth semesters only part III papers provided. Total of 30 hrs was to be maintained constantly for all semesters.

Projects and Field works might be introduced in the sixth semester of any UG course by utilizing two core papers. Each project work / field work might be awarded with twelve credits and twelve hours per week.

Total credits of 140 attained through three years of their study period.

Question Paper Pattern

SECTION – A (30 words)

10 OUT OF 12 - 10 X 2 marks = 20 marks

SECTION – B (200 words)

5 out of 7 - 5 x 5 marks = 25 marks

SECTION – C (500 words)

3 out of 5 - 3x 10 marks = 30 marks

TOTAL = 75 marks

7.9 SCHEME OF EXAMINATIONS:

SUBJECTS	MAX. CREDITS	EXAM HRS	MAX. MARKS		
			Internal	External	TOTAL
PART I Language	3	3	25	75	100
PART II English	3	3	25	75	100
PART III Core Subject	4	3	25	75	100
Core Practical	3	3	40	60	100
Allied Paper	5	3	25	75	100
PART IV 1. (a) Those who have not studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Tamil comprising of two paper (level will be at 6th Standard). (b) Those who have studies Tamil up to XII Std. and taken a Non- Tamil Language under Part-I shall take Advanced Tamil comprising of two papers. (c) Others who do not come under a + b can choose non-major elective comprising of two papers.	2	2	25	75	100
2. Skill based subjects – Skill Enhancement course, Ability Enhancement course, Foundation course, Professional Competency course	3	2	50	50	100
PART V – Extension activities	1				
Total credits : 24					

The following procedure be followed for internal Marks

The offer of an Add-on Courses to the students in various disciplines is to enhance their employability. The number of working hours per week for the students for getting the **140** prescribed credits should not exceed 30 hours of class per week and no faculty member should be allocated extra hours beyond the prescribed 16 lecture hours. The following procedure be followed for Internal Marks

INTERNAL MARKS

Tests (2 out of 3)	= 10
Attendance	= 5
Seminars	= 5
Assignments	= 5
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	25 marks

***Break-up Details for Attendance**

Below 60%	- No marks
60% to 75%	- 2 marks
76% to 90 %	- 3 marks
91% to 100%	- 4 marks

Practice based Continuous Internal Assessment (CIA) – 20 provided based upon the type of the practice recommended by board of studies to the respective paper for example: quiz, report generation, problem solving, etc.,

Practical: Internal Marks 40

Attendance	5 marks
Practical Test best 2 out of 3	30 marks
Record	5 marks

7.10 REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

i. Candidates shall register their names for the First Semester Examination after the admission in UG Courses.

ii. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subject of earlier semesters along the current (subsequent) Semester Subjects.

iii. Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed therefore by the Academic Council from time to time. Provided in case of a candidate earning less than 50% of attendance in any one of the Semesters due to any extraordinary circumstances such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorized Medical Attendant (AMA), duly certified by the Principal of the college, shall be permitted to proceed to the next semester and to complete the Course of study. Such Candidates shall have to repeat the missed Semester by rejoining after completion of Final Semester of the course, after paying the fee for the break of study as prescribed by the Academic Council from time to time.

iv. There shall be examinations at the end of each semester, for odd semesters in the monthof October / November, for even semesters in April / May. A candidate who does not pass the examination in any paper(s) shall be permitted to appear in such failed courses in the subsequent examinations to be held in October / November or April / May.

v. The results of all the examinations will be published through the college Website.

7.11 PASSING MINIMUM

A candidate shall be declared to have passed:

a) There shall be no Passing Minimum for Internal.

b) For External Examination, Passing Minimum shall be of 40 % (Forty Percentage) of the maximum marks prescribed for the paper for each Paper/Practical/Project and Viva-voce.

c) In the aggregate (External + Internal) the passing minimum shall be of 40%. d) He/She shall be declared to have passed the whole examination, if he/she passes in all the papers and practicals wherever prescribed / as per the scheme of examinations by earning **140** CREDITS in Parts-I, II, III, IV & V. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 Credit to qualify for the Degree. He/She shall also complete two certificate courses to qualify for the Degree.

7.12 CLASSIFICATION OF SUCCESSFUL CANDIDATES

PART- I TAMIL / OTHER LANGUAGES

TAMIL/OTHER LANGUAGES: Successful candidates passing the Examinations for the Language and securing the marks (1) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND class, respectively. All other successful candidates shall be declared to have passed the examination in the THIRD Class.

PART – II ENGLISH

ENGLISH: Successful candidates passing the examinations for English and securing the marks (i) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND Class, respectively. All other successful candidates shall be declared to have passed the examination in the THIRD class.

PART – III consisting of CORE SUBJECTS, ALLIED SUBJECTS, PROJECT with three papers: Successful candidates passing the examinations for Core papers together and securing the marks (i) 60 percent and above (ii) 50 percent and above but below 60 percent in the aggregate of the marks prescribed for the Core papers together shall be declared to have passed the examination in the FIRST and SECOND Class respectively. All other successful candidates shall be declared to have passed the examinations in the THIRD Class.

PART – IV consisting of sub items 1 (a), (b) & (c), 2, 3 and 4

Successful Candidate earning of 2 credits for each paper SHALL NOT BE taken into consideration for Classification / Ranking / Distinction.

PART – V EXTENTION ACTIVITIES

Successful Candidate earning of 1 credit for extension activities SHALL NOT BE taken into consideration for Classification / Ranking / Distinction.

7.13 RANKING

Candidates who pass all the examinations prescribed for the Course in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking / Distinction.

Provided in the case of Candidates who pass all the examinations prescribed for the Course with a break in the First Appearance due to the reasons as furnished in the Regulations 8(iii) category are only eligible for Classification.

7.14 APPEARANCE FOR IMPROVEMENT

Candidates who have passed in a theory paper / papers are allowed to appear again for theory paper / papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such candidates are allowed to improve within a maximum period of 12 semesters counting from his/her first semester of his / her admission. If candidate improve his marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. If the candidate does not show improvement in the marks, his previous marks will be taken into consideration**.** No candidate will be allowed to improve marks in the Practical, Project, Viva-voce, and Field work.

7.15 CONDONATION

Students must have 75% of attendance in each paper for appearing the examination. Students who have 74% to 70% of attendance shall apply for condonation in the prescribed form with the prescribed fee Rs. 200/-. Students who have 69% to 60% of attendance shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the programme.

7.16 RETOTALING

Candidates are permitted to apply for retotaling within 10 days from the date of publication of results. The student should submit request for retotaling in the prescribed format and paya fee of Rs.100/-.

PHOTOCOPY OF ANSWER SCRIPT

Candidates are permitted to apply for obtaining a photocopy of answer paper within 20 days from the date of publication of results. The student should submit request for photocopy of answer script in the prescribed format.

7.17 REVALUATION

Candidates are permitted to apply for revaluation after obtaining a photocopy of answer paper within 30 days from the date of publication of results. The student should submit request for revaluation in the prescribed format and pay a fee of Rs.500/- per paper.

7.18 MALPRACTICE

Any malpractice by the students debars them from subsequent appearance based on the decision of the examination committee. In all cases of malpractice their conduct certificates will indicate malpractice.

7.19 EVALUATION AND GRADING SYSTEM

The performance of a student in each paper is evaluated in terms of percentage of marks with a provision for conversion to grade points (GP). Evaluation for each paper shall be done by a continuous internal assessment by the concerned paper teacher as well as by an end semester examination and will be consolidated at the end of the course.

The term grading system indicates a Ten Point Scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade.

Once the marks of the Internal and end-semester examinations for each of the papers are available, they will be added. The marks thus obtained will then be graded as per details provided in Table.

The sum of total performance in each semester will be rated by **Grade Point Average (GPA)** while the continuous performance from the second semester onwards will be marked by **Cumulative Grade Point Average (CGPA).** These two are calculated by the following

$$GPA = \frac{\text{Sum of [Credits acquired x Grade points]}}{\text{Sum of Credits acquired}}$$

formulae.

For the calculation of Grade Point Average (GPA), Gi is the grade point awarded; Ci is the credit units earned for the ith paper.

$$CGPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum_{i=1}^{n} C_i}$$

where 'Ci' is the Credit earned for the paper i in any semester ; 'Gi' is the Grade Point obtained by the student for the paper i and 'n' is the number of papers **passed** in that or **CGPA** = GPA of all the papers starting from the first semester to the current semester.

Note: The GPA and CGPA shall be calculated separately for the following five parts:

Part I: Language Course; Part II: English Language Course and Part III: Core Cs, Allied Cs,Part IV: NME, SBC, ES, VE, Part V: Extension activities.

Marks	Grade Point	CGPA	Letter Point	Classification of Final Result
96 and above	10	9.51 and above	S^+	First Class with Exemplary
91 – 95	9.5	9.01 – 9.50	S	
86 – 90	9.0	8.51 – 9.00	D^{++}	First Class with Distinction
81 – 85	8.5	8.01 – 8.50	D^+	
76 – 80	8.0	7.51 – 8.00	D	
71 – 75	7.5	7.01 – 7.50	A^{++}	First Class
66 – 70	7.0	6.51 – 7.00	A^+	
61 – 65	6.5	6.01 – 6.50	A	
56 – 60	6.0	5.51 – 6.00	B^+	Second Class
51 – 55	5.5	5.01 – 5.50	B	
46 – 50	5.0	4.51 – 5.00	C^+	Third Class
40 – 45	4.5	4.00 – 4.50	C	
Below 40	0	Below 4.00	F	Fail

The grade card / mark sheet issued at the end of the semester to each student will containthe following:

a. the marks obtained for each paper registered in the semester
b. the credits earned for each paper registered for that semester
c. the performance in each paper by the letter grade point obtained
d. the Grade Point Average (GPA) of all the papers registered for that semester and
e. from the second semester onwards, the Cumulative Grade Point Average (CGPA) of all the papers and
f. the class and grade of the student in the final CGPA

7.20 TRANSITORY PROVISION

Candidates who have undergone the course of study prior to the academic year 2015-2016 will be permitted to appear for the examinations under those Regulations for a period of TWO years i.e. upto and inclusive of April - May 2017 Examinations. Thereafter, they will be permitted to appear for the examination only under the Regulations then in force.

