

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
ACCREDITED BY NAAC WITH 'A++' GRADE

UNDER GRADUATE DEGREE PROGRAMME

B.Sc., Computer Science

Three Years

/

B.Sc., (Hons) Computer Science

Four Years

CURRICULUM & SYLLABUS

REGULATION 2024

Choice Based Credit System (CBCS)

&

Learning Outcomes Based Curriculum Framework (LOCF)

Effective from the Academic Year

2024 -2025

Department of Computer Science

School of Computing Sciences

VELS
INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
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PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
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DEPARTMENT OF COMPUTER SCIENCE

VISION OF THE DEPARTMENT
Aims to provide quality education in the field of Computer Science with state of art facilities and handle quality research in association with industry and other Universities to produce well trained IT professionals in Computer Science domain.

MISSION OF THE DEPARTMENT	
M1	To provide knowledge through teaching and training in the field of Computer Science.
M2	To concentrate on teaching-learning, research, project and consultancy help to increase the growth of IT and IT Enabled Services.
M3	To train students to get best opportunities and tackle challenges in IT industry.
M4	To equip students with communication skill, Leadership quality, ability to work with team help to improve the society.
M5	To provide value based and technical oriented related students help to build the nation.

PROGRAMME EDUCATIONAL OUTCOMES (PEO)	
PEO1	Graduates are prepared to be employed in IT industries by providing expected Domain Knowledge.
PEO2	Graduates are provided with practical training, hands-on and project experience to meet the industrial needs.
PEO3	Graduates are motivated in career and entrepreneurial skill development to become global leaders.
PEO4	Graduates are trained to demonstrate creativity, develop innovative ideas and to work in teams to accomplish a common goal.
PEO5	Graduates are addressed with social issues and guided to operate problems with Solution.

PROGRAMME OUTCOMES (PO)	
PO1	**Critical Thinking:** Apply knowledge of Cyber Security to identify, analyse problems and to provide effective solution in the area of Computing.
PO2	**Computing Skills:** Analyze a problem, identify and define the computing requirements appropriate to its solution.
PO3	**Analytical skills:** Ability to design, develop algorithms and provide software solutions to cater the industrial needs.
PO4	**Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practices
PO5	**Employability Skills:** Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.
PO6	**Ethics:** Insists ethical responsibilities, human and professional values and make their contribution to the society.
PO7	**Self Directed and Life-long Learning:** Engaged in lifelong learning to equip them to the changing environment and be prepared to take-up mastering programmes.
PO8	**Individual and Team Work:** Function effectively as an individual, and as a member or a leader in diverse team and multidisciplinary settings.
PO9	**Project Management and Finance:** Demonstrate knowledge and understanding of the problem and management principles and apply these to one's own work, as a member and engineering and management principles and apply these to one's own work, as a member.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1	Professionally trained in the areas of programming, multimedia, animation, web designing, networking and to acquire knowledge in various domain-based electives.
PSO2	Abet students to communicate effectively and to improve their competency skills to solve real time problems.
PSO3	The ability to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

VELS
KNOWLEDGE IS POWER

BOARD OF STUDIES

List of Members

Department of Computer Science

S. No	Name & Designation	Address	Role
1.	Dr. R. Sivakumar	Dean, School of Computing Sciences, VISTAS	
2.	Dr. P. Magesh Kumar	Director, School of Computing Sciences, VISTAS.	
3.	Dr. R. Ganesan	Professor and Dean, School of Computer Science and Engineering, VIT, Chennai Campus	External Member (Academic Expert)
4.	Mr. D. Rajkumar	Program Manager, Birla Soft, Prince Infocity Chennai	External Member (Industry Expert)
5.	Mr. K. Thirumurugan	Milestone Internet Marketing Private Limited, Team Lead-DX	Alumni, VISTAS
6.	Dr. R. Parameswari	Professor & Head, Department of Computer Science, VISTAS	Internal Member
7.	Dr. S. Perumal	Professor, Department of Computer Science, VISTAS	Internal Member
8.	Dr. G. Thailambal	Professor, Department of Computer Science, VISTAS	Internal Member
9.	Dr. S. Mangayarkarasi	Professor, Department of Computer Science, VISTAS	Internal Member
10.	Dr.A.S. Arunachalam	Professor, Department of Computer Science, VISTAS	Internal Member
11.	Dr.T.Sree Kala	Professor, Department of Computer Science, VISTAS	Internal Member
12.	Dr.R.Durga	Professor, Department of Computer Science, VISTAS	Internal Member
13.	Dr.A.Akila	Associate Professor, Department of Computer Science, VISTAS	Internal Member
14.	Dr.A.S.Aneetha	Associate Professor, Department of Computer Science, VISTAS	Internal Member
15.	Mr. R. Balamurugan	Assistant Professor, Department of Computer Science, VISTAS	Internal Member
16.	Ms. R. Padma	Assistant Professor, Department of Computer Science, VISTAS	Internal Member

CREDIT DISTRIBUTION

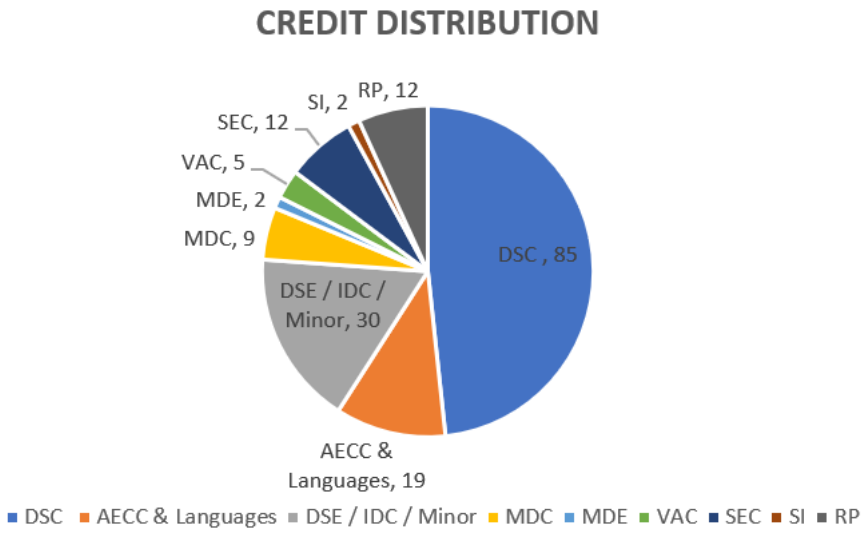
B.Sc., (Hons) Computer Science

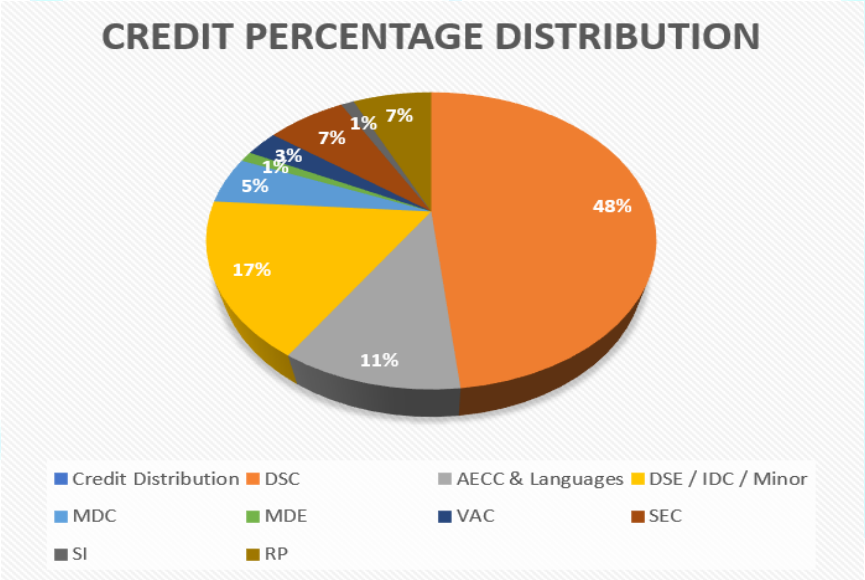
Minimum credits to be earned: 176

B.Sc., Computer Science

Minimum credits to be earned: 132

Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	3 Yrs. Total Credits	VII Sem	VIII Sem	4 Yrs Total Credits
DSC	8	8	8	8	12	16	60	12	12	84
AECC & Languages	4	4	7	4	-	-	19	-	-	19
DSE / IDC / Minor	3	4	3	4	4	4	22	4	4	30
MDC	3	3	-	3	-	-	9	-	-	9
MDE	-	-	2	-	-	-	2	-	-	2
VAC	1	2	-	1	2	-	6	-	-	6
SEC	2	2	2	2	2	2	12	-	-	12
SI	-	-	1	-	1	-	2	-	-	2
RP	-	-	-	-	-	-	-	6	6	12
Total Credits	21	23	23	22	21	21	132	22	22	176





