PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

B.Sc., COMPUTER SCIENCE CURRICULUM

FULL TIME

[Regulation 2023]

[Candidates admitted from the academic year 2023-2024 onwards]

INDEX

REGULATIONS ON LEARNING OUTCOMES BASED CURRICULUM FRAME WORK FOR UNDERGRADUATE EDUCATION

1. 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 in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LO CF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. 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 Science 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 disciplines of basic science and engineering. Computer science 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 Science 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 science 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 science 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 Science 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.

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science 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, enhance their 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.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc. Computer Science**
Programme Code:	**23UGCSCGE**
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3:Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and applies their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team**PO8: Scientific reasoning**: Ability to analyze interprets and draws conclusions from quantitative/qualitative data; and critically evaluates ideas, evidence and experiences from an open- minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO 3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO 5:** Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

PROGRAM OUTCOMES

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

PROGRAM SPECIFIC OUTCOMES

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 real-time application related sciences.
PSO3	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
PSO4	Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.
PSO5	Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.
PSO6	Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.
PSO7	Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
PSO8	Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of Computing sciences.
PSO9	Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of Computing sciences.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

PEO1	To study about I/O management, storage management.
PEO2	To know the methods of connecting them to the peripheral devices
PEO3	- To learn Software design and Implementation
PEO5	To learn the basic principles of database and database design
PEO6	To understand dynamic memory allocation, structure and pointers
PEO7	To understand computational development of graphics with mathematics
PEO8	Design and implement reliable and maintainable object-oriented applications of Moderate complexity composed of several classes

Eligibility for admission

To be eligible to enroll in for the B. Sc. in computer science degree courses you need to clear the following eligibility criteria.

- Students need to have graduated their 12th standard in the science stream with physics, chemistry and mathematics (PCM),
- Students who have science with physics, chemistry and biology (PCB).

Highlights of 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 Mathematics 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 - Artificial Intelligence.

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 Literature and analyzing the world through the literary lens Give rise to a new perspective.	➢ Instill 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 language and communication skills enable the students gain knowledge and Exposure in the competitive world.
		➢ Discipline centric skill will improve the Technical knowhow of solving real life Problems.
III,IV,V & VI	Elective papers	➢ 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 ➢ Emerging topics in higher education/industry/communication network/health sector etc. are introduced with hands-on-training.

IV	Elective Papers	➢ Exposure to industry moulds students in to solution providers ➢ Generates Industry ready graduates ➢ Employment opportunities enhanced
V Semester	Elective papers	➢ Self-learning is enhanced ➢ Application of the concept to real situation is conceived resulting intangible outcome
VI Semester	Elective papers	➢ Enriches the study beyond the course. ➢ Developing are search framework and presenting their independent and intellectual ideas effectively.
Extra Credits: **For Advanced Learners /Honors degree**		**1.** To cater other needs of peer learners/research aspirants
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
B.Sc. COMPUTER SCIENCE
REGULATION 2023 – 2024
COURSE STRUCTURE
SEMESTER-I

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23110AEC11/ 23111AEC11/ 23132AEC11/ 23135AEC11	Tamil – I/Advanced English-I/Hindi-I/ French – I	3	1	0	3
23111AEC12	English-I	3	1	0	3
23120AEC13	Python Programming	4	1	0	3
23120GEC14	Numerical Methods	3	1	0	3
23120GEC15	Statistics	3	1	0	3
PRACTICAL					
23120SEC16L	Python Programming Lab	0	0	3	3
SKILL ENHANCEMENT COURSE					
23120SEC17	Fundamentals of Information Technology	2	0	0	2
23120SEC18	Problem Solving Techniques	2	0	0	2
ABILITY ENHANCEMENT COMPULSORY COURSE(AECC1)					
231AECCINC	Indian Constitution	2	0	0	2
AUDIT COURSE					
231LSCUV	Universal Human Values	-	-	-	1
	Total	**22**	**5**	**3**	**25**

SEMESTER – II

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23110AEC21/ 23111AEC21/ 23132AEC21/ 23135AEC21	Tamil – II/Advanced English-II/Hindi-II/ French - II	3	1	0	3
23111AEC22	English-II	3	1	0	3
23120AEC23	Data Structure & Algorithms	4	1	0	3
23120GEC24	Operations Research	3	1	0	3
23120GEC25	Discrete Mathematics	3	1	0	3
PRACTICAL					
23120SEC26L	Data Structure and Algorithms lab	0	0	3	3
SKILL ENHANCEMENT COURSE					
23120SEC27	Quantitative Aptitude	2	0	0	2
23120SEC28	Advanced Excel	2	0	0	2
ABILITY ENHANCEMENT COMPULSORY COURSE(AECC1)					
231AECCCMS	Communication Skills	2	0	0	2
AUDIT COURSE					
231SSCBE	Basic Behavioural Etiquette	-	-	-	1
	Total	**22**	**5**	**3**	**25**

SEMESTER – III

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23110AEC31/ 23111AEC31/ 23132AEC31/ 23135AEC31	Tamil – III/Advanced English-III/Hindi-III/ French – III	3	1	0	3
23111AEC32	English-III	3	1	0	3
23120AEC33	Microprocessor and Microcontroller	5	1	0	4
23120DSC34_	Discipline Specific Elective-I	5	1	0	3
PRACTICAL					
23120SEC35L	Microprocessor and Microcontroller lab	0	0	3	3
SKILL ENHANCEMENT COURSE					
23120SEC36	Introduction to HTML	3	0	0	2
23120SEC37	Cloud Computing	2	0	0	2
ABILITY ENHANCEMENT COMPULSORY COURSE(AECC1)					
23120RMC38	Research Methodology	2	0	0	2
AUDIT COURSE					
231ACLSOAN	Office Automation	-	-	-	1
	Total	**23**	**4**	**3**	**23**

SEMESTER – IV

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23110AEC41/ 23111AEC41/ 23132AEC41/ 23135AEC41	Tamil – IV/Advanced English-IV/Hindi-IV/ French – IV	3	0	0	3
23111AEC42	English-IV	3	0	0	3
23120AEC43	Java Programming	5	1	0	3
23120DSC44_	Discipline Specific Elective-II	5	1	0	3
PRACTICAL					
23120SEC45L	Java Programming lab	0	0	3	3
SKILL ENHANCEMENT COURSE					
23120SEC46	PHP Programming	3	0	0	2
23120SEC47	Software Testing	2	0	0	2
ABILITY ENHANCEMENT COMPULSORY COURSE(AECC1)					
23120BRC48	Participation in Bounded Research	2	0	0	2
231AECCEVS	Environmental Studies	2	-	-	2
AUDIT COURSE					
231LCSCLS	Leadership and Management Skills	-	-	-	1
	Total	**25**	**2**	**3**	**24**

SEMESTER – V

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23120AEC51	Software Engineering	5	1	0	4
23120AEC52	Database Management System	5	1	0	3
23120AEC53	IOT and its Applications	5	0	0	4
23120DSC54_	Discipline Specific Elective-III	4	0	0	4
23120DSC55_	Discipline Specific Elective-IV	4	0	0	4
PRACTICAL					
23120SEC56L	Database Management System lab	0	0	3	3
23120SEC58	Internship / Industrial Training				2
AUDIT COURSE					
231ACLSPSL	Professional Skills	-	-	-	1
231AECCVED	Value Education	2	-	-	2
	Total	**25**	**2**	**3**	**27**

SEMESTER – VI

Course Code	Course Title - B.Sc.(cs)	L	T	P	C
THEORY					
23120AEC61	Computer Networks	5	1	0	4
23120AEC62	Data Analytics Using R	5	1	0	4
23120DSC63_	Discipline Specific Elective-V	5	0	0	3
PRACTICAL					
23120SEC64L	Data Analytics Using R lab	0	0	3	3
23120PRW65	Project	8	0	0	4
23120SEC66	Professional Competency Skill General awareness for competitive examination	2	0	0	2
23120EXACT	Extension Activity	-	-	-	1
AUDIT COURSE					
231ACSIKWS	Indian Knowledge System	-	-	-	2
	Total	25	2	3	23
Total Credits-Programme					**140**
Total Credits-Audit Courses					**07**
Total Credits					**147**

Discipline Specific Electives

Semester	**Discipline Specific Elective Courses-I**
III	a) 23120DSC34A- Image Processing b) 23120DSC34B- Big Data Analytics c)23120DSC34C-Natural Language Processing
	Discipline Specific Elective Courses-II
IV	a) 23120DSC44A- Agile Project Management b)23120DSC44B- Analytics for Service Industry c)23120DSC44C-Computational Intelligence
V	**Discipline Specific Elective Courses-III**
	a) 23120DSC54A-Introduction to Data science b) 23120DSC54B- RDBMS with PL/SQL c) 23120DSC54C- Cloud Computing
	Discipline Specific Elective Courses-IV
	a) 23120DSC55A-Disaster Management b)23120DSC55B- Artificial Neural Network c)23120DSC55C-Cryptography
	Discipline Specific Elective Courses-V
VI	a) 23120DSC63A-Robotics and its Applications b) 23120DSC63B- Virtual Reality c)23120DSC63C-Mobile Adhoc Network

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Credit Distribution for UG Programme

Consolidated Semester wise Credit distribution

SEM	AEC	SEC	GEC	DSC	AECC	Research	others	Total
I	9	7	6	-	2	-	1	25
II	9	7	6	-	2	-	1	25
III	10	7	-	3	-	2	1	23
IV	9	7	-	3	2	2	1	24
V	11	5	-	8	-	-	3	27
VI	8	5	-	3	-	4	3	23
Total	**56**	**38**	**12**	**17**	**6**	**8**	**10**	**147**

AUDIT COURSE CREDIT DISTRUBUTION

Sem	Audit
I	1
II	1
III	1
IV	1
V	1
VI	2
Total	7

HOD **DEAN**

இக்கால இலக்கியம்

23110AEC11

முதல் பருவம்

**பாட ந
ாக்கங்கள்**

1. இக்காலதமிழ்இலக்கியவகககளின்மாதிரிகளகற்பித்தல்.
2. தமிழின்இனிகமகயஉணரச்சசய்தல்
3. தமிழின்ஈடுபாட்கடயும்சுகவக்கும்திறகனயும்ஏற்படுத்Fதல்.
4. கவிகத எழுFம் திறகன உருவாக்குதல்
5. **படடப்பாளர்களாக உருவாக்கும் திறடை** ஏற்படுத்Fதல்.

பயைகள்

- சமாழி ஆளுகமத்திறன் சபறுதல்.
- சமூக சிந்தகனகய வளர்த்Fக் சகாள்ளுதல்.
- **படடப்பாளர்களாக உருவாகும் திறடைப் பபறுதல்**.
- இலக்கியங்களின் அறிகவ மமம்படுத்Fதல்.
- கவிகதஎழுFம் முகறகய புரிந்Fக்சகாள்ளுதல்

அலகு -1 மரபுக்கவிடத

1. பாரதியார--விடுதகல, வநமத மாதரம ,காறறு

2.பாரதிதாசன் - அழகின்சிரிப்பு , தமிழFக்கு வீழ்ச்சி இல்கல

3.கவிமணிமதசியவிநாயகமபிளகள—சதாழிலாளியின முகறயீடு

4.நாமக்கல்கவிஞர்—தருணம் இFமவ ,

5.கண்ணதாசன்-- அFபவம்

அலகு -2புFக்கவிடதகள்

1.அப்Fல்ரகுமான் -சவற்றி

2.அறிவுமதி-நட்புக்காலம்

3.கவரமுத்F- ருசி, சிற்பி- ஓடுஓடுசங்கிலி

4.மு.மமத்தா- சவளிச்சம் சவளிமய இல்கல

அலகு -3 ாட்டுப்புறவியல்

1.பழசமாழிகள்

2. விடுகததகள்

3. சதாழில்பாடல்

அலகு- 4 சிறுகடத

1. தடயம்- மா. செயபிரகாசம்

2. எதார்த்தம் - சு. தமிழ்ச்சசல்வி

3. நீதி-- பூமணி

அலகு- 5இலக்கியவரலாறு

1. கவிகத

2. சிறுககத

3. நாட்டுப்புறவியல்

பபாFக்கட்டுடர –மனிதமநயம், வாழ்வியல்அறங்கள்

மைப்பாடப்பகுதி : பாரதியார் கவிகத- மவண்டும்,பாரதிதாசன் கவிகத- சசந்தாமகர

பார்டவ நூல்கள் :

1. பாரதியார் கவிகதகள் - மணிவாசகர் பதிப்பகம் சசன்கன

2. **பாரதிதாசைக்கவிடதகள் - பாரி ிடலயம், பசைடை**

3. தமிழ் இலக்கிய வரலாறு - முவரதராென் சாகித்திய அகாசதமி,சசன்கன.