7.21 INSTANT EXAMINATION

Candidates who have passed all the theory papers upto 5th semester and failed in only one paper pertaining to the 6th semester can apply for Instant Examination. Application form with a demand draft for Rs.300/-, drawn in favour of “The Principal, Sri Sankara Arts and Science College, Enathur” should be submitted on or before 10 days after the publication of results. The results are published within 15 days after the date of examinations.B.C.A Syllabus

8 Highlight soft the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Computer Science based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest – Statistics withR Programming, Data Science, Machine learing. Internet of Things and Artificial Intelligence etc...

9 Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/Benefits
I	**Foundation Course** To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world..	• Instil confidence among students • Create interest for the subject
I,II,III,IV	**Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial)	• Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable
		Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects
		• Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.
		• Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment
		Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools

III,IV,V &VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	• Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education / industry / communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	• Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II year Vacation activity	Internship / Industrial Training	• Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva – voce	• Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	• Curriculum design accommodates all category of learners; 'Mathematics for Advanced Explain' component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; • 'Training for Competitive Examinations' –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: **For Advanced Learners / Honorsdegree**		• To cater to the needs of peer learners / research aspirants

Skills acquired from the Courses	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
Part 1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	5.1 Core Course –\CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part.2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	5	2..3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5. 3.Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5. 4.Core Course –/ Project with viva- voce CC - XII	4	5	6.4 Elective -VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective II Generic/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective v Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.6 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement - (Foundation Course)	2	2	2.7 Skill Enhancement Course –SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S.		1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training	2				
	23	**30**		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System

For all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	**30**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	**30**

Third Year
Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	28
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	-
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	18	28
Part-4	Professional Competency Skill	2	2
Part-5	Extension Activity	1	-
		21	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	**140**

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to becompleted during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

First Year
Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	**Language** – Tamil-I	3	6
Part-II	**English-I**	3	6
Part-III	**Core Course – CC-1-** Python Programming	5	5
	Core Course – CC-I1 - Practical : Python Programming Lab	5	5
	Elective Course I - Generic (Any One) – Mathematics I Statistics I Physics I	3	4
Part-IV	**Skill Enhancement Course (SEC-1) :** Office Automation *	2	2
	Basic Tamil *		
	Advanced Tamil I*		
	Skill Enhancement (Foundation Course FC): Structured Programming in C	2	2
		23	**30**

PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)

1. Students who have studied Tamil upto XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have not studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take **Basic Tamil** comprising of Two Courses (level will be at 6th Std.).
3. Students who have studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take **Advanced Tamil** comprising of Two Courses.

Semester-II

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	**Language** –Tamil-II	3	6
Part-II	**English-II**	3	6
Part-III	**Core Course – CC-III** : Object Oriented Programming Concept using C++	5	5
	Core Course – CC-IV : Practical: C++ Programming Lab	5	5
	Elective Course II - Generic (Any One) – Mathematics II Statistics II Physics II	3	4
Part-IV	**Skill Enhancement Course (SEC-2)**: HTML Lab	2	2
	Skill Enhancement Course (SEC-3): Fundamentals of Information Technology	2	2
	Basic Tamil II*		
	Advanced Tamil II*		
		23	**30**

Second Year
Semester-III

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	**Language** – Tamil – III	3	6
Part-II	**English – III**	3	6
Part-III	**Core Course – CC-V** - Data Structures and Algorithm	5	5
	Core Course – CC-VI - Practical: Data Structures and Algorithm Lab	5	5
	Elective Course III: **Generic** (Any One) Mathematics I Financial Accounting I Physics I	3	4
Part-IV	**Skill Enhancement Course (SEC-4)** : PHP Programming Lab	2	2
	Skill Enhancement Course (SEC-5) : Web Design Lab	1	1
	Environmental Studies	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	**Language** – Tamil – IV	3	6
Part-II	**English – IV**	3	6
Part-III	**Core Course – CC-VII** – Programming in Java	5	5
	Core Course – CC-VIII - Practical: Programming in Java Lab	5	5
	Elective Course IV: **Generic** (Any One) Mathematics II Financial Accounting II Physics II	3	3
Part-IV	**Skill Enhancement Course (SEC-6)**: Understanding Internet	2	2
	Skill Enhancement Course (SEC-7): Quantitative Aptitude	2	2
	Environmental Studies	2	1
		25	**30**

Third Year
Semester-V

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	**Core Course – CC-IX** – Operating System	4	5
	Core Course – CC-X – ASP.NET Programming	4	5
	Core Course – CC-XI - Practical - ASP.NET Programming Lab	4	5
	Core Course – CC-XII - Project with Viva Voce	4	5
	Elective Course V - Discipline Specific – (Any One) Cloud Computing/ Natural Language Processing/ IOT and its Applications	3	4
	Elective Course VI - Discipline Specific –(Any One) Introduction to Data Science / Cryptography/ Artificial Neural Network	3	4
Part-IV	**Value Education**	2	2
	Summer Internship / Industrial Training (Summer vacation at the end of IV semester activity)	2	--
		26	**30**

Semester-VI

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	**Core Course – CC-XIII** – Computer Network	4	6
	Core Course – CC-XIV - Data Analytics Using R Programming	4	6
	Core Course – CC-XV – Practical R Programming Lab	4	6
	Elective Course VII - Discipline Specific – (Any One) DBMS/ Big Data Analytics/ Artificial Intelligence	3	5
	Elective Course VIII - Discipline Specific – (Any One) Software Project Management / Image Processing/ Robotics and Its Applications	3	5
Part-IV	**Professional Competency Skill Enhancement Course** Advanced Excel	2	2
Part -V	**Extension Activity**	1	--
		21	**30**

Total Credits: 140

FIRST YEAR

SEMESTER-I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PYTHON PROGRAMMING		5	-	-	-	5	25	75	100

Learning Objectives	
LO1	To make students understand the concepts of Python programming.
LO2	To apply the OOPs concept in PYTHON programming.
LO3	To impart knowledge on demand and supply concepts
LO4	To make the students learn best practices in PYTHON programming
LO5	To know the costs and profit maximization

UNIT	Contents	No. of Hours
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation-Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	**15**
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass state ents**.**	**15**
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments-Recursion. **Python Strings:** String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir () function – Modules and Namespace – Defining our own modules.	**15**

IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries..	**15**
V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
	TOTALHOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1,PO2,PO3, PO4,PO5,PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1,PO2,PO3, PO4,PO5,PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1,PO2,PO3, PO4,PO5,PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1,PO2,PO3, PO4,PO5,PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1,PO2,PO3, PO4,PO5,PO6

Textbooks

1	ReemaThareja, ―Python Programming using problem solving approach‖, First Edition, 2017, Oxford University Press.
2	Dr. R. NageswaraRao, ―Core Python Programming‖, First Edition, 2017, Dream tech Publishers.

Reference Books

1.	VamsiKurama, ―Python Programming: A Modern Approach‖, Pearson Education.
2.	Mark Lutz, ‖Learning Python‖, Orielly.
3.	Adam Stewarts, –Python Programming‖, Online.
4.	Fabio Nelli, ―Python Data Analytics‖, APress.

5.	Kenneth A. Lambert, ‒Fundamentals of Python – First Programs‖, CENGAGE Publication.
Web Resources	
1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**2**	**3**	**2**	**3**
CO3	**3**	**2**	**2**	**3**	**2**	**2**
CO4	**3**	**2**	**2**	**3**	**2**	**3**
CO5	**3**	**2**	**2**	**3**	**3**	**3**
Weight age of course contributed to each PSO	15	10	10	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PYTHON LAB	CORE	-	-	5	-	5	40	60	100

CourseObjectives:

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. Be able to read and write files in Python.

LAB EXERCISES	Required Hours
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	**75**

Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of PYTHON language
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**2**	**2**	**2**	**3**	**2**
CO2	**2**	**1**	**3**	**2**	**-**	**2**
CO3	**3**	**3**	**1**	**1**	**1**	**2**
CO4	**2**	**3**	**3**	**1**	**-**	**1**
CO5	**3**	**2**	**3**	**1**	**1**	**-**
Weightage of course contributed to each PSO	12	11	12	7	5	7

S-Strong-3 M-Medium-2L-Low-1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst.Hours**	**Marks**		
									CIA	**External**	**Total**
	OFFICE AUTOMATION	SEC	2	-	-	-	2	2	25	75	100

Course Objective	
LO1	Understand the basics of computer systems and its components.
LO2	Understand and apply the basic concepts of a word processing package.
LO3	Understand and apply the basic concepts of electronic spreadsheet software.
LO4	Understand and apply the basic concepts of database management system.
LO5	Understand and create a presentation using PowerPoint tool.