ABBREVIATIONS

DSC	Disciplinary Specific Core
AECC	Ability Enhancement Compulsory Courses
DSE	Disciplinary Specific Elective
IDC	Interdisciplinary Courses
MDC	Multidisciplinary Courses
MDE	Multidisciplinary Elective
VAC	Value Added Courses
SEC	Skill Enhancement Courses
SI	Summer Internship
RP	Research Project

CURRICULUM STURUCTURE

B.Sc., Computer Science Three Years / BSc., (Hons) Computer Science Four Years

Total number of Credits: 176

	B.Sc., Computer Science (Hons) Minimum Credits to be earned :176 B.Sc., Computer Science Minimum Credits to be earned: 132									
	SEMESTER 1									
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil-I / Hindi-I/ French-I	2	0	0	1	2	40	60	100
ENG 1	24LENG11	English-I	2	0	0	1	2	40	60	100
DSC 1	24CBCS11	Problem Solving Approaches Using C	4	0	0	2	4	40	60	100
DSC 2	24CBCS12	Digital Logic Fundamentals	3	0	0	2	3	40	60	100
MDC 1	24BMA001	Mathematics-I	2	1	0	2	3	40	60	100
DSE 1/ IDC 1 / Minor 1	24DBCS1-	Discipline Specific Elective – I	3	0	0	2	3	40	60	100
DSC 1 (Lab)	24PBCS11	Practical I:Problem Solving Approaches Using C Lab	0	0	2	1	1	40	60	100
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1	40	60	100
SEC 1	24SSKU11	Soft skills-I	2	0	0	1	2	40	60	100
SEC 2	24SBCS11	Orientation programme / Industrial Visit	-	-	-	-	-	-	-	-
			19	**1**	**2**	**-**	**21**	**-**	**-**	**-**

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study**

SEMESTER 2										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil-II / Hindi-II / French-II	2	0	0	1	2	40	60	100
ENG 2	24LENG21	English-II	2	0	0	1	2	40	60	100
DSC 3	24CBCS21	Object Oriented Programming Languages	3	0	0	2	3	40	60	100
DSC 4	24CBCS22	Database Management System	3	0	0	2	3	40	60	100
MDC 2	24BMA002	Mathematics-II	2	1	0	2	3	40	60	100
DSE 2 / IDC 2 / Minor 2	24DBCS2-	Discipline Specific Elective - II	4	0	0	2	4	40	60	100
DSC 3 (Lab)	24PBCS21	Practical II- Object Oriented Programming Languages Lab	0	0	2	1	1	40	60	100
DSC 4 (Lab)	24PBCS22	Practical III- RDBMS Lab	0	0	2	1	1	40	60	100
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2	-	100	100
SEC 3	24SSKU21	Soft Skills-II	2	0	0	1	2	40	60	100
			20	**1**	**4**	**-**	**23**	**-**	**-**	**-**

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

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SEMESTER 3										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil-III / Hindi-III / French-III	2	0	0	1	2	40	60	100
ENG 3	24LENG31	English-III	2	0	0	1	2	40	60	100
AECC 1	24EVS031	Environmental Studies	3	0	0	2	3	40	60	100
DSC 5	24CBCS31	Problem Solving Using Python	3	0	0	2	3	40	60	100
DSC 6	24CBCS32	Modern Operating System	3	0	0	2	3	40	60	100
DSE 3 / IDC 3 / Minor 3	24DBCS3-	Discipline Specific Elective - III	3	0	0	2	3	40	60	100
DSC 5 (Lab)	24PBCS31	Practical IV : Data Structures Using Python Lab	0	0	2	2	1	40	60	100
DSC 6 (Lab)	24PBCS32	Practical V : Operating System Lab	0	0	2	2	1	40	60	100
MDE 1	24EMDE31	Indian Knowledge System	2	0	0	0	2	40	60	100
SEC 4	24SSKU31	Soft Skills-III	2	0	0	1	2	40	60	100
SI 1	24IBCS31	Internship-I	0	0	2	1	1	-	100	100
			20	**-**	**6**	**-**	**23**	**-**	**-**	**-**

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SEMESTER 4										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil-IV / Hindi-IV / French-IV	2	0	0	1	2	40	60	100
ENG 4	24LENG41	English-IV	2	0	0	1	2	40	60	100
MDC 3	24BMA003	Statistics-I	2	1	0	2	3	40	60	100
DSC 7	24CBCS41	Advanced Java Programming	3	0	0	2	3	40	60	100
DSC 8	24CBCS42	Computer Graphics	3	0	0	2	3	40	60	100
DSE 4 / IDC 4 / Minor 4	24DBCS4-	Discipline Specific Elective - IV	4	0	0	2	4	40	60	100
DSC 7 (Lab)	24PBCS41	Practical VI : Advanced Java Programming Lab	0	0	2	1	1	40	60	100
DSC 8 (Lab)	24PBCS42	Practical VII : Computer Graphics Lab	0	0	2	1	1	40	60	100
SEC 5	24SBCS41	Industry Oriented Employability skills	1	0	2	1	2	40	60	100
VAC 3	24DVAC41	Yoga Education / National Service Scheme	0	0	2	1	1	-	100	100
SEC 6	24SBCS42	In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-	-	-	-
			17	**1**	**8**	**-**	**22**	**-**	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

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SEMESTER 5										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC 9	24CBCS51	Web Development using Angular JS and Mongo	3	0	0	2	3	40	60	100
DSC 10	24CBCS52	Data Communication and Networking	4	0	0	2	4	40	60	100
DSC 11	24CBCS53	R Programming	3	0	0	2	3	40	60	100
DSE 5 / IDC 5 / Minor 5	24DBCS5-	Discipline Specific Elective – V	4	0	0	2	4	40	60	100
DSC 9 (Lab)	24PBCS51	Practical VIII : Web Development using Angular JS Lab	0	0	2	2	1	40	60	100
DSC 10 (Lab)	24PBCS52	Practical IX : Computer Networks Lab	0	0	2	2	1	40	60	100
SEC 7	24SBCS51	Entrepreneurial Development	2	0	0	1	2	40	60	100
VAC 4	24DVAC51	Value Education	2	0	0	1	2	40	60	100
SI 2	24IBCS51	Internship-II	0	0	2	1	1	-	100	100
SEC 8	24SBCS52	Skill Enhancement Training / Student Club Activities/ Institution Innovation Council Activities	-	-	-	-	-	-	-	-
			17	**-**	**8**	**-**	**21**	**-**	**-**	**-**

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study**

SEMESTER 6										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC 12	24CBCS61	Theory of Computation	3	0	0	2	3	40	60	100
DSC 13	24CBCS62	Software Testing	4	0	0	2	4	40	60	100
DSC 14	24CBCS63	Cloud Computing	4	0	0	2	4	40	60	100
DSC 15	24CBCS64	IOT Fundamentals	4	0	0	2	4	40	60	100
DSE 6 / IDC 6 / Minor 6	24DBCS6-	Discipline Specific Elective - VI	4	0	0	2	4	40	60	100
DSC 12 (Lab)	24PBCS61	Practical X : Software Testing Lab	0	0	2	2	1	40	60	100
SEC 9	24SBCS61	Mini Project	2	0	0	2	2	-	100	100
SEC 10	24SBCS62	On Job Training / Apprenticeship / Startup	-	-	-	-	-	-	-	-
			21	**-**	**2**	**-**	**22**	-	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

***L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study**

SEMESTER 7										
			Hours/Week					Maximum Marks		
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC 16	24CBCS71	Machine Learning Essentials	3	0	0	2	3	40	60	100
DSC 17	24CBCS72	Image Processing	4	0	0	2	4	40	60	100
DSC 18	24CBCS73	Soft Computing	4	0	0	2	4	40	60	100
DSE 7 / IDC 7 / Minor 7	24DBCS7-	Discipline Specific Elective – VII	4	0	0	2	4	40	60	100
DSC 16 (Lab)	24PBCS71	Practical XI: Machine Learning Lab	0	0	2	2	1	40	60	100
RP 1	24RBCS71	Research Project-I	0	0	12	2	6	40	60	100
			15	**-**	**14**	**-**	**22**	**-**	**-**	**-**