4. நாட்டுப்புறவியல் - முகனவர். ஆறு. ராமநாதன் ,மணிவாசகர்பதிப்பகம், சசன்கன.

5. **தமிழ்சிறுகடதயும்நதாற்றம்வளர்ச்சி – தமிழ் புத்தக ிடலயம், பசைடை.**

இகணயதளம் -www.tamilvu.org
www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

FIRST YEAR - SEMESTER I

PAPER II –GENERAL ENGLISH

Subject Code	Category	L	T	P	C	
23111AEC12	Part II	3	1	-	3	

Learning Objectives		
LO1	To enable learners to acquire the linguistic competence necessarily required in various life Situations.	
LO2	To help them understand the written text and able to use skimming, scanning skills	
LO3	To assist them in creative thinking abilities	
LO4	To enable them become better readers and writers	
LO5	To assist them in developing correct reading habits, silently, extensively and intensively	
Unit No.	**Unit Title & Text**	**No. of Periods for the Unit**
I	**Poetry** 1.1 A Patch of Land - Subramania Bharati 1.3 A Nation's Strength – Ralph Waldo Emerson 1.4 Love Cycle - Chinua Achebe	20
II	**Prose** JRD - Harish Bhatt Us and Them- David Sedaris From Dress Your Family in Corduroy and Denim	20
III	**Short Stories** 3.1 The Faltering Pendulum- Bhabani Bhattacharya 3.2 How I Taught my Grandmother to Read- Sudha Murthy 3.3 The Gold Frame- R.K. Laxman	20
IV	**Language Competency** 4.1 Vocabulary : Synonyms, Antonyms, Word	15

	Formation 4.2 Appropriate use of Articles and Parts of Speech 4.3 Error correction	
V	**English for Workplace** 5.1 Self - introduction, Greetings 5.2 Introducing others 5.3 Listening for General and Specific Information 5.4 Listening to and Giving Instructions / Directions	15

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing	PO1
CO2	Understand the total content and underlying meaning in the context.	PO1,PO2
CO3	Form the habit of reading for pleasure and for information	PO4,PO6
CO4	Comprehend material other than the prescribed text	PO4,PO5,PO6
CO5	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.	PO3,PO8

	Text books (Latest Editions)
1	Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi: Sahitya Academy, 1967
2	How I taught my Grandmother to Read and other Stories, Murthy, Sudha,Penguin Books, India, 2004

Web Resources	
1	A patch of land by Subramania Bharati translated by Usha Rajagoplan : https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false
2	The Sparrow by Paul Laurence Dunbar https://poets.org/poem/sparrow-0
3	A Nation's Strength by Emerson https://poets.org/poem/nations-strength
4	Love cycle by Chinua Achebe : https://www.best-poems.net/chinua-achebe/love-cycle.html
5	JRD by Harish Bhatt https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories
6	Us and Them by David Sedaris From Dress Your Family in Corduroy and Denim https://legacy.npr.org/programs/morning/features/2004/jun/sedaris/usandthem.html
7	Uncle Podgier Hangs a Picture: http://rosyhunt.blogspot.com/2013/01/uncle-podger-hangs-picture.html
8	The Gold Frame: https://fybaenglish.blogspot.com/2018/12/the-gold-frame-r-k-laxman.html

Reference Books

(Latest Editions, and the style given must be strictly adhered to)

1.	English in use - A textbook for College Students (English, Paper back, - T.Vijay Kumar, K Durga Bhavani, YL Srinivas.
2	Practical English Usage - 4th Edition By Michael Swan
3.	**The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and Grace -Shepherd, Penny**, Sharon Hogan, 2005.

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Mapping with Programme Specific Outcomes:

CO /PO	PS O1	PS O2	PS O3	PS O4	PS O5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

3 – Strong, 2 – Medium, 1 - Low

CORE PAPER

Subject Code	Subject Name	Category	L	T	P	C	
23120AEC13	Python programming	**Core**	4	1	0	3	

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-if-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	**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**
	TOTAL HOURS	**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	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	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

FIRST YEAR - SEMESTER I

COMPUTER SCIENCE-ALLIED MATHEMATICS
PAPER-1 NUMERICAL METHODS

Subject Code	Category	L	T	P		C	
23120GEC14		3	1	0		3	

Learning Objectives	
LO1	To introduce the various topics in Numerical methods.
LO2	To make understand the fundamentals of algebraic equations.
LO3	To apply interpolation and approximation on examples.
LO4	To solve problems using numerical differentiation and integration.
LO5	To solve linear systems, numerical solution of ordinary differential equations

UNIT	DETAILS
I	**FUNDAMENTALS OF ALGEBRAIC EQUATION**: Solution of algebraic and transcendental equations-Bisection method – Fixed point iteration method – Newton Raphson method –linear system of equations – Gauss elimination method – Gauss Jordan method.
II	**ITERATIVE, INTERPOLATION AND APPROXIMATION:** Iterative methods - Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices. Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation
III	**INTERPOLATION WITH EQUAL INTERVAL:** Difference operators and relations. -Interpolation with equal intervals – Newton's forward and backward difference formulae.
IV	**NUMERICAL DIFFERENTIATION AND INTEGRATION:** Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule
V	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS:** Single step methods – Taylor's series method – Euler's method – Modified Euler's method – Runge-Kutta method for solving(first, second , Third and 4th) order equations – Multi step methods

Course Outcomes		
CO1	Know how to solve various problems on numerical methods	PO1
CO2	Use approximation to solve problems	PO1,PO2
CO3	Differentiation and integration concept are applied	PO4,PO6
CO4	Apply , direct methods for solving linear systems	PO4,PO5, PO6
CO5	Numerical solution of ordinary differential equations	PO3,PO8

Text Books (Latest Editions)	
1	Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem solving Focus", Wiley India Edition, 2015.
2	Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1	Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition.
2	Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.
Web Resources	
1	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	2	3	3	3	2	1	3
CO2	2	1	3	1	3	3	3	2	1	2
CO3	3	2	3	1	3	3	3	2	1	3
CO4	1	2	3	2	3	3	3	2	1	1
CO5	3	1	2	3	3	3	3	2	1	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

COMPUTER SCIENCE-ALLIED MATHEMATICS
PAPER-2 STATISTICS

Subject Code	Category	L	T	P		C	
23120GEC15		3	1	0		3	

Learning Objectives	
LO1	Distinguish among different scales of measurement and their implications for solving problems
LO2	Create tables and graphs to format, organize, and interpret data; summarize and present data
LO3	Calculate and analyze numerical descriptive measures for a given data set
LO4	Apply concepts of sample space and probability to solving problems
LO5	Calculate measures of central tendency and variation; use statistical software to analyze

UNIT	DETAILS
I	**Data:** quantitative and qualitative, attributes, variables, Scales of measurement: nominal, ordinal, interval and ratio, Measures of Central Value: Meaning, Need for measuring central value. Characteristics of an ideal measure of central value. Types of averages - mean, median, mode, harmonic mean and geometric mean. Merits, Limitations and Suitability of averages.
II	**Correlation Analysis:** Meaning and significance. Correlation and Causation, Types of correlation, Methods of studying simple correlation - Scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.
III	**Regression Analysis:** Meaning and significance, Regression vs. Correlation, Simple Regression model: Linear Regression, Conditions for simple linear regression
IV	**Time Series :**Analysis of Time Series, Methods of measuring trend and seasonal variations
V	**Index Numbers:** Consumers price index and cost of living indices

Course Outcomes		
CO1	The learners will apprehend the basics of data science and data analysis like Averages and forecasting techniques.	PO1
CO2	The learners will comprehend the basics of data science and data analysis like Averages and forecasting techniques.	PO1,PO2
CO3	The learners will understand use of Time series and Index numbers in management decisions.	PO4,PO6
CO4	The learners will be able to understand the business implications and probabilities of every decision being made.	PO4,PO5, PO6
CO5	Gain entrance into careers as well as in graduate or professional school.	PO3,PO8

Text Books (Latest Editions)	
1	P A Navanitham (2006): Business Mathematics and Statistics
2	Gupta S.P. (2017) : Statistical Methods, Sultan Chand & Sons, 45h Revised Edition
	Levin, R. and Rubin, D. (2017). Statistics for Management. 8thed. New Delhi: Pearson

References Books (Latest editions, and the style as given below must be strictly adhered to)	
1	Harald Cramér ***Mathematical Methods of Statistics,*** Princeton Mathematical Series, vol. 9. Princeton University Press, Princeton, N. J., 1946. xvi+575 pp
2	S.C.Gupta, Business Statistics
Web Resources	
1	*https://www.ascdegreecollege.ac.in/wp-content/uploads/2020/12/Business-Statistics-by-Gupta.pdf*

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	2	3	3	3	2	1	3
CO2	2	1	3	1	3	3	3	2	1	2
CO3	3	2	3	1	3	3	3	2	1	3
CO4	1	2	3	2	3	3	3	2	1	1
CO5	3	1	2	3	3	3	3	2	1	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Subject Code	Subject Name	Category	L	T	P		C	
23120SEC16 L	**Python Programming Lab**	**Core**	0	0	3		3	

Learning Objectives	
LO1	Be able to design and program Python applications.
LO2	Be able to create loops and decision statements in Python.
LO3	Be able to work with functions and pass arguments in Python.
LO4	Be able to build and package Python modules for reusability.
LO5	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.	**60**

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

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

Subject Code	Subject Name	Category	L	T	P	C	Inst. hours
23120SEC17	**Fundamentals of Information Technology**	Skill Enha. Course (SEC)	2	0	0	2	2

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, MultiN Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
O1	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
O2	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
O4	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. Kavitha Murugeshan (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 Sushil Puneet 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	C		Inst. Hours	
23120SEC18	**Problem Solving Techniques**	FC	2	-	-	2		2	

Learning Objectives	
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
LO2	Implement different programming constructs and decomposition of problems into functions.
LO3	Use data flow diagram, Pseudo code to implement solutions.
LO4	Define and use of arrays with simple applications
LO5	Understand about operating system and their uses

UNIT	Contents	No. Of. Hours
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language, 4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	**6**
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.**Pseudocode:** Writing a pseudo code. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	**6**
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	**6**
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	**6**

V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	**6**
	TOTAL HOURS	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudo code.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	**Stewart Venit,** "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.