UNIT	**Details**	**No. of Hours**
I	**Introductory concepts:** Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS– UNIX–Windows.Introduction to Programming Languages.	6
II	**Word Processing:** Open, Save and close word document; Editing text – tools,formatting,bullets;Spell Checker-Document formatting–Paragraph alignment, indentation, headers and footers,numbering ; printing– Preview,options,merge.	6
III	**Spread sheets:**Excel–opening, entering text and data ,formatting, navigating; Formulas–entering, handling and copying;Charts– creating,formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	6

IV	**Database Concepts:** The concept of data base management system; Datafield, records, and files, Sorting and indexing data; Searching records.Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applications inquery language (MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slide type casting & viewing slides–creating slide shows.Applying special object – including objects & pictures – Slide transition–Animation effects,audio inclusion ,timers.	6
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8

TextBook	
1	PeterNorton,–Introduction toComputers‖–TataMcGraw-Hill.
ReferenceBooks	
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, ―Microsoft 2003‖, Tata McGrawHill.
WebResources	
1.	https://www.udemy.com/course/office-automation-certificate-course/
2.	https://www.javatpoint.com/automation-tools

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**2**	**2**	**3**	**3**	**1**
CO2	**3**	**1**	**2**	**3**	**3**	**3**
CO3	**3**	**2**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**2**	**2**	**2**	**1**
CO5	**2**	**2**	**1**	**3**	**1**	**3**
Weightage of course Contributed to each PSO	13	10	8	13	10	11

S-Strong-3 M-Medium-2 L-Low-1

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Structured Programming Language in C	FC	2	-	-	-	2	2	25	75	100

Course Objective	
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Datatypes in C, Mathematical and logical operations.
LO2	Tounderstand the concept using if statements and loops
LO3	This unit covers the concept of Arrays
LO4	This unit covers the concept of Functions
LO5	To under stand the concept of implementing pointers.

UNIT	**Details**	**No. of Hours**
I	**Overview of C** : Importance of C, sample C program, C program structure, executing C program.Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, datatypes, declaration of variables, Assigning values to variables – Assignment statement, declaring a variable as constant, as Volatile. Operators and Expression.	6
II	**Decision Making and Branching**: Decision making with If, simple IF, IF ELSE, nested IF ELSE, ELSE IF ladder, switch, GOTO statement.**Decision Making and Looping**: While, Do-While, For, Jumps in loops.	6
III	**Arrays**: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional Arrays.	6

IV	**Functions**: The form of C functions, Return values and types,calling a function, categories of functions, Nested functions,Recursion,functions with arrays, call by value,call by reference,storage classes-character arrays and string functions	6
V	**Pointers:** definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and Structures.	6
	Total	**30**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Remember the program structure of C with its syntax and semantics	PO1,PO3,PO5
2	Under stand the programming principles in C (datatypes, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2,PO3,PO6,PO7
3	Apply the programming principles learn in real-time problems	PO3,PO4,PO7
4	An alyze the various methods of solving a problem and choose the best method	PO4,PO5,PO6
5	Code, debug and test the programs with appropriate Test cases	PO7,PO8

Text Book	
1	E.Balagurusamy, Programmingin ANSIC, Fifth Edition, Tata McGraw-Hill,2010.
ReferenceBooks	
1.	Byron Gottfried, Schaum_s Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2.	Kernighan and Ritchie,The C Programming Language, Second Edition, Prentice Hall, 1998
3.	Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021
Web Resources	
1.	https://codeforwin.org/
2.	https://www.geeksforgeeks.org/c-programming-language/
3.	http://en.cppreference.com/w/c
4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**1**	**2**	**2**	**2**	**2**	**-**
CO2	**2**	**2**	**2**	**2**	**-**	**2**
CO3	**3**	**2**	**2**	**1**	**1**	**-**
CO4	**3**	**2**	**2**	**1**	**-**	**1**
CO5	**1**	**2**	**2**	**2**	**2**	**3**
Weightage of course contributed to each PSO	7	10	10	18	15	6

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER II

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC3	**OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++**	Core	5	-	-	-	5	5	25	75	100

Course Objective	
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
LO5	Demonstrate the use of various OOPs concepts with the help of programs

UNIT	**Details**	**No. of Hours**

I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages–Object Oriented Languages–I/O in C++-C++ Declarations. Control Structures:- Decision Making and Statements: If ..Else, jump, goto, break, continue, Switch case statements - Loops inC++: for, while, do - functions in C++ - inline functions – Function Overloading.	15
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions–array of objects–friend functions – Overloading member functions – Bit fields and classes –Constructor and destructor with static members.	15
III	Operator Overloading: Overload in unary, binary operators–Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance– Virtual base Classes–Abstract Classes.	15
IV	Pointers–Declaration–Pointer to Class, Object–this pointer–Pointers to derived classes and Base classes – Arrays – Characteristics – array ofclasses – Memory models – new and delete operators – dynamic object –Binding, Polymorphism and Virtual Functions.	15
V	Files –File stream classes –file modes–Sequential Read /Write operations–Binary and ASCII Files–Random Access Operation– Templates –Exception Handling- String –Declaring and Initializing string objects–String Attributes–Miscellaneous functions.	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Under stand the programming principles in C (datatypes, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
3	Apply the programming principles learn in real-Time problems	PO4,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8

TextBook

1. E.Balagurusamy,-Object-OrientedProgrammingwithC++ – ,TMH 2013,7th Edition.

ReferenceBooks

1. Ashok N Kamthane,-Object-Oriented Programming with ANSI and Turbo C++‖, Pearson Education 2003.
2. Maria Litvin & Gray Litvin,‖C++ for you‖, Vikas publication 2002.

Web Resources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**1**	**-**	**-**	**1**
CO2	**2**	**2**	**2**	**1**	**-**	**-**
CO3	**3**	**1**	**1**	**-**	**1**	**-**
CO4	**1**	**2**	**1**	**2**	**2**	**1**
CO5	**3**	**2**	**1**	**2**	**3**	**2**
Weightage of course contributed to each PSO	12	9	6	5	6	4

S-Strong-3 M-Medium-2 L-Low-1

Title of the Course / Paper	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	C++ PROGRAMMING LAB	Core	-	-	5	-	5	5	40	60	100

CourseObjective	
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data an dobjects
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc
LO3	Describe the concept of function over loading,operator overloading, virtual functions and polymorphism
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
LO5	Demonstrate the use of various OOPs concepts with the help of programs

S.No	Details	No. of Hours
1	Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.	

2	Write a C++ program to demonstrate Class and Objects	75
3	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
4	Write a C++ program to demonstrate the Friend Functions.	
5	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
6	Write a C++ program to demonstrate Constructor and Destructor	
7	Write a C++ program to demonstrate Unary Operator Overloading	
8	Write a C++ program to demonstrate Binary Operator Overloading	
9	Write a C++ program to demonstrate: • Single Inheritance • Multi level Inheritance • Multiple Inheritance • Hierarchical Inheritance • Hybrid Inheritance	
10	Write a C++ program to demonstrate Virtual Functions.	
11	Write a C++ program to manipulate a TextFile.	
12	Write a C++ program to perform Sequential I/O Operations on a file.	
13	Writea C++ program to find the Biggest Number using Command Line Arguments	
14	Write a C++ program to demonstrate ClassTemplate	
15	Write a C++ program to demonstrate Function Template.	
16	Writea C ++ program to demonstrate Exception Handling.	

Course Outcomes		**Programme Outcome**
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Under stand the programming principles in C (datatypes, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2

3	Apply the programming principles learnt in real-time problems	PO4,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8
Text Book		
1	E.Balagurusamy,-Object-Oriented Programming with C++ –, TMH 2013,7th Edition.	
Reference Books		
1.	Ashok N Kamthane,-Object-Oriented Programming with ANSI and Turbo C++Ⅱ, Pearson Education 2003.	
2.	Maria Litvin & Gray Litvin,– C++ for you —, Vikas publication 2002.	
Web Resources		
1.	https://alison.com/course/introduction-to-c-plus-plus-programming	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**3**	**1**	**2**
CO2	**2**	**3**	**3**	**3**	**1**	**2**
CO3	**2**	**3**	**3**	**3**	**1**	**2**
CO4	**2**	**3**	**3**	**3**	**1**	**2**
CO5	**2**	**3**	**3**	**3**	**1**	**2**
Weightage of course contributed to each PSO	11	15	15	15	5	10

S-Strong-3 M-Medium-2L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Inst. hours	Credits	Marks		
									CIA	External	Total
	Fundamentals of Information Technology	SEC	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand basic concepts and terminology of information technology.
LO2	Have a basic understanding of personal computers and their operation
LO3	Be able to identify data storage and its usage
LO4	Get great knowledge of software and its functionalities
LO5	Understand about operating system and their uses

UNIT	Contents	No. Of. Hours
I	**Introduction to Computers:** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer	**6**
II	**Basic Computer Organization:** Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, and Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	**6**
III	**Storage Fundamentals:** Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	**6**
IV	**Software:** Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	**6**
V	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters.Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6

CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Anoop Mathew, S. KavithaMurugeshan (2009), ―Fundamental of Information Technology‖, Majestic Books.
2	Alexis Leon, Mathews Leon,‖ Fundamental of Information Technology‖, 2nd Edition.
3	S. K Bansal, ―Fundamental of Information Technology‖.