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study

SEMESTER 8										
			Hours/Week					Maximum Marks		
Category	Code	Course	L	T	P	O	C	CIA	SEE	Total
DSC 19	24CBCS81	Big data analytics	3	0	0	2	3	40	60	100
DSC 20	24CBCS82	Mobile computing	3	0	0	2	3	40	60	100
DSC 21	24CBCS83	Research Methodology	4	0	0	2	4	40	60	100
DSE 8 / IDC 8 / Minor 8	24DBCS8-	Discipline Specific Elective – VIII	4	0	0	2	4	40	60	100
DSC 19 (Lab)	24PBCS81	Practical XII : Big Data Analytics Lab	0	0	2	2	1	40	60	100
DSC 20 (Lab)	24PBCS82	Practical XIII : Android Studio Lab	0	0	2	2	1	40	60	100
RP 2	24RBCS81	Research Project-II	0	0	12	2	6	-	60	100
			14	-	16	-	22	-	-	-

CIA - Continuous Internal Assessment SEE - Semester End Examination

*L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study

DISCIPLINE SPECIFIC CORE COURSES

Category	Code	Course	L	T	P	O	C
DSC 1	24CBCS11	Problem Solving Approaches Using C	4	0	0	2	4
DSC 2	24CBCS12	Digital Logic Fundamentals	3	0	0	2	3
DSC 1 (Lab)	24PBCS11	Practical I:Problem Solving Approaches Using C Lab	0	0	2	1	1
DSC 3	24CBCS21	Object Oriented Programming Languages	3	0	0	2	3
DSC 4	24CBCS22	Database Management System	3	0	0	2	3
DSC 3 (Lab)	24PBCS21	Practical II- Object Oriented Programming	0	0	2	1	1

		Languages Lab					
DSC 4 (Lab)	24PBCS22	Practical III- RDBMS Lab	0	0	2	1	1
DSC 5	24CBCS31	Problem Solving Using Python	3	0	0	2	3
DSC 6	24CBCS32	Modern Operating System	3	0	0	2	3
DSC 5 (Lab)	24PBCS31	Practical IV : Data Structures Using Python Lab	0	0	2	2	1
DSC 6 (Lab)	24PBCS32	Practical V : Operating System Lab	0	0	2	2	1
DSC 7	24CBCS41	Advanced Java Programming	3	0	0	2	3
DSC 8	24CBCS42	Computer Graphics	3	0	0	2	3
DSC 7 (Lab)	24PBCS41	Practical VI : Advanced Java Programming Lab	0	0	2	1	1
DSC 8 (Lab)	24PBCS42	Practical VII: Computer Graphics Lab	0	0	2	1	1
DSC 9	24CBCS51	Web Development using Angular JS and Mongo	3	0	0	2	3
DSC 10	24CBCS52	Data Communication and Networking	4	0	0	2	4
DSC 11	24CBCS53	R Programming	3	0	0	2	3
DSC 9 (Lab)	24PBCS51	Practical VIII : Web Development using Angular JS Lab	0	0	2	2	1
DSC 10 (Lab)	24PBCS52	Practical IX : Computer Networks Lab	0	0	2	2	1
DSC 12	24CBCS61	Theory of Computation	3	0	0	2	3
DSC 13	24CBCS62	Software Testing	4	0	0	2	4

DSC 14	24CBCS63	Cloud Computing	4	0	0	2	4
DSC 15	24CBCS64	IOT Fundamentals	4	0	0	2	4
DSC 12 (Lab)	24PBCS61	Practical X : Software Testing Lab	0	0	2	2	1
DSC 16	24CBCS71	Machine Learning Essentials	3	0	0	2	3
DSC 17	24CBCS72	Image Processing	4	0	0	2	4
DSC 18	24CBCS73	Soft Computing	4	0	0	2	4
DSC 16 (Lab)	24PBCS71	Practical XI: Machine Learning Lab	0	0	2	2	1
DSC 19	24CBCS81	Big data analytics	3	0	0	2	3
DSC 20	24CBCS82	Mobile computing	3	0	0	2	3
DSC 21	24CBCS83	Research Methodology	4	0	0	2	4
DSC 19 (Lab)	24PBCS81	Practical XII : Big data analytics Lab	0	0	2	2	1
DSC 20 (Lab)	24PBCS82	Practical XIII : Android Studio Lab	0	0	2	2	1

DISCIPLINE SPECIFIC ELECTIVE COURSES

Category	Code	Course	L	T	P	O	C
DSE 1	24DBCS11	Introduction to Cyber Security	3	0	0	2	3
	24DBCS12	Open Source Technology	3	0	0	2	3
DSE 2	24DBCS21	Data Structures and Algorithms	4	0	0	2	4
	24DBCS22	Computer Architecture and Organizations	4	0	0	2	4
DSE 3	24DBCS31	Multimedia and its applications	3	0	0	2	3
	24DBCS32	Data Visualization	3	0	0	2	3
DSE 4	24DBCS41	Software Engineering	4	0	0	2	4
	24DBCS42	Neural Networks	4	0	0	2	4

DSE 5	24DBCS51	Foundation of Artificial Intelligence	4	0	0	2	4
	24DBCS52	Natural Language Processing	4	0	0	2	4
DSE 6	24DBCS61	Principles of Data Science	4	0	0	2	4
	24DBCS62	Parallel Processing	4	0	0	2	4
DSE 7	24DBCS71	Cryptography and its Applications	4	0	0	2	4
	24DBCS72	UI/UX Design Fundamentals and Applications	4	0	0	2	4
DSE 8	24DBCS81	Block Chain Technology	4	0	0	2	4
	24DBCS82	Fundamentals of Robotics	4	0	0	2	4

AECC & LANGUAGES

Category	Code	Course	L	T	P	O	C
LANG 1	24LTAM11/ 24LHIN11/ 24LFRE11	Tamil-I / Hindi-I/ French-I	2	0	0	1	2
ENG 1	24LENG11	English-I	2	0	0	1	2
LANG 2	24LTAM21/ 24LHIN21/ 24LFRE21	Tamil-II / Hindi-II / French-II	2	0	0	1	2
ENG 2	24LENG21	English-II	2	0	0	1	2
LANG 3	24LTAM31/ 24LHIN31/ 24LFRE31	Tamil-III / Hindi-III / French-III	2	0	0	1	2
ENG 3	24LENG31	English-III	2	0	0	1	2
LANG 4	24LTAM41/ 24LHIN41/ 24LFRE41	Tamil-IV / Hindi-IV / French-IV	2	0	0	1	2
ENG 4	24LENG41	English-IV	2	0	0	1	2

MULTIDISCIPLINARY COURSES

Category	Code	Course	L	T	P	O	C
MDC 1	24BMA001	Mathematics-I	2	1	0	2	3
MDC 2	24BMA002	Mathematics-II	2	1	0	2	3
MDC 3	24BMA003	Statistics-I	2	1	0	2	3

ABILITY ENHANCEMENT COMPULSORY COURSES

Category	Code	Course	L	T	P	O	C
AECC 1	24EVS031	Environmental Studies	3	0	0	2	3

MULTIDISCIPLINARY ELECTIVE

Category	Code	Course	L	T	P	O	C
MDE 1	24EMDE31	Indian Knowledge System	2	0	0	0	2

VALUE ADDED COURSES

Category	Code	Course	L	T	P	O	C
VAC 1	24DVAC11	Universal Human Values	1	0	0	1	1
VAC 2	24DVAC21	Communication Skills	2	0	0	1	2
VAC 3	24DVAC41	Yoga Education/ National Service Scheme	0	0	2	1	1
VAC 4	24DVAC51	Value Education	2	0	0	1	2

SKILL ENHANCEMENT COURSES

Category	Code	Course	L	T	P	O	C
SEC 1	24SSKU11	Soft Skills-I	2	0	0	1	2
SEC 2	24SBCS11	Orientation Programme / Industrial Visit	-	-	-	-	-
SEC 3	24SSKU21	Soft Skills-II	2	0	0	1	2

SEC 4	24SSKU31	Soft Skills-III	2	0	0	1	2
SEC 5	24SBCS41	Industry Oriented Employability skills	1	0	2	1	2
SEC 6	24SBCS42	In-plant Training/ Industrial Tour/ Summer Term	-	-	-	-	-
SEC 7	24SBCS51	Entrepreneurial Development	2	0	0	1	2
SEC 8	24SBCS52	Skill Enhancement Training / Student Club Activities/ Institution Innovation Council Activities	-	-	-	-	-
SEC 9	24SBCS61	Mini Project	2	0	0	2	2
SEC 10	24SBCS62	On Job Training / Apprenticeship / Startup	-	-	-	-	-

SUMMER INTERNSHIP

Category	Code	Course	L	T	P	O	C
SI 1	24IBCS31	Internship-I	0	0	2	1	1
SI 2	24IBCS51	Internship-II	0	0	2	1	1

RESEARCH PROJECT

Category	Code	Course	L	T	P	O	C
RP 1	24RBCS71	Research Project-I	0	0	12	2	6
RP 2	24RBCS81	Research Project-II	0	0	12	2	6