Web Resources	
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3.	http://utubersity.com/?page_id=876

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

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

Ability Enhancement Compulsory Course

INDIAN CONSTITUTION

Subject Code	Category	L	T	P		C	Inst. Hours	
231AECCINC	AECC	2	0	0		2	2	

Learning Objectives	
LO1	To make the students understand about the democratic rule and parliamentarian administration
LO2	To appreciate the salient features of the Indian constitution
LO3	To know the fundamental rights and constitutional remedies
LO4	To make familiar with powers and positions of the union executive, union parliament and the Supreme Court
LO5	To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy

UNIT	DETAILS
I	**The making of Indian constitution:** The constitution assembly organization - character - work salient features of the constitution- written and detailed constitution - socialism -secularism-democracy and republic.
II	**Fundamental rights and fundamental duties of the citizens:** Right of equality - right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties.
III	**Directive principles of state policy:** Socialistic principles - Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles
IV	**The union executive, union parliament and Supreme Court :** Powers and positions of the president - qualification - method of election of president and vice president -prime minister - Rajya Sabah - Lok Sabah .the supreme court - high court -functions and position of supreme court and high court
V	**State council -election system and parliamentary democracy in India:** State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

Course Outcomes		
CO1	Students can know about constitution our fundamental rights and duties	PO1
CO2	Students can get knowledge of the Indian administrative systems.	PO1,PO2
CO3	Students will be able to understand the Nature of Indian Politics	PO4,PO6
CO4	Students will be able to understand the Indian constitution and Fundamental rights and Duties.	PO4,PO5, PO6
CO5	Integrate knowledge of the diversity of cultures and peoples.	PO3,PO8

Text Books (Latest Editions)	
1	India's Constitution by M.V.Pylee., 16th edt.,S.Chand & Company Ltd, Ram Nagar, New Delhi-110055.
2	Introduction to the Constitution of India by Durga Das Basu · 2015,. LexisNexis publication,SBN:9789351434467, 935143446X.
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1	Palekar.s.a. Indian constitution government and politics, ABD publications, India
2	Aiyer, alladikrishnaswami, Constitution and fundamental rights 1955.
3	Markandan. K.c.directive Principles in the Indian constitution 1966.
Web Resources	
	https://www.google.co.in/books/edition/India_s_Constitution_16th_Edition/yjJlDwAAQBAJ?hl=en&gbpv=1&dq=indian+constitution+pdf&printsec=frontcover

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

FIRST YEAR - SEMESTER I
Part-IV
Audit Course
UNIVERSAL HUMAN VALUES

Subject Code	Category	L	T	P	C		Inst. Hours	
231LSCUV	AC	-	-	-	1		-	

Learning Objectives	
LO1	The present course deals with meaning, purpose, and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realize one's potentials

UNIT	DETAILS
I	Introduction: What is love? Forms of love for self, parents, family, friend, spouse, community, nation, humanity and other beings, both for living and non-living Love and compassion and inter-relatedness Love, compassion, empathy, sympathy and non-violence Individuals who are remembered in history for practicing compassion and love. Narratives and anecdotes from history, literature including local folklore Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion? Sharing learner's individual and/or group experience(s) Simulated Situations Case studies
II	Introduction: What is truth? Universal truth, truth as value, truth as fact(veracity, Sincerity, honesty among others) Individuals who are remembered in history for practicing this value Narratives and anecdotes from history, literature including local folklore Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it? Learners' individual and/or group experience(s) Simulated situations Case studies
III	Introduction: What is nonviolence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence Ahimsa as non-violence and non-killing Individuals and organizations that are known for their commitment to non-violence Narrativesandanecdotesaboutnon-violencefromhistory,andliteratureincluding local folklore Practicing on-violence: What will learners learn/gain if they practice non- violence? What will

	Learners lose if they don't practice it? Sharing learner's individual and/or group experience(s) about non-violence Simulated situations Case studies
IV	Introduction: What is righteousness? Righteousness and *dharma*, Righteousness and Propriety Individuals who are remembered in history for practicing righteousness Narratives and anecdotes from history, literature including local folklore Practicing righteousness: What will earners learn/gain if they practice righteousness? What will learners lose if they don't practice it? Sharing learners' individual and/or group experience(s) Simulated situations Case studies
V	Introduction: What is peace? Its need, relation with harmony and balance Individuals and organizations that are known for their commitment to peace Narratives and Anecdotes about peace from history, and literature including local folklore Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it? Sharing learner's individual and/or group experience(s) about peace Simulated situations Case studies
VI	Introduction: What is service? Forms of service, for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster. Individuals who are remembered in history for practicing this value. Narratives and anecdotes dealing with instances of service from history, literature including local folklore Practicing service: What will earners learn/gain gain if they practice service? What will learners lose if they don't practice it? Sharing learners' individual and/or group experience(s) regarding service Simulated situations Case studies

VII	Introduction: What is renunciation? Renunciation and sacrifice. Self-restrain and Ways of overcoming greed. Renunciation with action as true renunciation Individuals who are remembered in history for practicing this value. Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation. Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it? Sharing learners' individual and/or group experience(s) Simulated situations Casestudies

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	2	2
CO2	3	3	3	2	3	3	3	2	3	2
CO3	2	3	3	3	2	3	3	2	2	2
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

II -SEMESTER

பக்தி இலக்கியம் - 23110AEC21
இரண்டாம்பருவம்

பாட ந
ாக்கங்கள்

- காலந்மதாறும் பக்தி இலக்கியம் வளர்ந்Fள்ள தன்கமகயக் கற்பித்தல்.
- நாயன்மார்கள், ஆழ்வார்களின் பக்திச்சிறப்கபஅறியசசய்தல்.
- ஆழ்வார்களின் பக்தி உணர்கவ ஊட்டுதல்
- பாடல்களில் இகச இன்பம், ஓகச நயம் ஆகியவற்கற உணரச்சசய்தல்
- குழந்கதப் பருலத்தின் தன்கமகய உணர்த்Fதல்

பயைகள்

- **ாயைமார்கள் பக்திச்சிறப்டப அறிதல்**.
- ஆழ்வார்களின் பக்திசநறிகய உணர்தல்.
- பக்தி இலக்கியம்காலம் மதாறும் வளர்ந்தகத அறிதல்.
- பாடல்களில் இகச இன்பம், ஓகச நயம் அறிதல்.
- குழந்கதப் பருலத்தின் தன்கமகய உணர்தல்.

அலகு- 1 பை்ைிருதிருமுடறகள்

1. திருஞானசம்பந்தர்– திருத்தில்கலப்பதிகம்
2. திருநாவுக்கரசர் - திருநீற்றுப்பதிகம்
3. சுந்தரர் - திருசவண்கணநல்லூர்
4. திருமூலர்- திருமந்திரம்(இளகமநிகலயாகம)

அலகு- 2 பை்ைிருஆழ்வார்கள்

ஆண்டாள் - திருப்பாகவ

சபரியாழ்வார்- மூன்றாம்திருமுகற(பத்Fபாடல்கள்)

மFரகவியாழவார - கணணினநுணசிறுதாமபு

அலகு- 3சிற்றிலக்கியங்கள்

1. மீனாட்சியம்கமப்பிள்களத்தமிழ்– சசங்கீகரபருவம், அம்புலிபருவம்
2. நந்திக்கலம்பகம்
3. குற்றாலகுறவஞ்சி- குறத்திநகர்வளம்கூறுதல்
4. காளமமகப் புலவர் பாடல்கள்

அலகு- 4 புதிைம

1. நா .பார்த்தசாரதியின்- குறிஞ்சிமலர்

அலகு-5 தமிழ் இலக்கிய வரலாறு

1. பக்திஇலக்கியங்கள்
2. கசவமும்தமிழும்
3. கவணவசமயம்மபாற்றிவளர்த்ததமிழ்
4. சிற்றிலக்கியங்கள்
5. நாவல்இலக்கியம்

பார்டவநூல்கள் :

1. மதவாரம் - மணிவாசகர்பதிப்பகம்சசன்கன

2. நாலாயிரதிவ்ய பிரபந்தம் - வர்த்தமான பதிப்பகம் சசன்கன.

3. தமிழ்இலக்கியவரலாறு - முகனவர்சசுபாஷ்சந்திரமபாஸ், இயல்சவளியீடு ,தஞ்சாவூர

4. தமிழ் நாவல் இலக்கியம் -காகககலாசபதி- தமிழ் புத்தக,நிகலயம், சசன்கன

இகணயதளம் -www.tamilvu.org , www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

FIRST YEAR - SEMESTER II

PAPER II –GENERAL ENGLISH

Subject Code	Category	L	T	P	C		Inst. Hours	
23111AEC22	**Part II**	3	1	0	3		6	

Learning Objectives	
LO1	To introduce learners to the essential skills of communication in English
LO2	To enable them use these skills effectively in academic and non-academic contexts
LO3	To help them identify and eliminate common mistakes in writing and speaking
LO4	To enable them use various business communication strategies and to use advanced vocabulary
LO5	To familiarize them in writing descriptive essays and respond to arguments orally and in writing

Unit No.	**Unit Title & Text**	**No. of Periods for the Unit**
I	**Poetry** 1.1 Very Indian Poem in Indian English - Nissim Ezekiel 1.2 Still I Rise - Maya Angelou 1.3 On Killing a Tree - Gieve Patel	20
II	If You Are Wrong Admit it- Dale Carnegie Kindly Adjust Please - Shashi Tharoor The Spoon-fed Age- W.R. Inge	20
III	**Fiction** Alchemist - Paulo Coelho	20
IV	**Language Competency** 4.1 Homonyms, Homophones, Homographs Portmanteau words 4.2 Subject Verb Agreement	15
V	**English in the Workplace** 5.1 Reading for General and Specific information [charts, tables, schedules, graphs etc] 5.2 Reading news and weather reports 5.3 Writing paragraphs 5.4 Taking and making notes	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to introduce themselves and talk about everyday activities confidently	PO1
CO2	Be able to write short paragraphs on people, places and events	PO1, PO2
CO3	Identify the purpose of using various tenses and effectively employ them in speaking and writing	PO4, PO6
CO4	Gain knowledge to write subjective and objective descriptions	PO4, PO5,PO6
CO5	Identify and use their skills effectively in formal contexts.	PO3,PO8

Textbooks(Latest Editions)	
1	The Alchemist - Paulo Coelho Harper – 2005
References Books **(Latest editions, and the style as given below must be strictly adhered to)**	
1	Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2	Descriptive English. SP Bakshi, Richa Sharma · 2019, Arihant Publications (India) Ltd.
3	The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4	Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5	Brilliant Speed Reading: Whatever you need to read, however ...Phil Chambers, Pearson, 2013.
6	The Archer, Paulo Coelho. Penguin Viking, 2020.
Web Resources	
1	Very Indian poem by Nissim Ezekiel http://econtent.in/pacc.in/admin/contents/40_%20_2020103001102714.pdf
2	Still I Rise by Maya Angelou https://www.poetryfoundation.org/poems/46446/still-i-rise
3	The Flower by Tennyson: https://www.poemhunter.com/poem/the-flower-2/
4	On Killing a tree by Gieve Patel: https://www.poemhunter.com/poem/on-killing-a-tree/

5	If you are wrong, admit it: https://www.tbr.fun/if-youre-wrong-admit-it/
6	Kindly Adjust please - Shashi Tharoor https://www.theweek.in/columns/shashi-tharoor/2018/05/25/kindly-adjust-to-our-english.html?fbclid=IwAR3IhtdXqvuV4ySECn9S7SA6HmCEYISyd1QHd3BlwKgiNKKwdkeSg3qWp-U/
7	The Spoon Fed Age: https://www.nrkacademy.com/2016/04/spoon-feeding-by-wringe .html
8	The Alchemist: https://www.youtube.com/watch?v=lxBYpmxjeDU

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Semester II

Title of the Course/ Paper	Subject Name	Category	L	T	P	C		Inst. Hours	
23120AEC23	**DATA STRUCTURE AND ALGORITHMS**	Core	4	1	0	3		5	

Learning Objectives	
LO1	To understand 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 understand various sorting and searching

UNIT	**Contents**	**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-Polynomial Manipulation- All operations-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 – Cut vertex- 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**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Book		
1	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.	
2	Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1.	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

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	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each	15	14	13	13	15	14