Reference Books

1.	Bhardwaj Sushi lPuneet Kumar, ―Fundamental of Information Technology‖
2.	GG WILKINSON, ―Fundamentals of Information Technology‖, Wiley-Blackwell
3.	A Ravichandran , ―Fundamentals of Information Technology‖, Khanna Book Publishing

Web Resources

1.	https://testbook.com/learn/computer-fundamentals
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3.	https://www.javatpoint.com/computer-fundamentals-tutorial
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	HTML LAB	Skill Enha. Course (SEC)		-	2		2	40	60	100

Learning Objectives		
LO1	Insert a graphic within a web page.	
LO2	Create a link within a web page.	
LO3	Create a table within a web page.	
LO4	Insert heading levels within a web page.	
LO5	Insert ordered and unordered lists within a web page. Create a web page.	
UNIT	**Contents**	**No. Of. Hours**
	1. Write a HTML program to display ―Happy Birthday‖ Wishes 2. Write a HTML program to demonstrate Text Formatting Tags 3. Write a HTML program to create a Home page having three links and Create separate web pages for the three links 4. Write a HTML program to demonstrate Ordered List 5. Write a HTML program to demonstrate Unordered List 6. Write a HTML program to demonstrate Definition List 7. Write a HTML code to create a Time Table for your class 8. Write a HTML code to illustrate Image Mapping 9. Write a HTML program to add Multimedia to your page 10. Write an HTML program to create a Registration Form	**30**
	TOTAL HOURS	**30**

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

Textbooks	
1	―Mastering HTML5 and CSS3 Made Easy‖, TeachUComp Inc., 2014.
2	**Thomas Michaud, "Foundations of Web Design: Introduction toHTML & CSS"**
Web Resources	

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

SECONDYEAR

Semester III

Title of the Course /Paper	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	DATA STRUCTURES AND ALGORITHMS	Core	5	-	-	-	5	5	25	75	100

Course Objective	
LO1	T ounderstand the concepts of ADTs
LO2	To learn linear data structures - lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To under stand various sorting and searching

UNIT	**Details**	**No.of Hours**
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomia lManipulation-Alloperations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations-Applications-Evaluating arithmetic expressions –Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue-Priority Queue-deQueue applications of queues.	15
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+Tree –Heap-Applications of heap.	15
IV	Definition-Representation of Graph-Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cutvertex-Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search- Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining-Open Addressing-Rehashing Extendible Hashing	15
	Total	**75**

CourseOutcomes		Programmeme Outcome
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, datatypes, algorithms, Big O notation	PO1,PO6
2	Understand basic data structures such as arrays, linked lists,stacks and queues	PO2
3	Describe the hash function and concepts of collision and Its resolution methods	PO2,PO4
4	Solve problem involving graphs,trees and heaps	PO6,PO8
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO7
TextBook		
1	1.MarkAllenWeiss,–DataStructuresandAlgorithmAnalysisinC++‖,Pearson Education2014,4th Edition.	
2	Reema Thareja,‖ Data Structures Using C ‖,Oxford Universities Press 2014, 2nd Edition	
ReferenceBooks		
1.	Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein,-Introduction to Algorithms‖ –, McGraw Hill 2009,3rd Edition.	
2.	Aho,Hopcroftand Ullman,‖Data Structures and Algorithms –, Pearson Education 2003	
Web Resources		
1.	NPTEL & MOOC courses titled Data Structures	
2.	https://nptel.ac.in/courses/106106127/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**-**	**1**	**-**
CO2	**1**	**2**	**1**	**-**	**-**	**-**
CO3	**3**	**1**	**2**	**1**	**-**	**-**
CO4	**2**	**2**	**1**	**-**	**-**	**1**
CO5	**3**	**1**	**1**	**-**	**-**	**-**
Weightage of course Contributed to each PSO	12	9	8	1	1	1

S-Strong-3 M-Medium-2 L-Low-1

Title of the Course / Paper	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	DATASTRUCTURES AND ALGORITHMS LAB using C++	Core	-	-	5	-	5		40	60	100

CourseObjective	
LO1	To understand the concepts of ADTs
LO2	Tolearn linear datastructures - lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To under stand various sorting and searching

Sl.No	Details	No.of Hours
1.	Write a program to implement the List ADT using arrays and linked Lists.	75
2.	Write a programs to implement the following using a singly linked list. • Stack ADT • Queue ADT	
3.	Write a program that reads an infix expression,converts the expression to post fix form and then evaluates the postfix expression (use stack ADT).	
4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: • Insert an elementin to a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree.	
6.	Write a program to perform the following operations • Insertionin to an AVL-tree • Deletion from an AVL-tree	

7.	Write a program for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: • Linear search • Binary search.	
9.	Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.	
	Total	75

Course Outcomes		**Programmem Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, datatypes, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists,stacks and queues	PO1,PO4,PO8
3	Describe the hash function and concepts of collision and Its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs,trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting,searching,insertion and deletion of data	PO1,PO5,PO6

Text Book	
1	1.MarkAllenWeiss,–DataStructuresandAlgorithmAnalysisinC++‖,Pearson Education2014, 4th Edition.
2	Reema Thareja,‖ Data Structures Using C ‖,Oxford Universities Press 2014, 2nd Edition

Reference Books	
1.	Thomas H.Cormen, Chales E.Leiserson, Ronald L.Rivest, Clifford Stein,-Introduction to Algorithms‖ —, McGraw Hill 2009, 3rd Edition.
2.	Aho,Hopcroftand Ullman,‖Data Structures and Algorithms –, Pearson Education 2003

Web Resources	
1.	NPTEL & MOOC courses titled Data Structures
2.	https://nptel.ac.in/courses/106106127/

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**2**	**1**	**-**
CO2	**1**	**2**	**1**	**-**	**-**	**2**
CO3	**3**	**1**	**2**	**1**	**-**	**-**
CO4	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**3**	**2**	**1**	**-**	**-**	**-**
Weightage of course contributed to each PSO	12	10	8	5	4	4

S-Strong-3 M-Medium-2L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	PHP PROGRAMMING LAB	Skill Enha.Course (SEC)	-	-	1	-	1	1	40	60	100

Learn ing Objectives	
LO1	To provide the necessary knowledge on basics of PHP.
LO2	To design and develop dynamic, database-driven web applications using PHP version.
LO3	To get an experience on various web application development techniques.
LO4	To learn the necessary concepts for working with the files using PHP.
LO5	To get a knowledge on OOPS with PHP.

UNIT	Contents	No. of Hours
	1. Write a PHP program which adds up columns and rows of given table 2. Write a PHP program to compute the sum of first n given prime numbers 3. Write a PHP program to validate an email address 4. Write a PHP program to convert a number written in words to digit. 5. Write a PHP script to delay the program execution for the given number of seconds. 6. Write a PHP script, which changes the colour of the first character of a word 7. Write a PHP program to generate a multiplication table of a number. 8. Write a PHP program to calculate the Factorial of a number.	15

	9. Write a PHP script to read a file, reverse its contents, and write the result back to a new file 10. Write a PHP script to look through the current directory and rename all the files with extension .txt to extension .xtx	
	Total	**15**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and meta characters.	PO2,PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6.

Text Book	
1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes
Reference Books	
1.	PHP: The Complete Reference-Steven Holzner.
2.	DT Editorial Services (Author), ‖*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*‖, Paperback 2016, 2nd Edition.
Web Resources	
1.	Opensource digital libraries: PHP Programming
2.	https://www.w3schools.com/php/default.asp

Mapping with Programme Outcomes:

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

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	WEB DESIGNING LAB	Skill Enha. Course (SEC)	-	-	2	-	2		40	60	100

Learning Objectives	
LO1	Understand the basics of HTML and its components
LO2	To study about the Graphics in HTML
LO3	Understand and apply the concepts of CSS
LO4	Understand the concept of JavaScript
LO5	Understand the table concept

UNIT	Details	No. of Hours
	1. Write a HTML program to use heading tags 2. Write a HTML program to use external and internal links in web page 3. Write a HTML program to insert image in a web page and use the image properties 4. Write a HTML program to format text using CSS 5. Write a JavaScript program to print the contents of the current window. 6. Write a JavaScript program to get the current date. 7. Write a JavaScript program to convert temperatures to and from Celsius, Fahrenheit. 8. Write a JavaScript exercise to create a variable using a user-defined name. 9. Write a JavaScript program to calculate multiplication and division of two numbers (input from user) 10. Write a JavaScript program to set the background color of a paragraph. 11. Write a JavaScript function to get the values of First name and Last name and print the result. 12. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link. 13. Write a JavaScript function that creates a table by accepting the number of rows & columns from the user. 14. Write a JavaScript program to get the width and height of the window (any time the window is resized)	30
	Total	**30**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6

CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using javascript.	P02, PO6, PO7
Text Book		
1	Pankaj Sharma, ―Web Technology‖, SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, ―Java Script‖, Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole&AtulKahate, ―Web Technologies‖, 2002, 2nd Edition.	
Reference Books		
1.	Laura Lemay, RafeColburn, Jennifer Kyrnin, ―Mastering HTML, CSS &Javascript Web Publishing‖, 2016.	
2.	DT Editorial Services (Author), ―HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)‖, Paperback 2016, 2nd Edition.	
Web Resources		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	https://www.geeksforgeeks.org	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**1**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**	**2**	**3**
CO5	**3**	**2**	**2**	**2**	**3**	**3**
Weightage of course contributedto each PSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC7	**Programming in JAVA**	Core	5	-	-	-	5	5	25	75	100

Course Objectives	
LO1	To provide fundamental knowledge of object-oriented programming
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.
LO4	To provide fundamental knowledge of object-oriented programming.
LO5	To equip the student with programming knowledge in Core Java from the basics up.