SEMESTER I

24LTAM11 **TAMIL-I**

L	T	P	O	C
2	0	0	1	2

மொழிவரலாறு – சங்க இலக்கியம் – அற இலக்கியம் – மொழித்திறன்

பாடத்திட்ட நோக்கம்:

மாணவர்களின் இலக்கிய நாட்டத்தை மேம்படுத்துதல், தற்கால தமிழ் இலக்கிய வகைமைகளான மரபுக்கவிதை, புதுக்கவிதை, உரைநடை ஆகியவற்றை அறிமுகப்படுத்துதல், தமிழர்தம் வாழ்வியல் நெறிகளையும் பண்பாட்டுச் செழுமைகளையும் இன்றைய தலைமுறையினர் அறியச் செய்தல், மாணவர்களுக்குத் தமிழைத் தவறின்றி எழுதுவதற்குத் தேவையான பயிற்சி அளித்து அவர்களின் மொழித்திறனை மேம்படுத்துதல், செய்யுளின் நலத்தைப் பாராட்டும் முறைமையை அறியச் செய்து அதன்வழி சிந்தனை வளத்தைப் பெருகச் செய்தல் என்பனவும் மேற்கண்டவழி மாணவர்களை ஆளுமை மிக்கவர்களாக உருவாக்கி, போட்டித்தேர்வுகளுக்குத் தயார் செய்து அவர்களுக்கு வேலைவாய்ப்பை உருவாக்குவதும் இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு- 1: தமிழ் மொழி வரலாறு **8 மணி நேரம்**

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் -திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு -2 **8 மணி நேரம்**

புறநானூறு- பாடல் எண்: , 182, 183, - இரண்டு பாடல்கள்.

குறுந்தொகை- பாடல் எண்: 2, 167, - இரண்டு பாடல்கள்

பரிபாடல் - முருகன். வையை - இரண்டு பாடல்கள்

அலகு - 3 அற இலக்கியங்கள் **7 மணி நேரம்**

திருக்குறள்- வான்சிறப்பு (அறம்), பெருமை (பொருள்), பிரிவாற்றாமை (இன்பம்),. மூன்று அதிகாரங்கள் முழுமையும்

1. நாலடியார் - இரண்டு பாடல்கள். (2, 3)
2. மூதுரை - இரண்டு பாடல்கள். (2, 8)

அலகு 4 மொழி **7 மணி நேரம்**

பிழை நீக்கி எழுதுதல் - ஒற்றுப்பிழை நீக்கி எழுதுதல் - தொடர்பிழை நீக்கி எழுதுதல் - ஒற்று மிகும் இடங்கள் - ஒற்று மிகா இடங்கள் - பிற மொழிச் சொற்களை நீக்கி எழுதுதல் - பயிற்சிகள்.

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

1. **தமிழர் நாகரிகமும் பண்பாடும்,** டாக்டர் அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், 2001.
2. **தவறின்றித் தமிழ் எழுதுவோம்**, மா. நன்னன், ஏகம் பதிப்பகம், 1999.
3. **தவறின்றித் தமிழ் எழுத** - மருதூர் அரங்கராசன், ஐந்திணைப் பதிப்பகம், 2003.
4. **தமிழ் இலக்கிய வரலாறு**, வரதராசன், மு., புது தில்லி : சாகித்திய அக்காதெமி, 2002.
5. **புதிய தமிழ் இலக்கிய வரலாறு**, நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம், சாகித்திய அகாடெமி, 2007.
6. **செம்மொழி தமிழின் சிறப்பியல்புகள்** - முனைவர் மறைமலை இலக்குவனார்; https://www.youtube.com/watch?v=HHZnmJb4jSY
7. **பாடநூல் தேடலுக்கான இணையம் –**
8. https://archive.org/

24LHIN11 **HINDI-I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

- To enable the students to develop communication Skills
- To train students in official language
- To enrich their knowledge in Hindi Literature
- To teach them human values & create awareness towards importance of tourism
- To share the knowledge of their native place
- To teach them to use Azhagi, Azhagi+ fonts

UNIT I : पं.श्रीिाम शमाष कृत 'स्मृतत' (कहानी)

'Smruti' (Kahani) by Pandit Sriram Sharma. 6

UNIT II : शिद जोशी कृत 'अततति तुम कब जावोगे' (व्यंग्य)

'Athiti tum kab jaaoge' (Vyangy) by Sharad Joshi. 6

UNIT III: िाहुल सांस्कृतयायन कृत 'अातो घुमक्कड़ जजज्ञासा' (यात्रा वृत्तान्त)

'Atatho Ghumakkad Jigyasa' (Yatra Vruthanth) by Rahul Sanskrityayan. 6

UNIT IV: व्यावहारिक हहन्दी- पत्र लेखन में प्रयुक्त वाक्यांश, कौशल ववकास – भाव एक भार्ा अनेक 6

Functional Hindi-Phrases used in Letter Writing.

Skill development - Bhav Ek Bhasha Anek

UNIT V : पत्र लेखन – परिचय व प्रकाि, 3 अनोपचारिक पत्र

अलगी, अलगी + फ़ॉन्ट का परिचय

Letter Writing- Intro. & Types & 3 Personal Letters 6hrs. 6

Introduction to Azhagi, Azhagi + fonts

Total: 30 Hours

COURSE OUTCOMES:

At the end of this course Students will be able to

At the end of this course Students will be able to

CO1: Gain knowledge about the rural life style

CO2:Understand social values

CO3:Understand importance of varied culture

CO4: Journalise in Functional Hindi

CO5 : Use Azhagi, Azhagi+ fonts

Text Books:

1. Pandit Shriram Sharma, Shikaar, Sahitya Sadan, 1932.
2. Sharad Joshi, Yatha Sambhav, Bharatiya Gyanpeet, 2014.
3. Rahul Sanskrityayan, Ghumakkad Shastra, Rajkamal Prakashan, 1949.

***Reference Books*:**

1. Kendriya Hindi Sansthan, Banking Hindi Patyakram, 2012.
2. NCERT, Sparsh, Class 9.
3. Main Aur Mera Vyakaran, New Saraswati House, New Delhi.
4. Govind Ballabh Sharma, Hindi Vyavaharik Tankan Kala Evam Tankan Abhyas, Neelkanth Publishers Pvt. Ltd., 2022.

Web Sources:

1. Pandit Sriram Sharma ka kahani: https://www.evidyarthi.in
2. Harishankar parasayi ka Vyangy: http://gadyakosh.org
3. Rahul Sanskrityayan ka yatravruttant: https://www.hindwi.org
4. Prayojanmoolak Hindi:https://hi.mwikipedia.org
5. https://www.azhagi.com/hnd/helphtml/Introduction.html

24LFRE11 **FRENCH–I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

The lessons are being chosen:

1) To greet, to express excuse and to introduce oneself
2) To introduce another person
3) To express his/her ideas, opinions and weekend projects
4) To request someone to do something, polite manners
5) To accept, refuse, enquire and indicate the time and date
6) To express himself / herself in positive and negative manner

UNITS:

1) Salut

les nombres, Les jours de la semaine et du mois, La nationalité **4**

2) Enchanté

Les verbes Etre, Avoir, Aller, Regular ER verbes, Present tense. **6**

3) J'Adore

La negation, l'adjectif possessif, le futur proche **4**

4) Tu veux bien

Les articles de finis/indéfinis, Les pronoms après une préposition (avec lui, chez moi), Le passé composé **7**

5) On se voit quand

Les pronoms compléments directs me, te, nous, vous, L'interrogation avec est-ce que, L'heure et la date. **5**

6) Bonne idée

Les articles partitifs, Le masculin et le féminin des adjectifs, Les pronoms compléments directs le, la, les, La négation : ne… pas de. **4**

Total: 30 hours

COURSE OUTCOMES:

1) The students would be able to greet, to excuse and to introduce himself.
2) The students would be able to introduce someone.
3) The students would be able to express his ideas, opinions and weekend projects.
4) The students would be able to ask someone to do something, polite manner.
5) The students would be able to accept, refuse enquire and indicate the time and date.
6) The students would be able to express himself in positive and negative manner.

Text Books :

1. LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference Books:

1. SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

24LENG11 **ENGLISH–I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

- To enable students to develop their communication skills effectively.
- To make students familiar with usage skills in the English Language.
- To enrich their vocabulary in English.
- To develop communicative competence.

UNIT I- PROSE 6

- Dangers of drug abuse - Hardin B. Jones
- Tight corners - E.V. Lucas

UNIT II -POETRY 6

- Ecology - A.K. Ramanujan
- The owl and the chimpanzee - Jo Camacho

UNIT III - SHORT STORY 6

- The Dear Departed - Stanley Houghton
- The Fool's Paradise- Isaac Bashevis Singer

UNIT IV -GRAMMAR 6

- Parts of speech, Articles

UNIT V -GRAMMAR 6

- One-word substitution, prefix, suffix, synonym, antonym.