FIRST YEAR - SEMESTER II
COMPUTER SCIENCE-ALLIED MATHEMATICS
PAPER-III OPERATIONS RESEARCH

Subject Code	Category	L	T	P	C		Inst. Hours	
23120GEC24		3	1	0	3			

Learning Objectives	
LO1	To understand the methodology of OR problem solving and formulate linear programming problem.
LO2	To develop formulation skills in transportation models and finding solutions
LO3	To understand the basics in the field of game theory and assignment problems
LO4	To know how project management techniques help in planning and scheduling a project
LO5	To know the basics of dynamic programming and simulation

UNIT	DETAILS
I	Definition of operations research, models of operations research, scientific methodology of operations research, scope of operations research, importance of operations research in decision making, role of operations management, limitations of OR
II	Linear Programming: Introduction – Mathematical formulation of a problem – Graphical solutions, standard forms the simplex method for maximization and minimization problems. Method application to management decisions.
III	Transportation problem – Introduction – Initial basic feasible solution - NWC method – Least cost method – Vogel's method – MODI – moving towards optimality – solution procedure without degeneracy
IV	Assignment problem – Algorithm – Hungarian method – simple problems.
V	Network models and simulation. Network models for project analysis CPM; Network construction and time analysis; cost time trade off, PERT – problems

Course Outcomes		
CO1	To recognize the importance and value of Operations Research and linear programming in solving practical problems in industry	PO1
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems..	PO1,PO2
CO3	To know, how to transport a thing in minimum cost.	PO4,PO6
CO4	Gain knowledge about the assigning process	PO4,PO5, PO6
CO5	Gain knowledge of drawing project networks for	PO3,PO8

Text Books (Latest Editions)	
1	Kalavathy, Operations Research
References Books **(Latest editions, and the style as given below must be strictly adhered to)**	
1	Kanti Swarup, Gupta.P.K. & Man Mohan, operations Research, S.Chand & Sons
2	Taha.H.A, operation Research: An Introduction, McMillan publishing Co., 1982. 7 th ed.
Web Resources	
	https://rccmindore.com/wp-content/uploads/2015/06/Operations-Research.pdf

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	2	3	3	3	2	1	3
CO2	2	1	3	1	3	3	3	2	1	2
CO3	3	2	3	1	3	3	3	2	1	3
CO4	1	2	3	2	3	3	3	2	1	1
CO5	3	1	2	3	3	3	3	2	1	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

FIRST YEAR - SEMESTER II
COMPUTER SCIENCE-ALLIED MATHEMATICS
PAPRER-IV DISCRETE MATHEMATICS

Subject Code	Category	L	T	P	C			
23120GEC25		3	1	0	3			

Learning Objectives	
LO1	Use mathematically correct terminology and notation.
LO2	Apply logical reasoning to solve a variety of problems.
LO3	Construct correct direct and indirect proofs
LO4	Use division into cases in a proof.
LO5	Use counterexamples.

UNIT	DETAILS
I	**SET THEORY:** Introduction- set and Its Element – Set Description (Roster, Set Builder and cardinal number method) Types of Sets- Set Operations and Laws of set Theory. Partition of sets. Countable and uncountable set. Algebra of sets and Duality
II	**MATHEMATICAL LOGIC:** Basic Logic and Proof, logical operations – Logic Propositional equivalence, Predicates and Quantities, Tautology-Contradiction-Methods of proofs (Direct and Indirect) - Function- Definition-Notation- Types of Function- Composition of Functions
III	**NUMBER THEORY:** The Integers and Division, Integers and Algorithms, (Multiplication, Addition and Division -Sequences and Summations, Recursive algorithms, Program correctness
IV	**RELATIONS:** Relations – Relations and their properties, Representing Relations, Closures of relations, Equivalence relations, Partial orderings-Recurrence Relations Binary Relations
V	**MATRIX, DETERMINANT OF MATRIX AND ITS APPLICATION:** Introduction, definitions, Types of Matrix, Properties of matrix, operations on matrix, Inverse of matrix, Cayley Hamilton of matrix-applications

Course Outcomes		
CO1	To gain knowledge on set theory	PO1
CO2	Able to understand different mathematical logics and functions	PO1,PO2
CO3	To get an idea on Permutations and Combinations	PO4,PO6
CO4	Understanding the different form of number theory	PO4,PO5, PO6
CO5	Able to understand Relations and its applications	PO3,PO8

Text Books (Latest Editions)	
1	Rosen K.H. Discrete Mathematics and its Applications, 5th edition, Tata McGraw – Hills,2003
2	J.K Sharma "DISCRETE MATHEMATICS" 3 rd Edition Macmillan Reprint2011
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1	Johnson Baugh R, and Carman R, Discrete mathematics, 5th edition, Person Education, 2003.
2	Kolman B, Busoy R.C, and Ross S.C, Discrete Mathematical Structures, 5th edition, Pretitice – Hall, 2004.
Web Resources	
1	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	2	3	3	3	2	1	3
CO2	2	1	3	1	3	3	3	2	1	2
CO3	3	2	3	1	3	3	3	2	1	3
CO4	1	2	3	2	3	3	3	2	1	1
CO5	3	1	2	3	3	3	3	2	1	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution	3.0	3.0	3.0	3.0	3.0

Title of the Course/ Paper	Subject Name	Category	L	T	P	C		Inst. Hours
23120AE C26L	**DATA STRUCTURE AND ALGORITHMS LAB** [Note: Practical's may be offered through C / C++ / Python]	Core	0	0	3	3		4

Learning Objectives	
LO1	To understand 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 understand various sorting and searching

Sl. No	Contents	No. of Hours
1.	Write a program to implement the List ADT using arrays and linked lists.	**60**
2.	Write a programs to implement the following using a singly linked list. • Stack ADT • Queue ADT	
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	
4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: • Insert an element into a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree.	
6.	Write a program to perform the following operations • Insertion into an AVL-tree • Deletion from an AVL-tree	
7.	Write a programs for the implementation of BFS and DFS for a given graph.	

8	Write a programs for implementing the following searching methods: • Linear search • Binary search.	
9.	Write a programs for implementing the following sorting methods: • Bubble sort Selection sort Insertion sort Radix sort.	
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
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	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition
Reference Books	
1	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
Web Resources	
1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

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	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each Ps	15	15	13	15	13	15

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120SEC27	**Quantitative Aptitude**	Skill Enha. Course (SEC)	2	-	-	2		2	

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	**60**
		Programme Outcome

Course Outcomes		
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 processing.	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	"Quantitative Aptitude", R.S.AGGARWAL.,S.Chand & Company Ltd.,	
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

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120SEC28	**Advanced Excel**	Skill Enha. Course (SEC)	2	0	0	2		2	

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	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 Spark lines, 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

SEMESTER II
Part-IV
Ability Enhancement Compulsory Course
SOFT SKILL -2-COMMUNICATION SKILL

Subject Code	Category	L	T	P	C		Inst. Hours	
231AECCCMS	AECC	2	0	0	2		2	

Learning Objectives	
LO1	Identify common communication problems that may be holding learners back.
LO2	Identify what their non-verbal messages are communicating to others.
LO3	Understand role of communication in teaching-learning process.
LO4	Learning to communicate through the digital media.
LO5	Understand the importance of empathetic listening.
LO6	Explore communication beyond language.

UNIT	DETAILS
I	**Listening** Techniques of effective listening. Listening and comprehension. Probing questions. Barriers to listening.
II	**Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors
III	**Reading** • Techniques of effective reading • Gathering ideas and information from a given text i. Identify the main claim of the text ii. Identify the purpose of the text iii. Identify the context of the text

	iv. Identify the concepts mentioned • Evaluating these ideas and information i. Identify the arguments employed in the text ii. Identify the theories employed or assumed in the text • Interpret the text i. To understand what a text says ii. To understand what a text does iii. To understand what a text means
IV	**Writing and different modes of writing** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques • Be well structured i. Well-knit logical sequence ii. Narrative sequence iii. Category groupings • Different modes of Writing - i. E-mails ii. Proposal writing for Higher Studies iii. Recording the proceedings of meetings iv. Any other mode of writing relevant for learners
V	**Digital Literacy** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools i. Paint ii. Office iii. Excel iv. PowerPoint

VI	**Effective use of Social Media** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing
VII	**Non-verbal communication** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbelieves • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning

Course Outcomes		
CO1	By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.	PO1
References Books (Latest editions, and the style as given below must be strictly adhered to)		
1	Sen Madhuc chanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi	
2	Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC	

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	3	3	3	3	3	2	2	2
CO3	2	3	3	3	2	3	3	2	2	2
CO4	3	3	3	2	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 – Low Mapping with Programme Specific Outcomes

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

SEMESTER-III

காப்பிய இலக்கியம் - 23110AEC31
மூை்றாம் பருவம்

பாடந ாக்கங்கள்

- தமிழ்க்காப்பியங்ககள அறிமுகப்படுத்Fதல்.
- காப்பியங்கள் கூறும் வாழ்வியல் அறங்ககள உணர்த்Fதல்.
- காப்பிய இலக்கியங்களில் இலக்கியச் சுகவகய பயிற்றுவித்தல்.
- நாடக இலக்கியத்தின் தனித்Fவத்கதக்கற்பித்தல்.
- புராணச் சசய்திகள மமம்படுத்திக்சகாள்ளச்சசய்நல்.

பயிற்சிகள்

- இலக்கியங்களின் சிறப்புகள அறிவர்.
- காப்பியக்ககதகள்வழிஅறச்சிந்தகனசபறுவர்
- பல்மவறு காப்பியவடிவங்கள பற்றிய அறிவுசபறுவர் .
- நாடக பகடப்பாக்கத்திற்கான தூண்டுதகலப் சபறுவர்
- புராணச் சசய்திகள் வழி தமிழ்கலாச்சாரத்கத அறிவர்.

அலகு-1 காப்பியங்கள்

1.சிலப்பதிகாரம் - மFகரகாண்டம் (வழக்குகரகாகத)]

2.மணிமமகல - விழாவகறகாகத

3.சீவகசிந்தாமணி - குணமாகலயார்இலம்பகம்

அலகு-2 காவியங்கள்

1.கம்பராமாயணம்- மந்தகரசூழ்ச்சிபடலம்

2.மகாபாரதம் - ஆரண்யபருவம்

அலகு-3புராணங்கள்

1. சபரியபுராணம்- இகளயான்குடிமாறநாயனார்புராணம்
2. சீறாப்புராணம் - ஈத்தங்குகழவரவகழத்தப்படலம்
3. மதம்பாவணி- பிரிந்தமககனகாண்படலம்

அலகு-4 ாடகம் - சாபம்? விமமாசனம்

அலகு-5 இலக்கியவரலாறு

1. காப்பியங்கள்
2. இரட்கடக்காப்பியங்கள்

3. நாடகஇலக்கியம்

பார்டவ நூல்கள் :

1. காப்பியத்திறன்- மணிவாசகர்நூலகம், சிதம்பரம்.

2. தமிழ்காப்பியங்கள் - கி. வா .செகன்செகநாதன் , அமுதநிகலயம், சசன்கன.

3 .நவீனநாடகஉருவாக்கம் - மகாபழனி , தமிழ்பல்ககலக்கழகம், தஞ்சாவூர்.

4.இகணயதளம் -www.tamilvu.org , www.noolulagam.com

5. சாபம்? விமமாசனம்

மு.இராமசுவாமி,

சசண்பகம்இராமசுவாமி,

பாகவபதிப்பகம்,ெொனிெொன்சாகல,சசன்கன – 14

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

SECOND YEAR - SEMESTER III

PAPER II –GENERAL ENGLISH [23111AEC32]

Subject Code	Category	L	T	P	C		Inst. Hours	
23111AEC32	**Part II**	3	1	0	3		6	

Learning Objectives	
LO1	To enhance the level of literary and aesthetic experience of students and to help them respond creatively.
LO2	To sensitize them to the major issues in the society and the world.
LO3	To provide them with an ability to build and enrich their communication skills
LO4	To equip them to utilize the digital knowledge resources effectively for their chosen fields of study
LO5	To help them think and write imaginatively and critically.