UNIT	**Details**	**No. of Hours**
I	**Introduction:**Review of Object Oriented concepts-History of Java-Java buzz words-JVM architecture-Data types-Variables-Scope and life time of variables - Arrays -operators-control statements-type conversion and casting-simple java program-constructors - methods-Static block-Static Data-Static Method String and String Buffer Classes.	15
II	**Inheritance**: Basic concepts - Types of inheritance -Member access rules- Usage of this and Super keyword-Method Over loading-Method over riding-Abstract classes - Dynamic method dispatch - Usage offinal keyword. **Packages**: Definition-Access Protection - ImportingPackages. **Interfaces**:Definition–Implementation–Extending	15

	Interfaces. **Exception Handling**: *try–catch- throw - throws–finally*–Built-inexceptions- Creating own Exception classes.	
III	**Multithreaded Programming**: Thread Class-Runnableinterface–Synchronization–Using synchronized methods– Using synchronized statement-Inter thread Communication–Deadlock. **I/OStreams:** Concepts of streams-Stream classes-Byte and Character stream-Reading console Inputand Writing Console output-File Handling.	15
IV	**AWT Controls:** The AWT class hierarchy-user interface components-Labels-Button-TextComponents - Check Box - Check Box Group - Choice -List Box - Panels – Scroll Pane - Menu - Scroll Bar.Working with Frame class - Colour - Fonts and layout managers. **EventHandling:**Events-Eventsources-Event Listeners - Event Delegation Model (EDM) – Handling Mouse and Keyboard Events - Adapter classes – Innerclasses	15
V	**Swing:** Introduction to Swing-Hierarchy of swing components.Containers-Top level containers-JFrame-JWindow - JDialog - JPanel - JButton - JToggleButton -JCheckBox-JRadio Button- JLabel, JTextField-JText Area-JList-JComboBox-JScroll Pane.	15
	Total	**75**

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1,PO2,PO6
CO2	Implement inheritance, packages, interfaces and Exception handling of Core Java.	PO2,PO3,PO8

CO3	Implement multi-threading and I/O Streams of Core Java	PO1,PO3,PO7
CO4	Implement AWT and Event handling.	PO2,PO6
CO5	Use Swing to create GUI.	PO1,PO3,PO8
Text Books:		
1.	Herbert Schildt, –The Complete Reference –,Tata McGraw Hill, New Delhi,7th Edition, 2010	
2.	Gary Cornell, *CoreJava2 VolumeI–Fundamentals,*AddisonWesley,1999	
References:		
1.	Head First Java, O_Rielly Publications,	
2.	Y.DanielLiang, *Introduction to Java Programming* ,7th Edition, Pearson Education India, 2010	
Web Resources		
1.	https://javabeginnerstutorial.com/core-java-tutorial	
2.	http://docs.oracle.com/javase/tutorial/	
3.	https://www.coursera.org/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**2**	**2**	**2**
CO2	**3**	**1**	**2**	**1**	**2**	**2**
CO3	**1**	**-**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**1**	**2**	**-**	**2**	**2**	**2**
Weightage of course Contributed to each PSO	10	7	6	9	10	10

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Programming in java lab	Core	-	-	5	-	5	5	40	60	100
Course Objective											
LO1	To provide fundamental knowledge of object-oriented programming										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.										
LO4	To provide fundamental knowledge of object-oriented programming.										
LO5	To equip the student with programming knowledge in Core Java from the basics up.										
UNIT	**Details**										
1	Write a Java program that prompts the user for an integer and then prints Out all the prime numbers up to that Integer										5
2	Write a Java program to multiply two give n matrices.										5
3	Write a Java program that displays the number of characters, lines and words in a text										5
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.										5
5	Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings										5
6	Write a program to perform the following string operation susing String class:										5

	a. String Concatenation b. Search a substring c. To extract substring from given string	5
7	Write a program to perform string operations usingString Buffer class: a. Length of a string b. Reversea string c. Delete a substring from the given string	5
8	Write a java program that implements a multi-thread application that has three threads.First thread generates random integer every1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	5
9	Write a threading program which uses the same method a synchronously to print the numbers1to10 using Thread 1 and to print 90 to 100 using Thread 2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception	5
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	5
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	5

13	Write a Java program that handles all mouse events and shows the event name at the enter of the window when a mouse event is fired. (Use adapter classes).	5
14	Write a Java program that works as a simple calculator. Use a grid lay out to arrange buttons for the digits and for the +, - ,* ,% operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	5
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.	5
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and Exception handling of Core Java.	PO1,PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4,PO6
4	Implement AWT and Event handling.	PO4,PO5,PO6
5	Use Swing to create GUI.	PO3,PO8

TextBook

1. Herbert Schildt, "The Complete Reference",Tata McGraw Hill, New Delhi,7th Edition, 2010
2. Gary Cornell, *CoreJava2 VolumeI–Fundamentals,*AddisonWesley,1999

References:

1. Head First Java, O_Rielly Publications,
2. Y.DanielLiang, *Introduction to Java Programming* ,7th Edition, Pearson Education India, 2010

Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**1**	**3**	**2**	**3**
CO2	**3**	**2**	**1**	**3**	**1**	**3**
CO3	**3**	**2**	**1**	**3**	**2**	**3**
CO4	**3**	**2**	**1**	**3**	**2**	**3**
CO5	**3**	**2**	**1**	**3**	**2**	**3**
Weightage of course contributed to each PSO	15	10	5	15	9	15

S-Strong-3 M-Medium-2L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	UNDERSTANDING INTERNET	Skill Enha. Course (SEC)	2	-	-		2	25	75	100

Learning Objectives	
LO1	Knowledge of Internet medium
LO2	Internet as a mass medium
LO3	Features of Internet Technology,
LO4	Internet as source of infotainment
LO5	Study of internet audiences and about cyber crime

UNIT	Contents	No. Of. Hours
I	The emergence of internet as a mass medium – the world of _world wide web‘.	**6**
II	Features of internet as a technology.	**6**
III	Internet as a source of infotainment – classification based on content and style.	**6**
IV	Demographic and psychographic descriptions of internet _audiences‘ – effect of internet on the values and life-styles.	**6**
V	Present issues such as cybercrime and future possibilities.	**6**
	TOTAL HOURS	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows the concept of internet as a technology.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of Internet	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	01. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.	
2	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.	
3	Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.	
	Reference Book	
1	Acharya, R N [1987] Television in India. Manas Publications, New Delhi.	
2	Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP	
3	Luthra, H R [1986] Indian Broadcasting. Ministry of I& B, New Delhi.	
4	Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.	
Web Resources		
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf	
2.	https://www.w3schools.com/html/default.asp	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Quantitative Aptitude	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	To understand the basic concepts of numbers
LO2	Understand and apply the concept of percentage, profit & loss
LO3	To study the basic concepts of time and work, interests
LO4	To learn the concepts of permutation, probability, discounts
LO5	To study about the concepts of data representation, graphs

UNIT	**Contents**	**No. of Hours**
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Square root and cube roots - Average-problems on Numbers.	6
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.	6
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.	6
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Odd man out & Series.	6
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs.	6
	Total	**30**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	understand the concepts, application and the problems of numbers	PO1
CO2	To have basic knowledge and understanding about percentage, profit & loss related processings	PO1, PO2
CO3	To understand the concepts of time and work	PO4, PO6

CO4	Speaks about the concepts of probability, discount	PO4, PO5
CO5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO6
Text Book		
1	—QuantitativeAptitude‖,R.S.AGGARWAL.,S.Chand&CompanyLtd.,	
Reference Books		
1.		
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**2**	**2**
CO2	**2**	**3**	**1**	**3**	**2**	**2**
CO3	**1**	**3**	**1**	**1**	**3**	**1**
CO4	**1**	**2**	**1**	**1**	**3**	**1**
CO5	**1**	**2**	**1**	**1**	**3**	**3**
Weightage of course contributed to each PSO	**8**	**12**	**5**	**8**	**13**	**9**

S-Strong-3 M-Medium-2 L-Low-1

THIRD YEAR

SEMESTER V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Operating Systems	Core	5	-	-	-	4	5	25	75	100

Course Objective	
LO1	Under standing the design of the Operating System
LO2	Imparting knowledge on CPU scheduling, Process and Memory Management.
LO3	To code specialized programs for managing over all resources and operations of the computer.
LO4	To study about the concept to Job and processor scheduling
LO5	To learn about to concept of memory organization and multi programming

UNIT	**Details**	**No.of Hours**
	Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation.**Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts- Interrupt processing, interrupt classes,Inter process communication-signals,message passing.	15
II	**Asynchronous concurrent processes:**mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson_s algorithm, software solutions to the mutual Exclusion Problem-,n-thread mutual exclusion-Lamports Bakery Algorithm.Semaphores–Mutual exclusion with Semaphores, thread synchronization with semaphores,	15

	Counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing	
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra_s Banker_s algorithm, deadlock detection, deadlock recovery.	15
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptivevs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling.	15
V	**Real Memory organization and Management :**Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation,single user contiguous memory allocation, fixed partition multi programming, variable partition multi programming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multi level storageorganization, block mapping, paging basic concepts, segmentation, and paging/segmentation systems. **Virtual Memory Management:**Demand Paging, Page replacement strategies	15
	Total	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Define the fundamentals of OS and identify the concepts relevant to process, process life cycle,Scheduling Algorithms, Deadlock and Memory management	PO1
2	Know the critical analysis of process involving various algorithms, an exposure to threads and semaphores	PO1,PO2
3	Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock..	PO4,PO6

4	Have complete knowledge of Scheduling Algorithms and its types.	PO4,PO5,PO6
5	Under stand memory organization and management	PO3,PO8
Text Book		
1	H.M.Deitel, Operating Systems,Third Edition,Pearson Education Asia,2011	
Reference Books		
1.	William Stallings, Operating System: Internals and Design Principles,Seventh Edition, Prentice-Hallof India, 2012.	
2.	A.Silberschatz, and P.B. Galvin., OperatingSystems Concepts, Nineth Edition, John Wiley & Sons (ASIA) Pte Ltd., 2012	

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**-**	**1**	**2**	**-**	**1**
CO2	**2**	**3**	**1**	**2**	**-**	**1**
CO3	**3**	**2**	**-**	**3**	**-**	**1**
CO4	**1**	**3**	**1**	**1**	**3**	**2**
CO5	**3**	**-**	**1**	**3**	**2**	**1**
Weightage of course contributed to each PSO	12	8	4	11	5	6