Total: 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1 : Understand the characteristic features of the language used in the text.

CO2 :Srengthen their knowledge of basic grammar

CO3: Improve narrative skills after studying diverse prose and play.

CO4 : Understand to classify parts of speech and articles.

CO5:Develop critical writing skills in the textual content of the syllabus.

References:

1. Jeya Santhi (2015), English for Communication Enrichment
2. Dr. M. Narayana Rao and Dr. B. G.Barki,(2012)–Anu's Current English for Communication(AnuChitra).
3. Anu Chithra Pub (2010), Dr. Ananthan, R. Effective Communication. Ed. Chennai

24CBCS11 PROBLEM SOLVING APPROACHES USING C

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The learner understands the basic concepts of programming languages. Also can learn reading and writing of data using arrays and pointers. This approaches a proper method for File Manipulations such as creating, processing, opening and closing.

UNIT I: INTRODUCTION 12

History of C - Importance of C - Basic structure of C - overview of C – C fundamentals: Character Set - C primitive input output - Identifier and Keywords – Tokens-Declaration. Data Types - Constants - Variables - Expressions – Statements- Library Functions.

UNIT II: OPERATORS AND CONTROL STATEMENT 12

Operators: Arithmetic, Unary, Relational and Logical, Assignment And Conditional Operators-Comma Operator - Bit Wise Operators - Flow Of Control If, If Else, While, Do-While, For Loop, Nested Control Structures - Switch, Break And Continue, Go To Statements.

UNIT III: FUNCTIONS AND STORAGE CLASSES 12

Functions –Definition – Types of functions - Passing Arguments – Recursions- Storage Classes - Automatic, External, Static, Register Variables.

UNIT IV: ARRAYS AND STRUCTURES 12

Arrays - Defining And Processing of Arrays-Types of Arrays - 2D Arrays-3D Arrays – Multi-Dimension Arrays- Passing Arrays To Functions - Structures – Defining and processing of Structure - Passing Structures To Functions - Self-Referential Structures – Unions.

UNIT V: POINTERS AND FILES 12

Pointers - Declarations - Passing Pointers to Functions - Operation in Pointers- Files: Creating, Processing, Opening and Closing a Data File- Case Studies.

Total: 60 hours

COURSE OUTCOMES:

At the end of this course, the student will be able to:

CO-1: Evaluate real life applications developed by using C.

CO-2: Analyze the concepts of array, pointer, structure, union in C language.

CO-3: Apply control statements in various applications.

CO-4: Apply the knowledge of data types.

CO-5: Understand the concepts of tokens in C

Text Book:

1. E.Balaguruswamy (2017), Programming in ANSI C, TMH Publishing Company Ltd, 7th Edition

Reference Books:

1. Yashavant kanetkar (2016), Let us C solutions, 15th Edition, Kindle edition from BPB Publications.
2. H. Schildt (2017), The Complete Reference in C, TMH, 4th Edition.

Web Sources:

1. www.studytonight.com
2. www.javatpoint.com

VES KNOWLEDGE IS POWER

24CBCS12 **DIGITAL LOGIC FUNDAMENTALS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To understand the concept of digital systems, to operate on various Number systems and simplify Boolean functions and to distinguish logical and combinational circuits.

UNIT I NUMBER SYSTEM AND CODES 9

Binary-why it is so important in computers? – Conversions: binary to decimal – decimal to binary – octal – Hexa decimal – ASCII code –Excess-3 Code – Gray Code –Gates: OR gates – AND gates – Boolean Algebra – NOR gates – NAND gates.

UNIT II BOOLEAN ALGEBRA 9

Boolean Law and theorems –sum of product method – K-Map truth tables – Pairs, Quads, Octets – K-Map simplifications – Don't care – product of sum method – product of sum simplifications.

UNIT III COMBINATIONAL LOGIC CIRCUIT 9

Multiplexers –Demultiplexers – Decoders – Encoders – Code Converters – Parity Generators & Checkers – PAL – PLA.

UNIT IV SEQUENTIAL LOGIC CIRCUITS I 9

Sequential Logic: RS, JK, D and T Flip-Flops – Edge-Triggered – Master – Slave Flip- Flops. Registers: Shift Registers – Types of Shift Registers

UNIT V SEQUENTIAL LOGIC CIRCUITS II 9

Types of ROMs - Types of RAMs -Counters: Asynchronous Counters- Ripple – Synchronous Counters – Shift Counters.

Total: 45 hours

COURSE OUTCOMES:

At the end of this course, the student will be able to:

CO-1: Evaluate various types of K-Map simplification

CO-2: Analyze Boolean Algebra concepts

CO-3: Apply De-Morgan's law

CO-4: Understand the concepts of sequential logic circuits

CO-5: Understand the concepts of number system

Text Book:

1. D.P. Leach & A.P. Malvino (2002), Digital Principles and Application, THM Fifth Edition

Reference Books:

1. M.M. Mano (2001), Digital Logic and Computer Design, PHI
2. T.C. Bartee (1991), Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill.
3. Donald D.Givone (2004), Digital Principles and Design – Tata McGraw – Hill Publishing Company Limited .

Web Sources:

1. www.tutorialspoint.com/computer_logical_organization
2. www.geeksforgeeks.org/digital-electronics-logic-design-tutorials

24PBCS11 PROBLEM SOLVING APPROACHES USING C LAB

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

This course emphasizes the nature of C language using many applications and helps to understand the need to choose the language for solving the problem. The students can understand the art of computer programming.

LIST OF PROGRAMS:

1. a) Write a program to print first ten natural numbers.

   b) Write a program to find greatest of three numbers.

2. Write a program to find grade of a list of students given their marks.

3. Write a program to find gross salary of a person.

4. Write a program for counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.

5. Write a program for palindrome.

6. Write a program for Fibonacci sequence.

7. Write a program to find GCD of two numbers.

8. Write a program to find NCR and NPR.

9. a)Write a program to find Towers of Hanoi.

   b) Write a program to find Maximum & Minimum.

10. Write a program for a) sin(x).

11. Write a program for Cos(x).

12. Write a program for Addition and Subtraction of Matrix.

Total: 30 Hours

COURSE OUTCOMES:

At the end of this course, the student will be able to:

CO-1: Create Matrix addition and subtraction program using C.

CO-2: Evaluate String manipulation program using C.

CO-3: Apply recursive function to generate Fibonacci Sequence.

CO-4: Apply maths knowledge to find sinx and cosx .

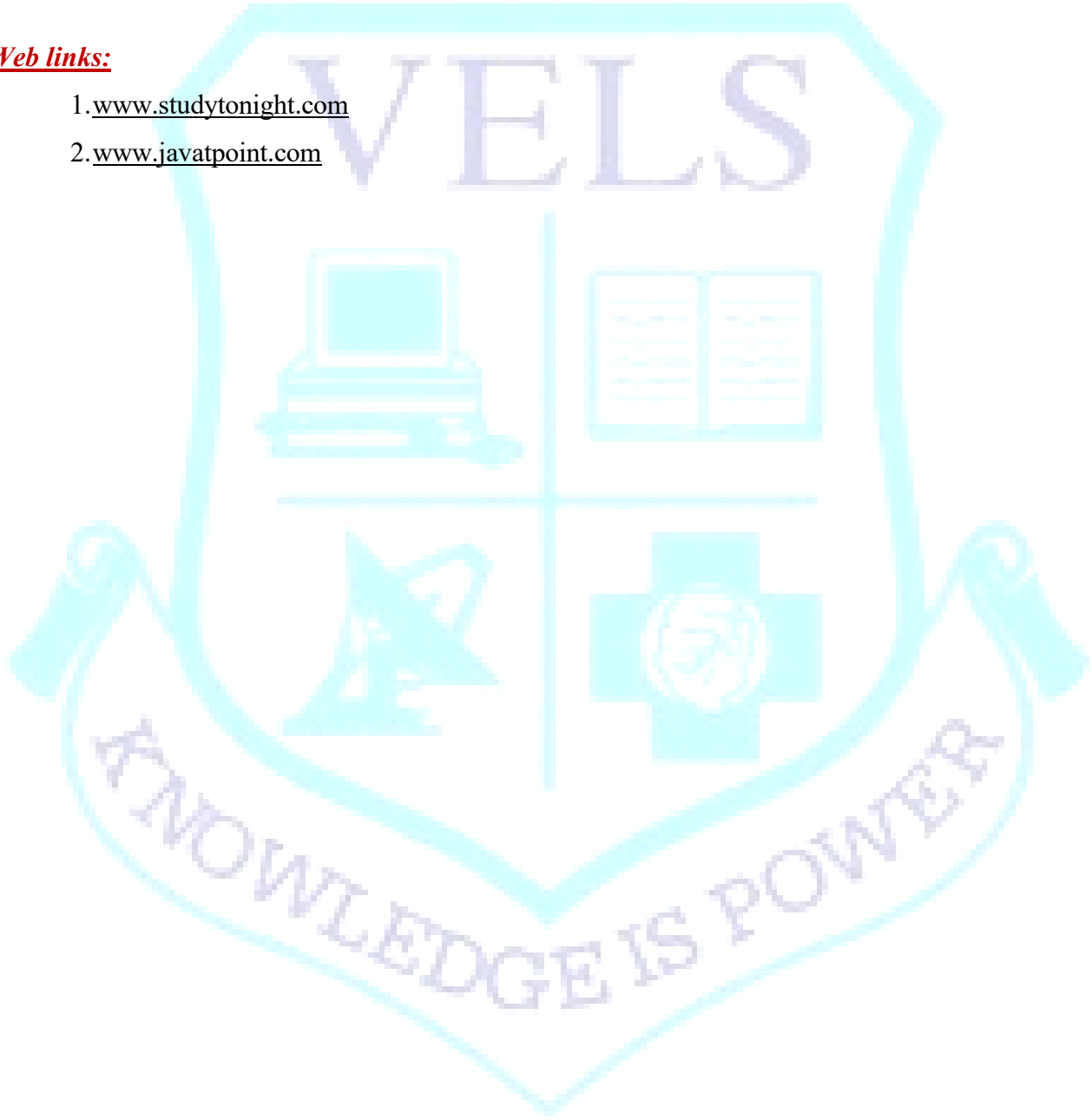
CO-5: Apply control structure concept to find max min numbers.