Unit No.	**Unit Title & Text**	**No. of Periods for the Unit**
I	**Poetry:** 1.1 The Voice of the Mountains - Mamang Dai 1.2 A Song of Hope - Oodgeroo Noonuccal 1.3 In an Artist's Studio - Christina Rossetti	20
II	**Scenes From Shakespeare:** 2.1 Romeo & Juliet -The Balcony Scene 2.2 Macbeth-Banquet Scene 2.3 Julius Caesar - Murder Scene	20
III	**Speeches of Famous personalities** 3.1 Yes, We Can-Barack Obama 3.2 You've Got to Find What You Love-Steve Jobs	20
IV	**Language Competency** 4.1 Writing letters and emails 4.2 Writing and messaging in social media platforms [blogs, twitter, instagram.facebook. 4.3 Learning netiquette, email etiquette	15
V	**English for Workplace** 5.1 Data Interpretation and Reporting 5.2 Data Presentation and analysis 5.3 Meeting Etiquettes - language, dress code, voice modulation. Online Meetings - Terms and expressions used	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.	PO1
CO2	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society	PO1,PO2
CO3	Produce grammatically and idiomatically correct language.	PO4,PO6
CO4	Gain knowledge in writing techniques to meet academic and professional needs.	PO4,PO5, PO6
CO5	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career oriented tests.	PO3,PO8

Text Books (Latest Editions)	
1	**Arden Shakespeare Complete works by Shakespeare (Author), William (Author), Bloomsbury, 2011)**
References Books (Latest Editions, and the style as given below must be strictly adhered to)	
1	The Shakespeare Book: Big Ideas Simply Explained, Stanley Wells et al. DK v Publishing, 2015
3	Famous Speeches by Mahatma Gandhi, Create space Independent Publishing Platform, 2016
4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by Keith S Folse, Michigan Teacher Training, 2016.
6	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Web Resources	
1	The Voice of the Mountains by Mamang Dai: https://www.scribd.com/document/558838656/The-Voice-of-the-Mountain-By-Mamang-Dai-Adivasi-Resurgence
2	A song of Hope by Kath Walker: http://www.wordslikethis.com.au/a-song-of-hope/
3	In an artist's studio by Christina Rossetti: https://www.poetryfoundation.org/poems/146804/in-an-artist39s-studio
4	Sita by Toru Dutt: https://www.poetrynook.com/poem/s%E2%94%9C%C2%ABta
5	Tryst with Destiny: https://www.cam.ac.uk/files/a-tryst-with-destiny/index.html#:~:text=Jawaharlal%20Nehru%2C%20delivering%20his%20Tryst%20with%20Destiny%20speech.&text=%22Long%20years%20ago%20we%20made,awake%20to%20life%20and%20freedom.
6	Yes, We Can: https://www.englishspeecheschannel.com/english-speeches/barack-obama-speech/
7	You've got to find what you love: https://www.businessbusinessbusiness.com.au/steve-jobs-youve-got-to-find-what-you-love/#:~:text=Steve%20Jobs%2C%20in%20his%20commencement,emphasizes%20on%20believing%20in%20oneself.

Mapping with Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 - Low

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

SEMESTER III

Subject Code	Subject Name	Category	L	T	P	C		Inst.	
23120AEC33	**Microprocessor and Microcontroller**	Core	5	1	0	4		5	
Learning Objectives									
LO1	To introduce the internal organization of Intel 8085 Microprocessor.								
LO2	To know about various instruction sets and classifications								
LO3	To enable the students to write assembly language programs using 8085.								
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.								
LO5	To provide real-life applications using microcontroller.								
UNIT	**Contents**								**No. of Hours**
I	Digital Computers - Microcomputer Organization-Computer languages – Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.								15
II	8085 Microprocessor – Pin out and Signals – Functional block diagram -8085 Instruction Set and Classifications.								15
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction – Multibyte Addition and Subtraction - Multiplication and Division.								15
IV	The 8085 Interrupts – RIM AND SIM instructions-825 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.								15
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 -								15
	Total								**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor.	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	PO4,PO6
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO 6
CO5	An exposure to create real time applications using microcontroller.	PO3,PO6
Text Book		
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications, 2009. [For unit I to unit IV]	
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [For unit V].	
Reference Books		
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.	
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.	
3.	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008	
Web Resources		
1.	E-content from open source libraries	
2.	https://www.bing.com/, https://theopennotes.in/	

Mapping with Programme Outcomes:

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

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

Discipline Specific Elective-I

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120DS34A	**Image Processing**	Elective	5	1	0	3		4	

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	12
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition	12
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.	12
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.	12

V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	12
	Total	**60**

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 of course contributed to each PSO	**15**	**14**	**11**	**15**	**10**	**10**

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

Subject Code	Subject Name	Category	L	T	P	C	Inst. Hours
23120DSC34B	Big Data Analytics	Elective	5	1	0	3	4

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 No SQL 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 — Map Reduce Programming Model	12
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.	12
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of	12

	Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	
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	12
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.	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, PO5
4	Perform analytics on data streams.	PO3, PO5, PO6
5	Learn No SQL 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 of course contributed to each PSO	**15**	**14**	**11**	**15**	**15**	**13**

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

Subject Code	Subject Name	Category	L	T	P	C		
23120DSC34C	NATURAL LANGUAGE PROCESSING	**Elective**	5	1	0	3		

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	To get 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 Net Stemmers- POS Tagger- Research	**12**

	Corpora SSAS.	

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 oftext data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of 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	

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120SEC35L	Microprocessor and microcontroller Lab	Core	0	0	3	3		4	

Learning Objectives		
LO1	To introduce the internal organization of Intel 8085 Microprocessor.	
LO2	To know about various instruction sets and classifications	
LO3	To enable the students to write assembly language programs using 8085.	
LO4	To interface the peripheral devices to 8085 using interrupt controller and DMA interface.	
LO5	To provide real-life applications using microcontroller.	
	Details	**No. of Hours**
	List of Exercises:	
	Addition and Subtraction 1. 8 - bit addition 2. 16 - bit addition 3. 8 - bit subtraction 4. BCD subtraction II. Multiplication and Division 1. 8 - bit multiplication 2. BCD multiplication 3. 8 - bit division III. Sorting and Searching 1. Searching for an element in an array. 2. Sorting in Ascending and Descending order. 3. Finding the largest and smallest elements in an array. 4. Reversing array elements. 5. Block move.	60

	IV. Code Conversion 1. BCD to Hex and Hex to BCD 2. Binary to ASCII and ASCII to binary 3. ASCII to BCD and BCD to ASCII V. Simple programs on 8051 Microcontroller 1. Addition 2. Subtraction 3. Multiplication 4. Division 5. Interfacing Experiments using 8051 1. Realization of Boolean Expression through ports. 2. Time delay generation using subroutines. 3. Display LEDs through ports	
	Total	**60**

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

Text Book	
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications, 2009. [For unit I to unit IV]
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [For unit V].
Reference Books	
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
3.	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008
Web Resources	
1.	E-content from open source libraries
2.	https://www.bing.com/

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	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

SKILL ENHANCEMENT COURSE

Subject Code	Subject Name	Category	L	T	P	C		
23120SEC36	**INTRODUCTION TO HTML**	Skill Enha. Course (SEC)	3	0	0	2		

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
I	Introduction: Web Basics: What is Internet–Web browsers–What is Web page –HTML Basics: Understanding tags?	6
II	Tags for Document structure(HTML, Head, Body Tag).Block level text elements: Headings paragraph(<p> tag)–Font style elements:(bold,italic,font,small,strong,strike,bigtags)	6
III	Lists: Types of lists: Ordered, Unordered– Nesting Lists–Other tags: Marquee, HR, BR-Using Images –Creating Hyperlinks.	6
IV	Tables: Creating basic Table, Table elements, Caption–Table and cell alignment–Rowspan, Colspan–Cell padding.	6
V	Frames: Frameset–Targeted Links–No frame–Forms: Input, Text area, Select, Option.	6
	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
	Concept of adding images	PO1, PO2, PO3, PO4, PO5, PO6

CO5	Understand the table creation.	
Textbooks		
1	"Mastering HTML5 and CSS3 Made Easy", Teach Comp Inc., 2014.	
2	**Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"**	
Web Resources		
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf	
2.	https://www.w3schools.com/html/default.asp	

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	C		Inst. Hours			
23120SEC37	**Cloud Computing**	Elective	2	0	0	2		4			
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 – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.										12
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. **Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services										12

	Content Delivery Services: Amazon Cloud Front - Windows Azure Content Delivery Network. **Analytics Services:** Amazon Elastic Map Reduce - Google Map Reduce Service - Google Big Query - Windows Azure Hindsight. **Deployment and Management Services:** Amazon Elastic Bean stack - Amazon Cloud Formation **Identity and Access Management Services:** Amazon Identify and Access Management - Windows Azure Active Directory. Open Source Private Cloud Software: Cloud Stack – Eucalyptus – Open Stack.	
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and upgradassions – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Méthodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approches: Relationnel Approach (SQL), Non- RelationalApproach (NoSQL).	12
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.	12
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - 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-	

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

Course Code	Course Title	L	T	P	C
23120RMC38	Research Methodology	2	0	0	2

AIM:

To create a basic appreciation towards research process and awareness of various research publication.

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-based
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

PREREQUISITIES:

Basic computer skill for working in window environment & conceptual knowledge on basic matrices.

UNIT-I Introduction to Research Methodology

Meaning of research – Objectives of research – Type of research – Significance of research – Research approaches.

UNIT-II Research Methods

Research methods versus Methodology – Research and scientific method – criteria of good research – Problems encountered by researchers in India.

UNIT-III Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Review – General treatises – Monographs.

UNIT-IV Database Survey

Database search – NIST –MSDS –PubMed – Scopus – Science citation index – Information about a specific search.

UNIT-V Introduction to MATLAB:

What is MATLAB? Matrix and its application in different areas: MATLAB approach to environmental modeling; Arithmetic Matrix – Operators; Arithmetic Array – Operators and its applications in MATLAB; Expressions, Opening M-Files; Structure of MATLAB Programming; Programming; Concatenation of strings; Vectorization ; Basic Graphics.

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computation frame works used in mathematical researches.

REFERENCES BOOK:

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi,2204.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2205.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
231ACLSOAN	**OFFICE AUTOMATION**	Skill Enha. Course (SEC)	-	-	-	1		2	

Learning Objectives	
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	**Contents**	**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	**Spreadsheets:** Excel– opening, entering text and data, formatting, navigating; Formulas– entering, handling and copying; Charts– creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	6
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language(MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting &viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition–Animation effects, audio inclusion, timers.	6

	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8
Text Book		
1	Peter Norton, "Introduction to Computers"–Tata McGraw-Hill.	
Reference Books		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.	
Web Resources		
1.	https://www.udemy.com/course/office-automation-certificate-course/	
2.	https://www.javatpoint.com/automation-tools	

Mapping with Programme Outcomes:

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

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

சங்க இலக்கியம் - 23110AEC41

◌ாை◌்காம் பருவம்

பாடந ◌ாக்கங்கள்

- இலக்கியங்கள் வாயிலரக சமுதாயக்கருத்தக்ககள
- பழந்தமிழ்இலக்கியவளத்கதஉணர்த்Fதல்.
- சங்கஅக. புறபாடல்மரபுகளப்பயிற்றுவித்தல்
- வாழ்வியல்அறங்கள்மற்றும்வரலாற்றுச்சசய்திகள .பயிற்றுவித்தல்
- புறஇலக்கியங்கள்காட்டும்வாழ்வியல்அறங்களளடுத்Fக்கூறுதல்

பயைக்கள்

- பழந்தமிழ்இலக்கியமரகபஅறிவர்.
- சங்கஇலக்கியங்களில்உள்ளஅழகியல்கூறுகளஉணர்வர்.
- வாழ்வியல்அறங்கள்மற்றும்வரலாற்றுச்சசய்திகளஅறிவர்.
- சங்கஅக, புறபாடல்மரபுகளபுரிந்Fக்சகாள்வர்.
- புறஇலக்கியங்கள்காட்டும்வாழ்வியல்அறங்களஉணர்வர்.