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	ASP.Net Programming	Core	5	-	-	-	4	5	25	75	100
Course Objective											
LO1	To identify and understand the goals andobjectives of the .NET framework and ASP.NET with C# language.										
LO2	To develop ASP.NET Web application using standard controls.										
LO3	To implement file handling operations.										
LO4	To handles SQLServer Database using ADO.NET.										
LO5	Understand the Grid view control and XML classes.										
UNIT	**Details**										**No. of Hours**
I	Overview of .NET framework : Common Language Runtime (CLR),Framework Class Library-C# Fundamentals : Primitive types and Variables – Operators –Conditional statements-Looping statements –Creating and Using Objects–Arrays–String operations.										15
II	Introductionto ASP.NET – IDE -Languages supported Components – Working with WebForms–Webform standard controls : Properties and its events–HTML Controls- ListControls: Properties and its events.										15
III	Rich Controls: Properties and its events–validation controls: Properties and its events– File Stream classes -File Modes – File Share – Reading and Writing to files –Creating, Moving, Copying and Deletingfiles – File uploading.										15
IV	ADO.NET Overview–Database Connections–Commands –DataReader- DataAdapter- DataSets-DataControls and										15
	Its Properties–DataBinding										
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes–Webform to manipulate XML files-Website Security-Authentication-Authorization–Creating a Web application.										15
	Total										**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1,PO2,PO6
2	To developa software to solve real-world problems using ASP.NET	PO2,PO3,PO8
3	To Work On Various Controls Files	PO1,PO3,PO7
4	To create a webapplication using Microsoft ADO.NET.	PO2,PO6
5	To develop web applications using XML	PO1,PO3,PO8
TextBook		
1	Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.	
2	Mathew, MacDonald, The Complete Reference ASP.NET, Tata McGraw- Hill, 2015.	
Reference Books		
1.	Herbert Schildt, The Complete Reference C#.NET, Tata McGraw- Hill, 2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET4.5 BlackBook, Dreamtechpres, 2013.	
3.	Anne Boehm, JoelMurach, Murach_s C# 2015, MikeMurach & Associates Inc.2016.	
4.	Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill, 2008.	
5.	Matthew Mac Donald, Beginning ASP.NET4 in C# 2010, APRESS, 2010.	
Web Resources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**1**	**2**	**2**	**1**	3
CO2	**3**	**2**	**2**	**2**	**2**	3
CO3	**3**	**3**	**2**	**2**	**3**	3
CO4	**3**	**1**	**2**	**2**	**1**	3
CO5	**3**	**1**	**2**	**2**	**1**	2
Weightage of course contributed to each PSO	15	8	10	10	8	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC11	**ASP.Net Programming LAB**	Core	-	-	5	-	4	5	40	60	100

Course Objective	
LO1	To develop ASP.NET Web application using standard controls.
LO2	TocreaterichdatabaseapplicationsusingADO.NET.
LO3	To implement file handling operations.
LO4	To implement XML classes.
LO5	To utilize ASP.NET security features for authenticating the website

Sl.No	**Programs**
1.	Create an exposure of Web applications and tools
2.	Implement the Html Controls
3.	Implement the Server Controls
4.	Web application using Web controls.
5.	Web application using List controls.
6.	Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.

7.	Web application using Data Controls.	75
8.	Data binding with Web controls	
9.	Data binding with Data Controls.	
10.	Database application to perform insert, update and delete operations.	
11.	Database application using Data Controls to Perform insert, delete, and edit, paging and sorting operation.	
12.	Implement the Xml classes.	
13.	Implement Authentication–Authorization.	
14.	Ticket reservation usingASP.NET controls.	
15.	Online examination using ASP.NETcontrols	
	Total	75
Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	To create web applications and implement various controls	PO1,PO2,PO6
2	Create a webpages in Rich control.	PO3,PO8
3	Develop knowledge about file handling operations	PO1,PO4,PO8
4	An ability to design XML classes	PO2,PO6,PO7
5	To develop a software to solve real-world problem susing ASP.NET	PO1,PO3,PO5,PO8
Text Book		
1	Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.	
2	Mathew, MacDonald, The Complete Reference ASP.NET, Tata McGraw- Hill, 2015.	
ReferenceBooks		
1.	Herbert Schildt, The Complete Reference C#.NET, Tata McGraw- Hill, 2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET4.5 BlackBook, Dreamtechpres, 2013.	
3.	Anne Boehm, JoelMurach, Murach_s C# 2015, MikeMurach & Associates Inc.2016.	
4.	Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill, 2008.	
5.	Matthew Mac Donald, Beginning ASP.NET4 in C# 2010, APRESS, 2010.	
WebResources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**2**	**2**	**1**	1
CO2	**3**	**2**	**3**	**2**	**2**	2
CO3	**3**	**3**	**2**	**2**	**1**	1
CO4	**3**	**2**	**3**	**2**	**1**	1
CO5	**3**	**2**	**2**	**2**	**1**	2
Weightage of course contributed to each PSO	**15**	11	12	10	6	7

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Cloud Computing	Elective	4	-	-	-	3	4	25	75	100

Course Objective	
LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

UNIT	**Contents**	**No. of Hours**
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking –	12

	Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus – OpenStack	12
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: RelationalApproach (SQL), Non-RelationalApproach (NoSQL).	12

IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for BenchmarkingMethodology – Benchmarking Tools and Types of Tests – DeploymentPrototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.	12
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for ManufacturingIndustry - Cloud Computing for Education.	12
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO 1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO 2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO 3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO 4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO 5	Understand various Case Studies in Cloud Computing.	PO3, PO6

Text Book

1	ArshdeepBahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018

Reference Books

1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2.	Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.

3.	David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
4.	Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.
Web Resources	
1.	https://en.wikipedia.org/wiki/Cloud_computing
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Mapping with Programme Outcomes:

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

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	NATURAL LANGUAGE PROCESSING	Elective	4	-	-		3	25	75	100

Learning Objectives	
LO1	To understand approaches to syntax and semantics in NLP.
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.
LO4	Toget acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
LO5	To understand current methods for statistical approaches to machine translation

UNIT	Contents	No. Of. Hours
I	**Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.	**12**
II	**Word level and Syntactic Analysis:**Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.	**12**
III	**Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	**12**
IV	**Natural Language Generation:** Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages-Machine Translation Approaches-Translation involving Indian Languages.	**12**
V	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers- POS Tagger- Research Corpora SSAS.	**12**
Total hours		**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain a broad understanding Of text data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to	PO1, PO2, PO3, PO4,

	communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.	PO5, PO6
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Daniel Jurafsky, James H. Martin, ―Speech & language processing‖, Pearson publications.	
2	Allen, James. Natural language understanding. Pearson, 1995.	
Reference Books		
1.	Pierre M. Nugues, ―An Introduction to Language Processing with Perl and Prolog‖,Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP	

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO5**	**PSO 6**
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	3	3	2	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	14	15	15	13	15

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	IOT and its applications	Elective	4	-	-	-	3	4	25	75	100

Course Objective	
C1	Use of Devices, Gateways and Data Management in IoT.
C2	Design IoT applications in different domain and be able to analyze their performance
C3	Implement basic IoT applications on embedded platform
C4	To gain knowledge on Industry Internet of Things
C5	To Learn about the privacy and Security issues in IoT

UNIT	**Details**	**No. of Hours**
I	IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	12
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	12

III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	12
IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management	12
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO5

Text Book

1	Vijay Madisetti and ArshdeepBahga, ―Internet of Things: (A Hands-on Approach)‖, Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference Books

1.	Michael Miller, ―The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World‖, kindle version.
2.	Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to

	Connecting Everything‖, Apress Publications 2013, 1st Edition,.
3	WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice‖ 4..CunoPfister, –Getting Started with the Internet of Things‖, O‟Reilly Media 2011
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.javatpoint.com
3.	https://www.w3schools.com

Mapping with Programme Outcomes:

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

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Introduction to Data Science	Elective	4	-	-	-	3	4	25	75	100
Learning Objectives											
LO1	To learn about basics of Data Science and Big data.										
LO2	To learn about overview and building process of Data Science.										
LO3	To learn about various Algorithms in Data Science.										
LO4	To learn about Hadoop Framework.										
LO5	To learn about case study about Data Science.										

UNIT	Contents	No. of Hours
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	12
II	**The Data science process**: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .	12
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	12
IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	12
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	12
	Total	**60**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5

Text Book

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, ―Introducing Data Science‖, manning publications 2016

Reference Books

1. Roger Peng, –The Art of Data Science‖, lulu.com 2016.
2. MurtazaHaider, ―Getting Started with Data Science – Making Sense of Data with Analytics‖, IBM press, E-book.
3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali,―Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools‖, Dreamtech Press 2016.
4. Annalyn Ng, Kenneth Soo, ―Numsense! Data Science for the Layman: No Math Added‖, 2017,1st Edition.

5.	Cathy O'Neil, Rachel Schutt, ―Doing Data Science Straight Talk from the Frontline‖, O'Reilly Media 2013.
6.	Lillian Pierson, ―Data Science for Dummies‖, 2017 II Edition
Web Resources	
1.	https://www.w3schools.com/datascience/
2.	https://en.wikipedia.org/wiki/Data_science
3.	http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**3**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**3**	**2**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**2**
Weightage ofcoursecontributedtoeachPSO	**15**	**14**	**11**	**15**	**11**	**10**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	CRYPTOGRAPHY	**Elective**	4	-	-	-	3	25	75	100

Learning Objectives		
LO1	To understand the fundamentals of Cryptography	
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.	
LO3	To understand the various key distribution and management schemes.	
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks	
LO5	To design security applications in the field of Information technology	
UNIT	**Contents**	**No. Of. Hours**
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network	**12**

	Security.	
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	**12**
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm.	**12**
IV	**Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: SecureSocketLayerand Transport Layer Security – Secure Electronic Transaction.	**12**
V	Intruders – Malicious software – Firewalls.	**12**
	TOTAL HOURS	**60**

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

Textbooks

1	**William Stallings, —**Cryptography and Network Security Principles andPractices‖.