Text Book:

1. E.Balaguruswamy (2017), Programming in ANSI C, TMH Publishing Company Ltd, 7th Edition,.
2. Yashavant kanetkar (2016), Let us C solutions, 15th Edition, Kindle edition from BPB Publications.
3. H. Schildt (2017), The Complete Reference in C, TMH, 4th Edition,.

Web links:

1. www.studytonight.com
2. www.javatpoint.com



SEMESTER II

24LTAM21 **TAMIL-II**

L	T	P	O	C
2	0	0	1	2

காப்பியம், பக்தி இலக்கியம், கலைகள், நாகரிகம்-பண்பாடு

பாடத்திட்ட நோக்கம்:

மாணவர்களின் இலக்கிய நாட்டத்தை மேம்படுத்துதல், அற இலக்கியங்கள், சிற்றிலக்கியம், சிறுகதை ஆகியவற்றை அறிமுகப்படுத்துதல், தற்காலப் பேச்சுத் தமிழ் எழுத்துத்தமிழ் ஆகியவற்றின் வளர்நிலைகளை மாணவர்களை அறியச் செய்தல், அதன்வழி சிந்தனை வளத்தைப் பெருகச் செய்தல் என்பனவும் மேற்கண்டவழி மாணவர்களை ஆளுமை மிக்கவர்களாக உருவாக்கி, போட்டித்தேர்வுகளுக்குத் தயார் செய்து அவர்களின் மொழித் திறனை மேம்படுத்த அவர்களுக்குக் கடிதம் எழுதும் கலையைக் கற்றுக்கொடுத்தல், அணி இலக்கணத்தை அறியச் செய்தல் என்பன இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு 1 காப்பியங்கள் 8

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.

மணிமேகலை- மலர்வனம் புக்க காதை முழுவதும்.

கம்பராமாயணம் - குகப் படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்)

அலகு 1: பக்தி இலக்கியம் 8

1. மாணிக்கவாசகர் - திருவாசகம் - மூன்று பாடல்கள்
   - ✓ புல்லாகி பூடாகி (சிவபுராணம்)
   - ✓ எல்லாப் பிறப்பும் (சிவபுராணம்)
   - ✓ உற்றாரை யான் வேண்டேன் (திருப்புலம்பல்)
2. ஆண்டாள் - திருப்பாவை - மூன்று பாடல்கள் (1, 3, 4)
   - ✓ மார்கழித் திங்கள் ··· (பாசுரம் 1)
   - ✓ ஓங்கி உலகளந்த··· (பாசுரம் 3)
   - ✓ ஆழிமழைக் கண்ணா··· (பாசுரம் 4)
3. வீரமாமுனிவர் - தேம்பாவணி - வளன் சனித்தப் படலம்
4. சீறாப்புராணம்- மானுக்கு பிணை நின்ற படலம்

அலகு 3 கலைகள் **7**

சிற்பம் - ஓவியம் - இசை - கூத்து - ஒப்பனை - ஆடை அணிகலன்கள்.

அலகு 4 நாகரிகம், பண்பாடு **7**

சொற்பொருள் விளக்கம் - பண்டைத் தமிழர் வாழ்வியல் - அகம் - களவு - கற்பு - குடும்பம் - விருந்தோம்பல் - உறவு முறைகள் - சடங்குகள் - நம்பிக்கைகள் - பொழுதுபோக்கு - புறம் - போர் முறைகள் - நடுகல் வழிபாடு - கொடைப்பண்பு.

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

1. **தமிழர் நாகரிகமும் பண்பாடும்,** டாக்டர் அ. தட்சிணாமூர்த்தி (2001), ஐந்திணைப் பதிப்பகம்,.
2. **தவறின்றித் தமிழ் எழுதுவோம்**, மா. நன்னன்(1999), ஏகம் பதிப்பகம்,.
3. **தவறின்றித் தமிழ் எழுத** - மருதூர் அரங்கராசன் (2003), ஐந்திணைப் பதிப்பகம்,
4. **தமிழ் இலக்கிய வரலாறு**, வரதராசன், மு.(2002), புது தில்லி : சாகித்திய அக்காதெமி,
5. **புதிய தமிழ் இலக்கிய வரலாறு**, நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம் (2007), சாகித்திய அகாடெமி,
6. **செம்மொழி தமிழின் சிறப்பியல்புகள்** - முனைவர் மறைமலை இலக்குவனார்; https://www.youtube.com/watch?v=HHZnmJb4jSY
7. **பாடநூல் தேடலுக்கான இணையம் -** https://archive.org/

24LHIN21 **HINDI-II**

L	T	P	O	C
2	0	0	1	2

Prose, Official Letter Writing & Functional Hindi

COURSE OBJECTIVES:

To inculcate the human values, importance of patriotism and hard work

To train students in functional Hindi

To introduce the usage of Inscript keyboard

UNIT I : मुंशी प्रेमचंद कृत 'बूढी काकी' (कहानी)

'Boodee kaki" (Kahani) by Munshi Premchand 6hrs.

UNIT II : जयशंकि प्रसाद कृत 'पुिस्काि' (कहानी)

'Puraskar' (Kahani) by Jaishankar Prasad 6hrs.

UNIT III: हरिशंकि पिसाई कृत 'मैं निक से बोल िहा हूूँ' (व्यंग्य)

'Main Narak Se Bhol Raha Hun' (Vyangy) by 6hrs.
Harishankar Parsayi,

UNIT IV: व्यावहारिक हहन्दी 1 – 50 – तकनीहक शब्द, 50 – पदनाम व ववभागीय नाम, भाव एक भार्ा अनेक 6hrs.

Functional Hindi 1 - 50-Technical Words, 50-Designation & Department Names, Bhav Ek Bhasha Anek

UNIT V : व्यावहारिक हहन्दी 2 – पत्र लेखन – 3 औपचारिक पत्र, इजन्स्िट्ट कीबोर्ष का परिचय 6hrs.

Functional Hindi 2 -Letter Writing- 3 Official Letters.
Introduction to Inscript Keyboard

Total: 30 Hours

COURSE OUTCOMES:

Course Outcome:

At the end of this course Students will be able to

CO1: Know to the human values

CO2: Know the importance of patriotism

CO3: Know the value of hardwork in human life

CO4: Journalise in Functional Hindi

CO5: Use inscript keyboard

Text Books:

1. Ed. Subhash chandar, Boodi Kaki by Premchand, Natioonal Book Trust, 2012.
2. Jaishankar Prasad, Pratinidhi Kahaniyan, Raj Kamal Prakashan, 2015.
3. Harishankar Parsai, Pratinidhi vyangy, Rajkamal, 2007.
4. Kendriya Hindi Prashikshan Sansthan, Parangat, Bharat Sarkar, 2015.

Reference books:

Kendriya Hindi Sansthan, Banking Hindi Patyakram, 2012.