அலகு-1

1. குறுந்சதாகக– பாடல்எண்: 28,38
2. நற்றிகண– பாடல்எண் : 1,27,28,167,168
3. ஐங்குறுநூறு– பாடல்எண்: இளமவனில்பத்F

அலகு-2

1. கலித்சதாகக– பாடல்எண்: 3,7
2. அகநானூறு– பாடல்எண்:5,42,100
3. புறநானூறு– பாடல்எண்: 182,204,41,121

அலகு-3

1 சிறுபாணாற்றுப்பகடமுழுவFம்

அலகு-4

1. திருக்குறள்– சசய்நன்றிஅறிதல், கூடாநட்பு ,நலம்புகனந்Fகரத்தல்.
2.

2. நாலடியார் – பாடல்எண்: 1,172,215,253

அலகு-5

இலக்கியவரலாறு

1.சங்கஇலக்கியம்

2.எட்டுத்சதாகக, பத்Fப்பாட்டு

3.பதிசனண்கீழ்க்கணக்குநூல்கள்

பார்டவநூல்கள்

1. குறுந்சதாகக - கழகசவளியீடு,சசன்கன.
2. நற்றிகண - கழகசவளியீடு,சசன்கன.
3. ஐங்குறுநூறு - கழகசவளியீடு,சசன்கன.
4. கலித்சதாகக - கழகசவளியீடு,சசன்கன.
5. அகநானூறு - கழகசவளியீடு,சசன்கன.
6. புறநானூறு - கழகசவளியீடு,சசன்கன.
7. திருக்குறள் -பரிமமலழகர்உகர ,கழகசவளியீடு,சசன்கன
8. இகணயதளம் -www.tamilvu.org , www.noolulagam.com

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4	3	3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	2	3	2	2	2	3	3

SECOND YEAR - SEMESTER IV

PAPER II –GENERAL ENGLISH [23111AEC42]

Subject Code	Category	L	T	P	C		Inst. Hours	
23111AEC42	**Part II**	3	0	0-	3		6	

Learning Objectives	
LO1	To help learners imbibe the rules of language unconsciously and tune to deduce language structure and usage.
LO2	To enable them use receptive skills through reading and listening to acquire good exposure to language and literature.
LO3	To help them develop style in speech and writing and manipulate the tools of language for effective communication.
LO4	To provide exposure to plays, autobiographies and expose them to value based ideas.
LO5	To enhance their language skills especially in the areas of grammar and pronunciation.

Unit No.	**Unit Title & Text**	**No. of Periods for the Unit**
I	**Life Writing** 1.1 I am Malala-Malala Yousafzai - Chapter 1 1.2 My Inventions - Nikola Tesla - Chapter 2	20
II	**One Act Plays** 2.1 The Zoo Story- Edward Albee 2.2 The Proposal- Anton Chekhov	20
III	**Interviews** Nelson Mandela's Interview with Larry King. Rakesh Sharma's Interview with Indira Gandhi from Space Lionel Messi with Sid Lowe (Print)	20
IV	**Language Competency** 4.1 Refuting, Arguing & Debating 4.2 Making Suggestions & Responding to Suggestions, Asking for and Giving Advice or Help4.3 Interviews(face to face, telephone and video conferencing)	15

V	**English for Workplace** 5.1 Job Applications: Covering letters, CV and Resume 5.2 Creating a digital profile - LinkedIn 5.3 Filling Forms (Online & Manual): creation of account, railway reservation, ATM,Credit/debit card 5.4 Body Language -Practical Skills for Interviews	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Learn to communicate effectively and appropriately in real life situation.	PO1
CO2	Use English effectively for study purpose across the curriculum	PO1,PO2
CO3	Develop interest in and appreciation of Literature	PO4,PO6
CO4	Develop and integrate the use of the four language skills	PO4,PO5,PO6
CO5	Enhance their language skills especially in the areas of grammar and pronunciation.	PO3,PO8

Textbooks(Latest Editions)	
1	I Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb , Little Brown, 2013.
2	My Inventions by Nikola Tesla Ingram Short title, 2011 Edition
References Books **(Latest editions, and the style as given below must be strictly adhered to)**	
1	**Autobiographies, Mary**, Taylor & Francis, 2021
2	One-act Plays for Acting Students: An Anthology of Short Norman A. Bert · 1987 ·
3	The One-Act Play Companion: A Guide to plays, play wrights ... Colin Dolley, Rex Walford · 2015

4	How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5	Role Play-Theory and Practice.Krysia M Yardley-Matwiejczuk, SAGE publications ltd, 1997

Web Resources	
1	For Readers' Theatre: https://www.youtube.com/watch?v=JaLQJt8orSw&t=469s(the link to the performance; refer scripts by Aaron Shepherd)
2	http://BBC learn English.com
3	http://onestopenglish.com
4	http://hearn-english-today.com
5	http://talkenglish.com
6	The Zoo Story: http://www.lem.seed.pr.gov.br/arquivos/File/livrosliteraturaingles/zoostory.pdf
7	The Proposal: https://www.one-act-plays.com/comedies/proposal.html
8	Nelson Mandela with Larry King Interviews: http://edition.cnn.com/TRANSCRIPTS/0005/16/lkl.00.html
9	Rakesh Sharma with Indira Gandhi Interview : https://www.ndtv.com/offbeat/what-first-indian-astronaut-rakesh-sharma-told-indira-gandhi-about-india-from-space-2204839
10	Lionel Messi with Sid Lowe Interview:https://www.worldsoccer.com/world-soccer-latest/lionel-messi-interview-part-one-338553

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

SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120AEC43	**Java Programming**	Core	5	1	0	3		5	

Learning 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	**Contents**	**No. of Hours**
I	**Introduction:** Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture – Datatypes - 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 key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**: Definition-Access Protection –Importing Packages. **Interfaces**: Definition–Implementation–Extending Interfaces. **Exception Handling**: *try – catch- throw - throws – finally* – Built-in exceptions - Creating own Exception classes.	15

III	**Multithreaded Programming**: Thread Class - Runnable interface – Synchronization–Using synchronized methods– Using synchronized statement- Interthread Communication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Color - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	15
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers – Frame – Window – Dialog – Panel – Button – J toggle Button – Checkbox – JRadioButton – JLabel,JTextField – JTextArea – JList – JComboBox – JScrollPane.	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, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6

Text Books:	
1.	Herbert Scheldt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010

2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals*, Addison Wesley, 1999
References :	
1.	Head First Java, O'Rielly Publications,
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

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

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

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium , 1 - Low

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120SEC45L	**Java Programming Lab**	Core	0	0	3	3		4	

Learning 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 know about Event Handling.
LO4	To enable the students to use String Concepts.
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.

EXCERCISE	**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
2	Write a Java program to multiply two given matrices.
3	Write a Java program that displays the number of characters, lines and words in a text
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
5	Write a program to do String Manipulation using Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings
6	Write a program to perform the following string operations using String class: a. String Concatenation
	b. Search a substring c. To extract substring from given string

7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	60
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception	
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by	
	zero.	

15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.	
	Total	**60**

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, PO6

Text Book

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

Reference Books

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

Web Resources

1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

Mapping with Programme Outcomes:

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

S-Strong M-Medium L-Low

Discipline Specific Elective-II

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120DSC44A	**Agile Project Management**	Elective	5	1	0	3		4	

Learning Objectives	
LO1	Learning of software design, software technologies and APIs.
LO2	Detailed demonstration about Agile development and testing techniques.
LO3	Learning about Agile Planning and Execution.
LO4	Understanding of Agile Management Design and Quality Check.
LO5	Detailed examination of Agile development and testing techniques.

UNIT	**Contents**	**No. of Hours**
I	**Introduction: Modernizing Project Management:** Project Management Needed a Makeover – Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.	12
II	**Being Agile** **Agile Approaches:** Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary	12

	Agile Environments in Action: Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. **Agile Behaviors in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy.	
III	**Agile Planning and Execution** **Defining the Product Vision and Roadmap:** Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. **Planning Releases and Sprints:** Refining requirements and estimates – Release planning – Sprint planning. **Working Throughout the Day:** Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment	12
IV	**Agile Management** **Managing Scope and Procurement:** What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management – Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication? **Managing Quality and Risk:** What's different about Agile quality –	12

	Managing Agile quality – What's different about Agile risk management – Managing Agile risk.	
V	**Implementing Agile** **Building a Foundation:** Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time. **Being a Change Agent:** Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. **Benefits, Factors for Success and Metrics:** Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.	12
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Understanding of software design, software technologies and APIs using Agile Management.	PO1
CO2	Understanding of Agile development and testing techniques.	PO1, PO2
CO3	Understanding about Agile Planning and Execution using Sprint.	PO4, PO5
CO4	Understanding of Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check.	PO4, PO5, PO6
CO5	Analyzing of Agile development and testing techniques.	PO2, PO4

Text Book	
1	Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin,

	2014.
Reference Books	
1.	Mark C. Layton, David Morrow, *Scrum for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018.
2.	Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.
3.	Alex Moore, Agile Project Management, 2020.
4.	Alex Moore, *Scrum*, 2020.
5.	Andrew Stellman and Jennifer Greene, *Learning Agile: Understanding Scrum, XP, Lean, and Kanban*, Shroff/O'Reilly, First Edition, 2014.
Web Resources	
1.	www.agilealliance.org/resources

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 of course contributed to each PSO	**15**	**14**	**11**	**15**	**11**	**10**

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

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120DSC44B	Analytics for Service Industry	Elective	5	1	0	3		4	

Course Objectives:

1. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
2. To become familiar with the processes needed to develop, report, and analyze business data.
3. To learn how to use and apply Excel and Excel add-ins to solve business problems.

I. Overview of Business Analytics • Introduction to Analytics • Davenport article - "Competing on Analytics. The New Path to Value"

II. Visualization/ Data Issues • Organization/sources of data • Importance of data quality • Dealing with missing or incomplete data • Data Classification • Davenport and Harris article - "The Dark Side of Customer Analytics"

III. III. Introduction to Data Mining • Introduction to Data Mining • Data Mining Process • Data mining tool XLMiner • Loveman article – "Diamonds in the Data Mine" • Market Basket Analysis –• Classification and Regression Trees

IV. IV. Introduction to Decision Modeling • Optimization Use of Excel to solve business problems: e.g. marketing mix, capital budgeting, portfolio optimization • Decision Making under Uncertainty Simulation Introduction to Risk

V. Types of problems: inventory management, capital investment analysis, market share estimation, sensitivity analysis.

Reference Books:

1. Data Analysis and Business Modeling by Wayne L. Winston
2. A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120DSC44 C	**Computing Intelligence**	Elective	5	1	0	3		4	

Learning Objectives		
LO1	To identify and understand the basics of AI and its search.	
LO2	To study about the Fuzzy logic systems.	
LO3	Understand and apply the concepts of Neural Network and its functions.	
LO4	Understand the concepts of Artificial Neural Network	
LO5	To study about the Genetic Algorithm.	
UNIT	**Contents**	**No. of Hours**
I	**Introduction to AI**: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.	12
II	**Fuzzy Logic Systems:** Notion of fuzziness – Operations on fuzzy sets – T- norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification –Fuzzy Clustering – fuzzy rule-based classifier.	12
III	**Neural Networks:** What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Back propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self-Organizing Map, Recent Applications	12
		12

IV	**Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	
V	**Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1
2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	PO1, PO2
3	Understand the concepts of Neural Network and analyze and apply the learning techniques	PO4, PO6
4	Understand the artificial neural networks and its applications.	PO4, PO5, PO6
5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO3, PO5

Text Book	
1	S.N. Sivanandam and S.N. Deep, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd.
2	Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2nd Edition, Pearson Education in Asia.
3	S. Rajasekaran, G. A. Vijayalakshmi, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI.
Reference Books	
1.	F. Martin, Mcneill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI
2.	Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.