Reference Books

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

Web Resources

1	https://www.tutorialspoint.com/cryptography/
2	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	14	13	15	12	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Artificial Neural Networks	Elective	4	-	-	-	3	4	25	75	100

Learning Objectives	
LO1	**Understand the basics of artificial neural networks, learning process, single layer And multi-layer perceptron networks.**
LO2	Understand the Error Correction and various learning algorithms and tasks.
LO3	Identify the various Single Layer Perception Learning Algorithm.
LO4	Identify the various Multi-Layer Perception Network.
LO5	Analyze the Deep Learning of various Neural network and its Applications.

UNIT	Contents	No. of Hours
I	Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perception Learning Algorithm, and Perception Convergence Theorem.	12
II	Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit	12

	assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	
III	.Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, learning in continuous perception. Limitation of Perception.	12
IV	Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm	12
V	Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications	12
	Total	**60**

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

Text Book	
1	Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.
2.	―Neural Network- A Comprehensive Foundation‖- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.
Reference Books	

1.	Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.
Web Resources	
1.	https://www.w3schools.com/ai/ai_neural_networks.asp
2.	https://en.wikipedia.org/wiki/Artificial_neural_network
3.	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**3**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**3**	**2**	**2**
CO5	**2**	**3**	**2**	**3**	**2**	**2**
Weightage ofcoursecontributedtoeach PSO	**14**	**14**	**11**	**15**	**10**	**10**

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Computer Networks	Elective	6	-	-	-	4	6	25	75	100

Course Objective	
LO1	To understand the concept of Data communication and Computer network
LO2	To get a knowledge on routing algorithms.
LO3	To impart knowledge about networking and inter networking devices
LO4	To study about Network communication.
LO5	To learn the concept of Transport layer

UNIT	**Details**	**No.of Hours**
I	Introduction–Network Hardware–Software–Reference Models–OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs-Physical Layer–Theoretical Basis for Data Communication-Guided Transmission Media	18
II	Wireless Transmission-Communication Satellites–Telephone System: Structure,Local Loop,Trunks and Multiplexing and Switching.Data LinkLayer: Design Issues–Error Detection and Correction.	18
III	Elementary Data Link Protocols - Sliding Window Protocols – DataLink Layer in the Internet - Medium Access Layer – Channel Allocation Problem–Multiple Access Protocols–Bluetooth	18
IV	Network Layer-Design Issues –Routing Algorithms-Congestion Control Algorithms– IP Protocol–IP Addresses–Internet Control Protocols.	18
V	Transport Layer-Services-Connection Management-Addressing, Establishing and Releasing a Connection–Simple Transport Protocol–Internet Transporet Protocols (ITP)-Network Security: Cryptography.	18
	Total	**90**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference model	PO1
2	To gain knowledge on Telephone systems using Wireless network	PO1,PO2

3	To understand the concept of MAC	PO4,PO6
4	To analyze the characteristics of Routing and Congestion control algorithms	PO4,PO5,PO6
5	To understand network security and define various Protocols such as FTP, HTTP, Telnet, DNS	PO3,PO8
Text Book		
1	A.S.Tanenbaum, -ComputerNetworksǁ, 4th Edition, Prentice- Hall of India, 2008.	
Reference Books		
1.	B.A.Forouzan,–Data Communications and Networking ,Tata McGraw Hill,4th Edition, 2017	
2.	F. Halsall, –Data Communications, Computer Networks and Open Systems , Pearson Education,2008	
3.	D.Bertsekasand R.Gallagher,ǀData Networksǁ, 2nd Edition, PHI, 2008.	
4.	Lamarca,ǀCommunication Networksǁ, Tata McGraw- Hill, 2002	
Web Resources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**2**	**1**	**-**
CO2	**3**	**2**	**1**	**2**	**2**	**-**
CO3	**3**	**-**	**-**	**2**	**-**	**2**
CO4	**3**	**1**	**-**	**2**	**1**	**-**
CO5	**3**	**3**	**-**	**2**	**1**	**-**
Weightage of course Contributed to each PSO	15	8	1	10	5	2

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	DATA ANALYTICS USING R Programming	Core	6	-	-	-	4	6	25	75	100

Course Objective	
LO1	To understand the problem solving approaches
LO2	To learn the basic programming constructs in R Programming
LO3	To learn the basic programming constructs in R Programming
LO4	To use R Programming data structures-lists, tuples, and dictionaries.
LO5	To do input/output with files in R Programming.

UNIT	**Details**	**No.of Hours**
I	Evolution of Big data — Best Practices for Big dataAnalytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big DataUse Cases- Characteristics of Big Data Applications —Perception and Quantification of Value – Under standing Big Data Storage —A General Overview of High-Performance Architecture—HDFS— Map Reduce and YARN— Map Reduce Programming Model	18
II	CONTROL STRUCTURES AND VECTORS-Control structures,functions, scoping rules, dates and times,Introduction to Functions, preview of Some Important R DataStructures,Vectors, CharacterStrings, Matrices, Lists, DataFrames, ClassesVectors:Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector,Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations	18

III	LISTS- Lists: Creating Lists, General List Operations, ListIndexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	18
IV	FACTORS AND TABLES –Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix / Array-Like Operationson Tables, Extracting a Sub table, Finding the Largest Cells in aTable, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING.	18
V	OBJECT-ORIENTED PROGRAMMINGS Classes,S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Functionon an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	18
	Total	**90**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1,PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4,PO6
4	Perform analytics on data streams.	PO4,PO5,PO6
5	Learn No SQL databases and management.	PO3,PO8

Text Book

1	Roger D.Peng, ─ R Programming for Data Science–,2012
2	Norman Matloff, ─ The Artof R Programming - A Tour of Statistical Software Design ─, 2011

Reference Books	
1.	.Garrett Grolemund, Hadley Wickham, ― Hands-On Programming with R : Write Your Own Functions and Simulations ―, 1st Edition,2014
2.	Venables, W.N.,and Ripley, ― S programming –, Springer ,2000.
Web Resources	
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**3**	**1**	**-**
CO2	**3**	**3**	**2**	**2**	**-**	**2**
CO3	**1**	**2**	**3**	**1**	**2**	**1**
CO4	**2**	**2**	**1**	**-**	**2**	**1**
CO5	**2**	**2**	**2**	**1**	**3**	**1**
Weightage of course Contributed to each PSO	11	11	8	7	8	5

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC15	**R Programming-LAB**	Core	-	-	6	-	4	6	40	60	100

Course Objective	
LO1	To understand the problem solving approaches
LO2	To learn the basic programming constructs in R Programming
LO3	To practice various computing strategies for R Programming-based solutions to real world problems
LO4	To use R Programming data structures-lists, tuples, and dictionaries.
`LO5	To do input/output with files in R Programming.

Sl.No	**Details**
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending up on user_s choice.
2.	Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
3.	Write a program to find list of even numbers from 1 to n using R-Loops.
4.	Create a function to print squares of numbers in sequence.
5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6.	Implement different String Manipulation functions in R.
7.	Implement different data structures in R (Vectors,Lists,DataFrames)

8	Write a program to read a csv file and analyze the data in the file in R.	90
9	Create pie chart and bar chart using R.	
10	10.Create a data set and do statistical analysis on the data using R.	
11	Program to find factorial of the give n number using recursive function	
12	Write a R program to count the number of even and odd numbers from array of Nnumbers.	
	Total	90

Course Outcomes		**Programe Outcome**
CO	On completion of this course, students will	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills In RProgramming.	PO1,PO4,PO8
3	Develop the skill of designing graphical-user Interfaces (GUI) in R Programming	PO1,PO3,PO6
4	Acquire RProgramming skills to move into Specific branches	PO3,PO4
5	Create Input/output files in R Programming.	PO1,PO5,PO6

Text Book	
1	Roger D.Peng, ‖R Programming for Data Science ‖,2012
2	Norman Matloff, The Artof R Programming –A Tour of Statistical Software Design, 2011
Reference Books	
1	Garrett Grolemund, Hadley Wickham, Hands- On Programming with R: Write Your Own Functions and Simulations ,1st Edition, 2014
2.	Venables, W.N.,and Ripley, ‖Sprogramming‖, Springer,2000.
Web Resources	
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**3**	**1**	**2**
CO2	**2**	**3**	**3**	**3**	**1**	**2**
CO3	**2**	**3**	**3**	**3**	**1**	**2**
CO4	**2**	**3**	**3**	**3**	**1**	**2**
CO5	**2**	**3**	**3**	**3**	**1**	**2**
Weightage of course contributed to each PSO	11	15	15	15	5	10

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Database Management System	Elective	5	-	-	-	3	5	25	75	100

Learning Objectives		
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.	
LO2	To understood the concepts of data base management system, design simple Database models	
LO3	To learn and understand to write queries using SQL, PL/SQL.	
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.	
LO5	To understood the concepts of data base management system, design simple Database models	
UNIT	**Contents**	**No. of Hours**
I	**Database Concepts:**Database Systems - Data vs Information -	15

	Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram	15
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15
IV	**Advanced SQL**:Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.**Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15
V	**PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.**Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor	15

	with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	
	Total	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO5

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

Reference Books	
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,―Database System Concepts‖, McGraw Hill International Publication ,VI Edition
2.	Shio Kumar Singh , ―Database Systems ―,Pearson publications ,II Edition

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

Mapping with Programme Outcomes:

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

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Big Data Analytics	Elective	5	-	-	-	3	5	25	75	100

Course Objective	
C1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs
C2	To identify and understand the basics of cluster and decision tree
C3	To study about the Association Rules,Recommendation System
C4	To learn about the concept of stream
C5	Understand the concepts of NoSQL Databases

UNIT	Contents	No. of Hours
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN —	15

	Map Reduce Programming Model	
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	15
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	15
IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	15
V	NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	15
	Total	**75**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different miningalgorithms and recommendation systems for large volumes of data.	PO4, PO5
4	Perform analytics on data streams.	PO3, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO4
Text Book		
1	Anand Rajaraman and Jeffrey David Ullman, ―Mining of Massive Datasets‖, Cambridge University Press, 2012.	
Reference Books		
1.	David Loshin, –Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph‖, Morgan Kaufmann/El sevier Publishers, 2013	
2.	EMC Education Services, ―Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data‖, Wiley publishers, 2015.	
Web Resources		
1.	https://www.simplilearn.com	
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**	**2**
Weightage ofcoursecontributedtoeachPSO	**15**	**14**	**11**	**15**	**15**	**13**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Artificial Intelligence	Elective	5	-	-	-	3	5	25	75	100

Course Objective	
C1	To learn various concepts of AI Techniques.
C2	To learn various Search Algorithm in AI.
C3	To learn probabilistic reasoning and models in AI.
C4	To learn about Markov Decision Process.
C5	To learn various type of Reinforcement learning.