Weblink:

1. Munshi Premchand, Manasarovar, 2007, http://gadyakosh.org
2. Jaishankar Prasad/ http://gadyakosh.org
3. Harishankar Parsai/ https://hindikahani.hindi-kavita.com
4. Prayojanmoolak Hindi:https://hi.mwikipedia.org
5. https://rajbhasha.gov.in/en/introduction

24LFRE21 **FRENCH-II**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

The lessons are being chosen:

1) To express his / her where abouts and to ask seek direction
2) To express obligation and restriction
3) To describe a place
4) To narrate and to question
5) To describe someone
6) To express his desire and to speak about the futur

UNIT I

1) **C'est où**

L'impératif, Les articles contractés au, à la…, Le passé composé et l'accord du participe passé avec être.

5

2) **N'oubliez pas**

Le pronom relatif Qui, que, où, Les pronoms compléments indirects (me, te, lui, leur…)

5

3) **Belle vue sur la mer --**

Les adjectifs démonstratifs, Y- pronom complément.

4

4) **Quel beau voyage!**

Les verbes pronominaux, En- pronom complément.

4

5) **Oh ! joli**

L'imparfait, L'imparfait ou le passé composé.

5

6) **Et après ?**

Le futur simple, Le subjonctif présent.

7

Total: 30 Hours

COURSE OUTCOMES:

1) The students would be able to express his/her where about and to ask direction
2) The students would be able to express obligation and restriction

3) The students would be able to describe a place
4) The students would be able to narrate and to question
5) The students would be able to describe someone
6) The students would be able to express his desire and to speak about the future

Text Book:

1. LATITUDES 1 (A1/A2) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau

Reference book:

1. SAISON A1 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

24LENG21 **ENGLISH-II**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To read and understand different types of prose, poetry, and fiction.

CO2: To think critically about texts and express ideas clearly.

CO3: To recognize and discuss key themes and styles in literary works.

CO4: To learn and use grammar rules correctly in writing and speaking.

CO5: To write more effectively by applying grammar and literary techniques.

UNIT I -PROSE

- If you are wrong, admit it- Dale Garnegie
- Words of Wisdom- Chetan Bhaghat

UNIT II - POETRY

- La Belle Dame Sans Merci - John Keats
- Ozymandias- P.B.Shelley

UNIT III - FICTION

- The School for Empathy - E.V. Lucas
- The Lamb to the Slaughter-Roald Dahl

UNIT IV - GRAMMAR

- Types of sentences, Concord

Unit V - Grammar

- Tenses, Voices

Total: 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1:Identify poetic expressions in the course of daily speech

CO2: Students will develop skills that enable them to communicate effectively in writing.

CO3: Students will develop skills that enable them to communicate effectively in writing.

CO4:Discriminate against different sensibilities in approaching life.

CO5:Strengthen the ability to solve life's problems, as highlighted in the selections.

References:

1) June., Dr. M. Narayana Rao and Dr. B. G. Barki (2012), Anu's Current English for Communication(AnuChitra).
2) General English for competitive examinations by V.Rajagopalan (2010), Mcgraw Hill Education.

24CBCS21 OBJECT ORIENTED PROGRAMMING LANGUAGES

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

The course provides insight knowledge about object-oriented programming conceptsand programming language in C++ and JAVA.

UNIT I OBJECT ORIENTED PROGRAMMING AND BASICS OF C++ 9

Principles of Object-Oriented Programming – Beginning with C++ - Applications of C++ - Tokens –Keywords- Expressions – Data Types – Storage Classes – Operators –Manipulators- Typecast Operator – Arrays –Strings-Control Structures – Operator Overloading -Functions in C++ - Function Prototyping – Call by Reference – Inline Functions –Recursion – Function Overloading – Friend and Virtual Function.

UNIT II CLASSES AND OBJECTS AND OPERATOR OVERLOADING 9

Introduction – Classes and Objects – Constructors –Parameterized Constructors – Copy Constructor – Dynamic Constructors – Destructors – Introduction to Operator Overloading – Overloading Unary Operator – Overloading Binary Operator – Type Conversions.

UNIT III INHERITANCE AND POLYMORPHISM 9

Introduction- Defining Derived Classes - Inheritance – Types of Inheritance – Abstract Classes - Introduction to Virtual Functions - Pure Virtual Function-Polymorphism – Exception Handling.

UNIT IV JAVA INTRODUCTION, ARRAYS AND STRINGS 9

Java Evolution - Overview of Java Language – Constants – Variables – Data Types – Operators and Expressions – Class, Objects and Methods – Arrays, Strings and Vectors.

UNIT V PACKAGES AND MULTITHREADING 9

Introduction – Java API Packages – Creating Packages – Accessing a Package – Adding a Class to a package – Multithreading – Creating Threads - Life Cycle of a Thread – Thread Exceptions – Inter-Thread Communication.

Total: 45 Hours

COURSE OUTCOMES:

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

CO1: Develop an in-depth understanding of functional, logic, and object-oriented Programming Paradigms.

CO2: An understanding of the concepts of inheritance and polymorphis and ability to overload Operators in C++.

CO3: An understanding of the difference between function overloading and function overriding.

CO4: An ability to write object-oriented programs of moderate complexity in Java. An understanding the concepts of class, objects and methods in java and strings.

CO5: An ability to create packages, accessing a package and adding a class to package and threads.

Text Books:

1) Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education

2) Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education.

Reference Books:

1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012.

2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015.

3. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2008.

4. S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014.

Web links:

1.https://www.geeksforgeeks.org/introduction-of-object-oriented-programming/

2.https://www.educative.io/blog/object-oriented-programming

24CBCS22 **DATABASE MANAGEMENT SYSTEM**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course introduces the basic concepts of Database Management System, the Structured Query Language (SQL) and PLSQL. The students gain knowledge about Database, Data models, Relational Algebra, Normalization, SQL, PL/SQL and Stored Procedure.

UNIT – I INTRODUCTION 9

DBMS Definition, Characteristics of DBMS ,Application and advantages of DBMS, Instances , Schemas and Database States, Three Levels of Architecture , Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

UNIT – II DATA MODELS 9

Data Models, types and their comparison, Entity Relationship Model, Entity Types, Entity Sets, Attributes and its types, Keys, E-R Diagram, Data Integrity, RDBMS –Concept, Components and Codd's rules.

UNIT – III RELATIONAL ALGEBRA AND NORMALIZATION 9

Relational Algebra (selection, projection, union, intersection, Cartesian product, Different types of join like theta join, equi-join, natural join, outer join) Functional Dependencies, Good & Bad Decomposition, Anomalies as a database: A consequences of bad design, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

UNIT – IV INTRODUCTION TO SQL 9

Introduction to SQL: DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins) Functions.

UNIT – V PL/SQL 9

Introduction to PL/SQL (blocks of PL/SQL, Variables, constants), Control Structure Introduction to Stored Procedures, Functions, Cursor and Triggers-Case Study.

Total: 45 Hours

COURSE OUTCOMES:

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

CO - 1: Analyze different types of SQL statements.

CO - 2: Apply the query knowledge to write PL/SQL code.

CO - 3: Apply ideas to combine tables using join.

CO - 4: Apply knowledge to write simple query.

CO – 5: Understand the fundamental concepts of DBMS.

Text Books:

1. A. Silberschatz, H. F. Korth, S.Sudharsan (2011), Database System Concepts,Sixth Edition, Tata McGraw Hill
2. Ivan Bayross (2015), SQL,PL/SQL, The programming language of Oracle, Second Revised Edition, BPB Publication

Reference Books:

1. R.Elmasri, S.B.Navathe (2008), Fundamentals of Database systems, Fifth Edition,Pearson Education
2. C. J. Date (2005), Introduction to Database Systems, Fifth Edition, Pearson Education,

Web links:

1. www.guru99.com/dbms-tutorial.html
2. www.oracletutorial.com

24PBCS21 OBJECT ORIENTED PROGRAMMING LANGUAGES LAB

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

The purpose of this course is to introduce to students to the field of programming using C++ and Java. Be able to use the Java SDK environment to create, debug and run simple Java programs.

LIST OF PROGRAMS:

1. Design C++ classes with static members, methods with default arguments.
2. Implement complex number class with necessary operator overloading using C++.
3. C++ program to illustrate concept of Virtual Functions
4. Implement Multiple Inheritance using C++
5. Program to Demonstrate Operator Overloading using C++
6. Programs illustrating various data types in java.
7. Programs to implement method overloading in java.
8. Programs illustrating the implementation of various forms of inheritance (single, hierarchical, multilevel).
9. Programs to implement polymorphism and method overriding in java.
10. Programs implementing exception handling.
11. Programs to illustrate interfaces in java.
12. Programs to create package in java

Total: 15 Hours

24PBCS22 **RDBMS LAB**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

- To give a good formal foundation on the relational model of data.
- To present SQL and procedural interfaces to SQL comprehensively.
- To present the concepts and techniques relating to query processing by SQL engines.
- To present the concepts and techniques relating to ODBC and its implementations.