Web Resources	
1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://www.w3schools.com/ai/

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 of course contributed to Each PSO	15	12	10	11	12	13

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120SEC46	**PHP PROGRAMMING**	Skill Enha. Course (SEC)	3	0	0	2		2	

Learning 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
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6
	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will know about php.	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers,	PO2,PO5,PO7.

	operators, and meta characters.	

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	C		Inst. Hours	
23120SEC47	**Software Testing**	Skill Enha. Course (SEC)	2	0	0	2		2	

Learning Objectives	
LO1	To study fundamental concepts in software testing
LO2	To discuss various software testing issues and solutions in software unit test, integration and system testing.
LO3	To study the basic concept of Data flow testing and Domain testing.
LO4	To Acquire knowledge on path products and path expressions.
LO5	To learn about Logic based testing and decision tables

UNIT	Contents	No. of Hours
I	Introduction: Purpose–Productivity and Quality in Software– Testing Vs Debugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction Flow Testing Techniques.	6
III	Data Flow Testing Strategies - Domain Testing: Domains and Paths – Domains and Interface Testing.	6
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing–Formats–Test Cases	6
V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, State Testing.	6
	Total	**30**

Course Outcomes		**Program Outcomes**
CO	On completion of this course, students will	
CO1	Students learn to apply software testing knowledge and engineering methods	PO1
CO2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
CO3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6

CO4	Have basic understanding and knowledge of contemporary issues in software testing, such as component- based software testing problems	PO4, PO5, PO6
CO5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8
Text Book		
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005	
Reference Books		
1.	I.Burnstein, 2003, "Practical Software Testing",Springer International Edn.	
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", Pearson Education, Delhi.	
3.	R.Rajani, and P.P.Oak, 2004, "Software Testing",Tata Mcgraw Hill, New Delhi.	
Web Resources		
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

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

Course Code	Course Title	L	T	P	C
231AECCEVS	Environmental Studies	2	0	0	2

AIM:

To create the awareness about environmental problems among the students.

OBJECTIVE:

- It deals with the study of flow of energy and materials in the environment
- It deals with the study of natural and its function

UNIT–I

The Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance - Need for public awareness - **Natural Resources: Renewable and Non-Renewable Resources** - Forest resources - Water resources - Mineral resources - Food resources - Energy resources - Land resources.

UNIT-II

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Types of ecosystem - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems.

UNIT-III

Biodiversity and its Conservation – Definition - Genetic, species and ecosystem diversity - Bio geographical classification of India - Values of biodiversity - Biodiversity at global, National and local levels - India as a mega - diversity nation - Hot-spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conversation of biodiversity.

UNIT-IV

Environmental Pollution – Definition - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - Solid waste Management - Role of an individual in prevention of pollution - Disaster management.

UNIT-V

Social Issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Environmental ethics - Climate change greenhouse effect and global warming - Ozone depletion - Waste land reclamation - Consumerism and waste products - Environmental Legislation - Issues involved in enforcement of environmental legislation - Public awareness - **Human Population and the Environment**.

REFERENCE BOOK:

1. “ENVIRONMENTAL STUDIES”, K.Kumarasamy, A.Alagappa Moses, M.Vasant

Course Code	Course Title	L	T	P	C
231LCSCLS	Leadership and Management Skills	-	-	-	1

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to**:**

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Course Outcomes:

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self-management, handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

Negotiation **Understanding Leadership and its Importance**

What is leadership?
Why Leadership required?
Whom do you consider as an ideal leader?

Traits and Models of Leadership

Are leaders born or made?
Key characteristics of an effective leader
Leadership styles
Perspectives of different leaders

Basic Leadership Skills

Motivation
Team work
Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organize teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

Self-Management Skills

- Understanding self-concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

Design Thinking

- What is design thinking?
- Key elements of design thinking:
  - Discovery
  - Interpretation
  - Ideation
  - Experimentation
  - Evolution.

- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings:

Books

- Ashokan, M. S. (2215). Karmayogi: A Bbiography of E. Sreedharan. Penguin, UK.
- Brown, T. (2212). Change by Design. Harper Business
- Elkington, J., & Hartigan, P. (2208). The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World. Harvard Business Press.
- Goleman D. (1995). Emotional Intelligence. Bloomsbury Publishing India Private Limited.
- Kalam A. A. (2203). Ignited Minds: Unleashing the Power within India. Penguin Books India
- Kelly T., Kelly D. (2214). Creative Confidence: Unleashing the Creative Potential Within Us

  All. William Collins

- Kurien V., & Salve G. (2212). I Too Had a Dream. Roli Books Private Limited
- Livermore D. A. (2210). Leading with cultural intelligence: The New Secret to Success. New York: American Management Association
- McCormack M. H. (1986). What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive. RHUS
- O'Toole J. (2219) The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good. Harpercollins
- Sinek S. (2209). Start with Why: How Great Leaders Inspire Everyone to Take Action. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2204). International Handbook of Intelligence. Cambridge University Press.

E-Resources

- Fries, K. (2219). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2219- 02-15 from https://www.forbes.com/sites/kimberlyfries/2218/02/08/8-essential- qualities-that-define-great-leadership/#452ecc963b63.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/watch?=laGZaS4sdeU
- Martin, R. (2207). How Successful Leaders Think. *Harvard Business Review*, *85*(6): 60.
- NPTEL Course on Leadership - https://nptel.ac.in/courses/122105021/9

SEMESTER-V

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120AEC51	**Software Engineering**	Core	5	1	0	4		5	

Learning Objectives	
LO1	Gain basic knowledge of analysis and design of systems
LO2	Ability to apply software engineering principles and techniques
LO3	Model a reliable and cost-effective software system
LO4	Ability to design an effective model of the system
LO5	Perform Testing at various levels and produce an efficient system.

UNIT	**Contents**	**No. of Hours**	**Course Objectives**
I	**Introduction**: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. **Software Life Cycle Models**: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.	15	
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS) **Software Design**: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	15	
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. **User-Interface design:** Characteristics of a good	15	

	interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.	
IV	**Coding and Testing:** Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. **Software Reliability and Quality Management:** Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	15
V	**Computer Aided Software Engineering:** CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. **Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.	15
	Total	**75**

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Gain basic knowledge of analysis and design of systems	PO1
CO2	Ability to apply software engineering principles and techniques	PO1, PO2
CO3	Model a reliable and cost-effective software system	PO4, PO6
CO4	Ability to design an effective model of the system	PO4, PO5, PO6
CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO6
Text Books		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
References Books		
1.	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997	
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.	
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**3**	**2**	**2**	**3**
CO2	**3**	**2**	**2**	**2**	**1**	**2**
CO3	**3**	**3**	**3**	**2**	**3**	**2**
CO4	**3**	**3**	**3**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**2**	**2**	**2**
Weightage of course contribute d to each PO/PSO	**15**	**13**	**14**	**10**	**10**	**11**

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

Subject Code	Subject Name	Category	L	T	P	C		Inst. Hours	
23120AEC52	**Database Management System**	Core	5	1	0	3		5	

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 - 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	15
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 with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15
	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	C		Inst. Hours	
23120DSC53	**Internet of Things and its applications**	Elective	5	0	0	4		4	

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 Gas Industry, 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 Arshdeep Bahga, "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	Waltenegus Dargie, Christian Poellabauer, "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

Discipline Specific Elective Courses-III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	
23120DSC54A	Introduction to Data Science	Elective	4	-	-	-	3	4	

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 - Dataretrieval – 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 of course contributed to each PSO	**15**	**14**	**11**	**15**	**11**	**10**

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	
23120DSC54B	RDBMS with PL/SQL	Elective	4	0	0	4	4	

COURSE OUTCOMES

1. The purpose of PL/SQL is to combine database language and procedural programming language.

2. The basic unit in PL/SQL is called a block and is made up of three parts: a declarative part, an executable part and an exception-building part.

UNIT-1 Introduction to PL/SQL

PL/SQL Overview-Benefits of PL/SQL Subprograms-Overview of the Types of PL/SQL blocks create a Simple Anonymous Block-Generate Output from a PL/SQL Block

UNIT-2 PL/SQL Identifiers

List the different Types of Identifiers in a PL/SQL subprogram-Usage of the Declarative Section to define Identifiers-Use variables to store data-Identify Scalar Data Types-The %TYPE Attribute-What are Bind Variables-Sequences in PL/SQL Expressions.

UNIT-3 Interaction with Server

Invoke SELECT Statements in PL/SQL to Retrieve data-Data Manipulation in the Server Using PL/SQL SQL Cursor concept-Usage of SQL Cursor Attributes to Obtain Feedback on DML-Save and Discard Transactions.

UNIT-4 Composite Data Types

Use PL/SQL Records-The %ROWTYPE Attribute-Insert and Update with PL/SQL Records

Associative Arrays (INDEX BY Tables)-Examine INDEX BY Table Methods-Use INDEX BY Table of Records

UNIT-5 Exception Handling

Understand Exceptions-Handle Exceptions with PL/SQL-Trap Predefined Oracle Server Errors-Trap Non-Predefined Oracle Server Errors-Trap User-Defined Exceptions

Propagate Exceptions-RAISE_APPLICATION_ERROR Procedure.

Reference:

1. RDBMS with PL/SQL -Steven Feuerstein with Bill Priby

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	
23120DSC54C	**Cloud Computing**	Elective	4	0	0	4	4	

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 – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.	12
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 - Notifications Services - Media Services. Content Delivery Services: Amazon Cloud Front - Windows Azure Content Delivery Network. Analytic services: Amazon Elastic Map Reduce-Google Map Reduce Service - Google Big Query - Windows Azure HDInsight	12

	Deployment and Management Services: Amazon Elastic Beanstack - Amazon Cloud Formation. Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory. Open Source Private Cloud Software: Cloud Stack – Eucalyptus – Open Stack.	

III	**Cloud Application Design:** Introduction – Design Considerations for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradassions – 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), REST ful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	12
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.	12
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing	12

	For Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	
	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	C		Inst.	
23120SEC56L	**Database Management System lab**	Core	0	0	3	3		5	
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								
	List of Exercises:						**No. of Hours**		**Course Objective**
II	**I. SQL** 1. DDLCOMMANDS 2. DMLCOMMANDS 3. TCLCOMMANDS **II. PL/SQL** FIBONACCI SERIES FACTORIAL STRING REVERSE SUM OF SERIES TRIGGER **III. CURSOR** 9. STUDENT MARK ANALYSIS USING CURSOR **IV. APPLICATION**								75

	10. LIBRARY MANAGEMENTSYSTEM 11. STUDENT MARK ANALYSIS		
	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, PO4

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	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weightage of course contributed to each PSO	12	12	13	14	14	11

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

Discipline Specific Elective-IV

Course Code	Course Title	L	T	P	C
23120DSC55A	**Disaster Management**	**4**	**0**	**0**	**4**

AIM: Disaster management aims to reduce, or avoid the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

Course Objectives:

1. To provide students an understanding the need for studying the disaster management
2. Develop an understanding about the various types of disasters.
3. To expose students to the risk and vulnerability analysis
4. To create awareness about disaster prevention and risk reduction
5. To establish relationship between disasters and developments.
6. To understand Rehabilitation, Reconstruction and Recovery in the event of Disaster
7. To gain knowledge on Climate Change Adaptation and IPCC Scenario and Scenarios in the context of India.