UNIT	Contents	No. of Hours
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree	15
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search	15
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	15
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	15
	Total	**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO4
Text Book		
1	Stuart Russell and Peter Norvig, –Artificial Intelligence: A Modern Approach‖ , 3rd Edition, Prentice Hall.	
	Elaine Rich and Kevin Knight, —Artificial Intelligence‖, Tata McGraw Hill	
Reference Books		
1.	Trivedi, M.C., —A Classical Approach to Artifical Intelligence‖, Khanna Publishing House, Delhi.	
2.	SarojKaushik, —Artificial Intelligence‖, Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, —Artificial Intelligence: Foundations for Computational Agents‖, Cambridge University Press 2010	
Web Resources		
1.	https://github.com/dair-ai/ML-Course-Notes	
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html	
3.	https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**1**	**2**	**1**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**	**2**	**3**
CO5	**3**	**2**	**2**	**2**	**3**	**3**
Weightage ofcoursecontributedto eachPSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	SOFTWARE PROJECT MANAGEMENT	**Elective**	**5**	**-**	**-**	**-**	**3**	**5**	**25**	**75**	**100**

Learning Objectives

LO1	To define and highlight importance of software project management.
LO2	To formulate and define the software management metrics & strategy in managing projects
LO3	To famialarize in Software Project planning
LO4	Understand to apply software testing techniques in commercial environment

Unit	Contents	No. of Hours
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	**15**
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	**15**
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	**15**
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	**15**
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	**15**
TOTAL		**75**

CO	Course Outcomes
CO1	Understand the principles and concepts of project management
CO2	Knowledge gained to train software project managers
CO3	Apply software project management methodologies.
CO4	Able to create comprehensive project plans
CO5	Evaluate and mitigate risks associated with software development process
Textbooks	
1	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, ―Quality Software Project Management‖, Pearson Education Asia 2002.
Reference Books	
1	PankajJalote, ―Software Project Management in Practice‖, Addison Wesley 2002.
2.	Hughes, ―Software Project Management‖, Tata McGraw Hill 2004, 3rd Edition.
Web Resources	
1.	Software Project Management e-resources from Digital libraries
2.	www.smartworld.com/notes/software-project-management

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/PSO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**3**	**2**	**1**	**2**	**2**	**2**
CO2	**3**	**1**	**3**	**2**	**2**	**2**
CO3	**2**	**3**	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**2**
CO5		**2**	**2**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**13**	**11**	**10**	**13**	**13**	**12**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Image Processing	Elective	5	-	-	-	3	5	25	75	100

Learning Objective	
LO1	To learn fundamentals of digital image processing.
LO2	To learn about various 2D Image transformations
LO3	To learn about various image enhancement processing methods and filters
LO4	To learn about various classification of Image segmentation techniques
LO5	To learn about various image compression techniques

UNIT	**Contents**	**No. of Hours**
I	**Digital Image Fundamentals:** Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis	15
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition	15
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.	15
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	15
V	Image Compression: Need for compression -Redundancy- Classification	15

	of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	
	Total	**75**
Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the fundamental concepts of digital image processing.	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and Filters	PO4, PO6
4	Understand the classification of Image segmentation Techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO5
Text Book		
1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
Reference Books		
1.	1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007	
Web Resources		
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf	
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf	
3.	https://dl.acm.org/doi/10.5555/559707	
4.	https://www.ijert.org/image-processing-using-web-2-0-2	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage ofcoursecontributedtoeachPSO	15	14	11	15	10	10

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Robotics and its Applications	Elective	5	-	-	-	3	5	25	75	100

Learning Objectives		
LO1	To understand the robotics fundamentals	
LO2	Understand the sensors and matrix methods	
LO3	Understand the Localization: Self-localizations and mapping	
LO4	To study about the concept of Path Planning, Vision system	
LO5	To learn about the concept of robot artificial intelligence	
UNIT	**Details**	**No. of Hours**
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	15
II	Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-	15

	proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot	
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	15
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations	15
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	15
	Total	**75**

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

Text Book

1	RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001
2	SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011

Reference Books	
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008
2.	Robotics technology and flexible automation by S.R.Deb, THH-2009
Web Resources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
2.	https://www.geeksforgeeks.org/robotics-introduction/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**2**	**3**	**3**	**2**
CO2	**3**	**3**	**2**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**2**	**3**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**2**
Weightage ofcoursecontributedtoeachPSO	**15**	**14**	**11**	**15**	**15**	**10**

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Advanced Excel	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	Handle large amounts of data										
LO2	Aggregate numeric data and summarize into categories and subcategories										
LO3	Filtering, sorting, and grouping data or subsets of data										

LO4	Create pivot tables to consolidate data from multiple files	
LO5	Presenting data in the form of charts and graphs	
UNIT	**Contents**	**No. of Hours**
I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets	6
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data - Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	6
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	6
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.	6
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.	6
	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8
Text Book		
1	Excel 2019 All	
2	Microsoft Excel 2019 Pivot Table Data Crunching	
Reference Books		
1	Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition	
Web Resources		
1.	https://www.simplilearn.com	
2	https://www.javatpoint.com	
3	https://www.w3schools.com	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**3**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**2**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**2**	**2**	**3**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**12**	**10**	**15**	**15**	**15**

Strong-3 M-Medium-2 L-Low-1

9. Teaching – Learning Process:

Teaching and Learning are two important fields which are required for effective teaching and it helps the student in better understanding. For BCA Programme the teaching and learning process is designed towards attaining the Program Specific Output(PSO) and Graduate Aptitude(GA). NPTEL and other MOOC courses are recommended for the students to enhance the knowledge. Online medium such as Google classroom are used to share the resources with the students. To meet the objectives of the course and enable students achieve the expected outcomes the course the following teaching processes are utilized:

Class Room Teaching:

The class room teaching helps the students imbibe the theoretical knowledge of the course. To demonstrate the programs and complex concepts projectors are used to illustrate the concepts.

Laboratory Teaching:

BCA programme give more emphasis for Open Source packages/programming languages. Laboratory is furnished with state-of-the-art technologies and software to help students to solve the problems practically.

Forums:

Student forum in the name of Stepping Stones is organized every week where alumini and industrial experts are invited to provide Guest Lecture. Students discuss the latest technologies and present seminar.

MOOCS:

In BCA programme, NPTEL courses are recommended for the course to enhance their knowledge of the student. It gives student the ability to know the latest development in that subject.

Project:

Students are suggested to do project based assignments in Practical Papers. Students are given variety of real world problems to demonstrate their skills. It enriches the ability of the students to solve the futuristic problems.

Final year students in their final semester are mandated to complete a real-time mini-project for the successful completion of the degree

Assessment Methods:

The Assessment plays the pivotal role in evaluating the progress of the student. Assessment also devises to test the cognitive levels of the students. Assessment methods are devised to assess and evaluate the understanding the foundation concept and also to illustrate the skills. The assessment methods try to validate and enhance the well-rounded skillsets of the students. Assessment Methods validates the students programming writing ability .It can help the student to develop the employable skill and entrepreneurial skills.

Assignments:

Student are given assignment regularly by which they can learn to collect data relevant to the assignment and also they can enhance the knowledge

10.1 Continuous Assessment:

The Continuous assessment occurs on a regular and continuous basis, it is an ongoing formative and summative process, involving the monitoring of students. This assessment is inherently integrated with teaching and involves of series of process like systematic collection of marks or grades that gradually flow into the final score. The assessment marks or grades collected through various stages of the semester eventually contribute to the final grade of the students.

The continuous Assessment process tests the students on various grounds and aspects such as:

- Continuous Internal Assessment – I
- Continuous Internal Assessment – I
- Continuous Internal Assessment – I
- Attendance
- Class Participation or seminars
- Assignments

The student is subjected to three internal assessment written exams in a semester. The student's regular class attendance proves to be an important factor in the evaluation of the student's credentials. The assessment also takes cognizance of the student's active participation in the class room discussions in the form of seminars and group discussions. The prompt submission of home assignments is monitored for assessing the student's final evaluation credentials.

11**. Keywords:**

Learning Outcome, Qualification Descriptor, Graduate Apptitute, Skill Enhancement, Program Specific Outcome, Course Outcome, Core Compulsory Courses, Discipline Specific Elective, Continuous Assessment, PSO – CO Matrix