Course Outcomes:

CO1: Understand the need and significance of studying disaster management

CO2: Understand the different types of disasters and causes for disasters.

CO3: Gain knowledge on the impacts Disasters on environment and society

CO4: Study and assess vulnerability of a geographical area.

CO5: Students will be equipped with various methods of risk reduction measures and risk mitigation.

CO6: Understand the role of Information Technology in Disaster Management

CO7: Understand Geographical Information System applications in Disaster Management

Content of Course
Unit I: Introduction to Disasters
ChapterNo.1 Disaster: Concept, Meaning, and Definition **ChapterNo.2** History of Major Disaster Events in India **ChapterNo.3** Types of Disasters–Natural Disasters: Famine, Drought, Flood, Cyclone, Tsunami, Earthquake
Unit II: Disaster Mitigation and Disaster Management
ChapterNo.4 Man-made Disasters: Riots, Blasts, Industrial, Militancy **ChapterNo.5** Profile, Forms and Reduction of Vulnerability **Chapter No. 6** Disaster Mitigation: Concept and Principles
Unit III: Impact of Disaster
ChapterNo.7 Disaster Management: Concept and Principles **ChapterNo.8** Pre-disaster-Prevention and Preparedness **ChapterNo.9** Physical, Economic, Social, Psycho-socio Aspects, Environmental Impacts
Unit IV: Disaster Process and Intervention
ChapterNo.10 During Disaster-Rescue and Relief **ChapterNo.11** Post-disaster-Rehabilitation and Reconstruction **ChapterNo.12** Victims of Disaster-Children, Elderly, and Women **ChapterNo.1 3**Displacement-Causes,Effectsand Impact
Unit V:DisasterIntervention
ChapterNo.14 Major Issues and Dynamics in the Administration of Rescue, Relief, Reconstruction and Rehabilitation **ChapterNo.15** Components of Rescue, Relief, Reconstruction; Rehabilitation **ChapterNo.16** Disaster Policy in India; Disaster Management Authority-NDMA, SDMA, DDMA; Disaster Management Act, 2005

References:

Anil Sinha(2001),DisasterManagement-LessonsDrawnandStrategiesforFuture.New Delhi, Jain Publications.

Backer,C.W.andChapman,W.(ed.).(1969),ManandSocietyinDisasters,New Delhi,

Clarke,J.I.,PeterCurson,et.al.(ed.)(1991),PopulationandDisaster,Oxford,Basil Blackwell

23120DSC55B	Artificial Neural Network	4	0	0	4

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, Perception Convergence Theorem.	12
II	Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	12
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 Boltzmann Machines, Training of DNN and Applications	12
	Total	**60**

	Programme Outcome

23120DSC55B	Artificial Neural Network	4	0	0	4

Course Outcomes		
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	

23120DSC55C	**CRYPTOGRAPHY**	4	0	0	4

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 Security.	**12**
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Mono alphabetic 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**: Secure Socket Layer and 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 and Practices".	
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

Course Code	Course Title	L	T	P	C
231ACLSPSL	Professional Skills	-	-	-	1

Aim: Course Objectives:

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an Individual SWOT.

Course Outcomes:

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment

Unit I: Resume Skills

Resume Skills: Preparation and Presentation

Introduction of resume and its importance
Difference between a CV, Resume and Bio data
Essential components of a good resume

Resume skills: common errors

Common errors people generally make in preparing their resume
Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

i. **Interview Skills : Preparation and Presentation**

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview

- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

Interview Skills: Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

Interview Skills: Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

SEMESTER-VI

23120AEC61	**COMPUTER NETWORKS**	5	1	0	4

Course Objective		
LO1	To learn the basic concepts of Data communication and Computer network	
LO2	To learn about wireless Transmission	
LO3	To learn about networking and data link layer.	
LO4	To study about Network communication.	
LO5	To learn the concept of Transport layer	
UNIT	**Contents**	**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	15
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	15
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	15
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1

CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4
Text Book		
1	A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.	
Reference Books		
1.	B. A. Frozen, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017	
2.	F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008	
3.	D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.	
4.	Lamarca, "Communication Networks", Tata McGraw- Hill, 2002	
Web Resources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4
Text Book		
1	A. S. Tanenbaum, "Computer Networks", 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. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
4.	Lamarca, "Communication Networks", Tata McGraw- Hill, 2002
Web Resources	
1.	https://en.wikipedia.org/wiki/Computer_network
2.	https://citationsy.com/styles/computer-networks

Mapping with Programme Outcomes:

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

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

23120AEC62	Data Analytics Using R	5	1	0	4

Course Objective		
C1	To understand the problem solving approaches	
C2	To learn the basic programming constructs in R Programming	
C3	To learn the basic programming constructs in R Programming	
C4	To use R Programming data structures - lists, tuples, and dictionaries.	
C5	To do input/output with files in R Programming.	
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 — Map Reduce Programming Model	15
II	CONTROL STRUCTURES AND VECTORS - Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: 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	15
III	LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List	15

	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	
IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING.	15
V	OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	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, PO3
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO5, PO6
Text Book		
1	Roger D. Peng," R Programming for Data Science ", 2012	

2	Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011
Reference Books	
1.	1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2.	Venables ,W.N.,andRipley,"S programming", Springer, 2000.
Web Resources	
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

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

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

Discipline Specific Elective Courses-V

23120DSC63A	**Robotics and its Applications**	5	0	0	3

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.	12
II	Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors. Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot	12
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based	12

	localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	
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	12
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.	12
	Total	**60**

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 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	L	T	P	C		Inst. Hours	
23120DSC63B	**Virtual Reality**	**5**	**0**	**0**	**3**		**4**	

Learning Objectives		
LO1	To provide knowledge on basic principles of virtual & augmented reality	
LO2	To have the ability to use its technology as a platform for real-world applications.	
Unit	**Contents**	**No. of Hours**
I	Virtual Reality: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System –Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces	12
II	Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkits and Scene Graphs – Traditional and Emerging Applications of VR	12
III	Augmented Reality: Introduction – Augmented Reality Concepts: Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience	12
IV	Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies	12
V	Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - Mobile Augmented Reality: Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality	12
	Total Hours	**60**
CO	**Course Outcomes**	
CO1	Outline the basic terminologies, techniques and applications of VR and AR	
CO2	Describe different architectures and principles of VR and AR systems	
CO3	Use suitable hardware and software technologies for different varieties of virtual and	

	augmented reality applications	
CO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	
CO5	Assess the importance of VR/AR content and interactions to implement for the real-world problem	
Text books		
1.		Grigore C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Wiley Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
2.		Alan B. Craig(2013), "Understanding Augmented Reality: Concepts and Applications"(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
3.		Jon Peddie (2017), "Augmented Reality: Where We Will All Live", Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies)
Reference Books		
1.		Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), "Developing Virtual Reality Applications: Foundations of Effective Design", Elsevier(Morgan Kaufmann Publishers)
2.		Paul Mealy (2018), "Virtual and Augmented Reality", Wiley
3.		Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), "Virtual Reality and Augmented Reality: Myths and Realities", Wiley
NOTE: Latest Edition of Textbooks May be Used		
Web Resources		
1.		http://msl.cs.uiuc.edu/vr/
2.		http://www.britannica.com/technology/virtual-reality/Living-in -virtual-worlds
3.		https://mobidev.biz/blog/augmented-reality-development-guide

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	C		Inst. Hours	Marks		
										CIA	External	Total
23120SEC64L	Data analytics using R Lab	Core	0		0	3	3		4	25	75	100

	Course Objective		
C1		To understand the problem solving approaches	
C2		To learn the basic programming constructs in R Programming	
C3		To practice various computing strategies for R Programming -based solutions to real world problems	
C4		To use R Programming data structures - lists, tuples, and dictionaries.	
C5		To do input/output with files in R Programming.	
Sl. No		**Contents**	
1.		Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon 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.	**60**
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, Data Frames)	
8		Write a program to read a csv file and analyze the data in the file in R.	

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 given number using recursive function	
12		Write a R program to count the number of even and odd numbers from array of N numbers.	
		Total	**60**

		Course Outcomes	**Programme 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 R Programming.	PO1, PO4,PO6
3		Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
4		Acquire R Programming skills to move into specific branches	PO3,PO4
5			PO1,PO5,PO6

		Text Book
1		Roger D. Peng," R Programming for Data Science ", 2012
2		Norman Matloff,"The Art of 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.,andRipley,"S programming", Springer, 2000.

		Web Resources
1.		https://www.simplilearn.com

Course Code	Course Title	L	T	P	C
231ACSIKWS	**INDIAN KNOWLEDGE SYSTEM**	-	-	-	2

Course Objectives:

The course design seeks to address the following issues:

• To introduce to the students the overall organization of IKS

• To develop an appreciation among the students the role and importance of Veda, Vedangas, Upa Vedas and Puraṇas.

• To show case the multi-dimensional nature of IKS and their importance in the contemporary society

• To motivate the students to take up a detailed study of some of these topics and explore their application potential

Course Outcomes:

CO1: Explain the historicity of Indian Knowledge System and the broad classification of Indian philosophical systems

CO2: Explain the potential of Sanskrit in natural language processing

CO3: Explain the features of Indian numeral system and its role in science & technology advancement

CO4: Illustrate the basic elements of the Indian calendar and the components of Indian Panchanga

CO5: Outline the science, engineering & technology heritage of ancient and medieval India

Unit I:

Introduction to Indian Knowledge System (IKS), Definition, Concept and Scope of IKS (4)

Definition, Concept and Scope of IKS

IKS based approaches on Knowledge Paradigms

IKS in ancient India and in modern India

Unit II: IKS and Indian Scholars, Indian Literature (8)

Philosophy and Literature (Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta, Nagarjuna

and Panini)

Mathematics and Astronomy (Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta)

Medicineand Yoga (Charak,Susruta,Maharishi Patanjaliand Dhanwantri)

Sahitya (Vedas,Upvedas,Upavedas(Ayurveda,Dhanurveda,Gandharvaveda) Puran and Upnishad) and shaddarshan(Vedanta,Nyaya.Vaisheshik,Sankhya,MimaYoga, Adhyatma and Meditation)

Shastra(Nyaya,vyakarana,Krishi,Shilp,Vastu,Natya and Sangeet)

Unit III: Indian Traditional/tribal/ethnic communities, their livelihood and local wisdom (6)

1. Geophysical aspects, Resources and Vulnerability
2. Resource availability, utilization pattern and limitations
3. Socio-Cultural linkages with Traditional Knowledge System
4. Tangible and intangible cultural heritage.

Unit IV: Unique Traditional Practices and Applied Traditional Knowledge (8)

1. Myths, Rituals, Spirituals, Taboos and Belief System, Folk Stories, Songs, Proverbs, Dance, Play, Acts and Traditional Narratives
2. Agriculture, animal husbandry, Forest, Sacred Groves, Water Mills, Sacred Water Bodies, Land, water and Soil Conservation and management Practices
3. Indigenous Bio-resource Conservation, Utilization Practices and Food Preservation Methods, Handicrafts, Wood Processing and Carving, -Fiber Extraction and Costumes
4. Vaidya(traditional health care system), Tantra-Mantra, Amchi Medicine System
5. Knowledge of dyeing, chemistry of dyes, pigments and chemicals.

Unit V: Protection, preservation, conservation and Management of Indian Knowledge System (4)

1. Documentation and Preservation of IKS
2. Approaches for conservation and Management of nature and bio-resources
3. Approaches and strategies to protection and conservation of IKS