LIST OF PROGRAMS:

1. Write a Program to create table and insert values using DDL Commands.
2. Write a Program to implement DML commands.
3. Write a Program on Types of Data Constraints.
4. Write a Program on Joins.
5. Write a Program on group-by clause and order-by clause.
6. Write a Program on different functions (aggregate, math and string).
7. Write a Program on different types of sub queries.
8. Write a Program on different SET Operations.
9. Write a Program on implementing Factorial, Fibonacci Series using PL/SQL.
10. Write a Program to implement triggers and cursors.
11. Write a program that creates the function and calculating area of circle.
12. Write a program that uses the concept of user defined exception

Total: 15 Hours

COURSE OUTCOMES:

At the end of this course, the student will be able to:

CO-1: Create an application to check user defined exception using PL/SQL.

CO-2: Evaluate the functionalities of trigger and cursor.

CO-3: Analyze different types of built-in function in PL/SQL.

CO-4: Apply DDL, DML and DCL statement using SQL.

CO-5: Apply various types of joins in tables.

Text books:

1. A. Silberschatz, H. F. Korth, S.Sudharsan (2011), Database System Concepts,Sixth Edition, Tata McGraw Hill.
2. Ivan Bayross (2015), SQL,PL/SQL, The programming language of Oracle, Second Revised Edition, BPB Publication

Reference Books:

1. R.Elmasri, S.B.Navathe (2008), Fundamentals of Database systems, Fifth Edition,Pearson Education
2. C. J. Date (2005), Introduction to Database Systems, Fifth Edition, Pearson Education.

Web links

1. www.guru99.com/dbms-tutorial.html
2. www.oracletutorial.com

SEMESTER III

24LTAM31 **TAMIL-III**

L	T	P	O	C
2	0	0	1	2

சிற்றிலக்கியம். சிறுகதை, எழுதுதிறன், பேச்சுக்கலை

பாடத்திட்ட நோக்கம்:

மாணவர்களின் இலக்கிய நாட்டத்தை மேம்படுத்துதல், பக்தி இலக்கியத்தை மாணவர்களுக்கு அறிமுகப்படுத்தி, அதன்வழி தமிழர்தம் பக்தி உணர்வையும் அதன் மேன்மையையும், கலைத்திறனையும் வெளிப்படுத்துதல், காப்பியம், புதினம் என்ற இலக்கிய வகைமைகளை அறிமுகப்படுத்துதல், மாணவர்களின் மொழித்திறனை மேம்படுத்தும் வகையில் மொழிபெயர்ப்பு, இலக்கணக் குறிப்பு என்பனவற்றை அறியச் செய்தல், மேற்கண்டவழி மாணவர்களைப் போட்டித்தேர்வுகளுக்குத் தயார் செய்தல் இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு 1: சிற்றிலக்கியம் 8 மணி நேரம்

1. நந்திக்கலம்பகம் - உரைவரம் பிகந்த உயர்புகழ்ப்
   வானுறுமதியை அடைந்தது உன்வதனம்
2. தமிழ்விடு தூது – 10 கண்ணிகள்
3. திருக்குற்றாலக் குறவஞ்சி – மலைவளம் கூறுதல் – முதல் 5 பாடல்கள்
4. கலிங்கத்துப் பரணி – பாலை பாடியது – முதல் 5 பாடல்கள்

அலகு 2: சிறுகதை 8 மணிநேரம்

1. அறிஞர் அண்ணா - செவ்வாழை
2. புதுமைப்பித்தன் - கடவுளும் கந்தசாமிப் பிள்ளையும்
3. கி.ராஜநாராயணன் - கதவு

அலகு 3 எழுதுதிறன் 7 மணி நேரம்

கலைச்சொல்லாக்கம் - தேவைகள் - கலைச்சொற்களின் பண்புகள் - கலைச்சொல்லாக்கத்தில் தவிர்க்க வேண்டியவை - அறிவியல் கலைச்சொற்கள்.

கடிதம் - வகைகள் - அலுவலகக் கடிதங்கள் - பயிற்சி - அறிஞர்களின் கடிதங்கள் - கடிதங்களின் வழி கற்பித்தல் - சில அறிஞர்களின் கடிதங்கள் - நேரு...,

அலகு 4: பேச்சுக் கலை 8 மணி நேரம்

பேச்சுத் திறன் – விளக்கம் – பேச்சுத்திறனின் அடிப்படைகள் – வகைகள் – மேடைப்பேச்சு – உடையாடல் - பயிற்சிகள்

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

1) **தமிழர் நாகரிகமும் பண்பாடும்,** டாக்டர் அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், 2001.
2) **தவறின்றித் தமிழ் எழுதுவோம்**, மா. நன்னன், ஏகம் பதிப்பகம், 1999.
3) **தவறின்றித் தமிழ் எழுத** - மருதூர் அரங்கராசன், ஐந்திணைப் பதிப்பகம், 2003.
4) **தமிழ் இலக்கிய வரலாறு**, வரதராசன், மு., புது தில்லி : சாகித்திய அக்காதெமி, 2002.
5) **புதிய தமிழ் இலக்கிய வரலாறு**, நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம், சாகித்திய அகாடெமி, 2007.
6) **செம்மொழி தமிழின் சிறப்பியல்புகள்** - முனைவர் மறைமலை இலக்குவனார்; https://www.youtube.com/watch?v=HHZnmJb4jSY
7) **பாடநூல் தேடலுக்கான இணையம் -** https://archive.org/

24LHIN31 **HINDI-III**

L	T	P	O	C
2	0	0	1	2

(Ancient & Medival Poetry, Hindi translation & Advertisement)

COURSE OBJECTIVES:

To enrich the knowledge of students about through Thirukkural

To enable them to learn life values through ancient and medievial poems of Hindi Literature

To develop translation and advertisements skills in Hindi

UNIT I : ततरुवल्लुवि कृत ततरुक्कुिल – 5, अमीिि खुसिो कृत पहेतलयाूँ - 5

'Thirukkural'- 5 Kural-by Thiruvalluvar **6**

Amir Khusro-5 Paheliyan

UNIT II: कबीिि के दोहे – 5

Kabir Ke Dohe,-5 **6**

UNIT III: तुलसीदास के पद – 2 & सूिदास के पद – 2

Tulsidas Ke Pad-2 & SurdasKe Pad-2 **6**

UNIT IV: व्यावहारिक हहन्दी 1 – अनुवाद का परिचय (अिष, परिभार्ा व प्रकाि) & 5 - अभ्यास अनुछेद

Functional Hindi 1 - Introduction to Translation

(Meaning, Definition &Types) & Exercise passages – 5 **6**

. UNIT V: व्यावहारिक हहन्दी 2 - ववज्ञापन का परिचय (अिष, परिभार्ा व प्रकाि) & 4 – नमूना ववज्ञापन 6hrs.

Advertisement –Introduction (Meaning, Definition &

Types) & Model Advertisement - 4 **6**

Total :30 Hours

COURSE OUTCOMES:

At the end of this course Students will

CO1: Know the valuable messages in social responsibilities

CO2 & CO3: Know the life values

CO4 : Gain knowledge of translation in functional Hindi

CO5 : Gain knowledge about advertisement skills in Hindi

Text Books:

1. Thirukkural, Bharatiya Gyanpeet, 2014.
2. Amir Khusro Ki Paheliyan, Prakrit Bharati Acadamy, 2006.
3. Amar Prakash, Kahir Dohavali, Mahamaya Publication, 2020.
4. Tulsidas, Dohavali, Geeta Press, Gorakhpur.

5. Vagdev, Surdas Ke Padavali, Prabhat Prakashan, 2011.

Reference book:

1. Rachana Vyas, Amir Khusro Ki Paheliyan, Lokoday Prakashan Pvt. Ltd., 2022.
2. Kendriya Hindi Sansthan, Banking Hindi Patyakram, 2012.
3. Kendriya Hindi Prashikshan Sansthan, Parangat, Bharat Sarkar, 2015.

Weblinks:

1. Thirukkural hindi translation by Venkata Krishnan
2. Ameer khusro ki paheliyan - https://www.hktbharat.com
3. Kabir ke Dohe - Kabir granthavali , Surhranthavali-http://kavitakosh.org
4. Tulsidas ke pad - http://kavitakosh.org

24LFRE31 **FRENCH-III**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

The lessons are being chosen:
1) to express certainty and uncertainty
2) to express one's desire to do something
3) to express one's willingness and unwillingness to do something
4) to express one's joy and sorrow
5) to express one's fear, concern and astonishment
6) to express one's anger and regrets

1) Très drôle le passe recent, passe compose et l'imparfait	**6**
2) Vous avez dit culture l'interrogation et le subjonctif.	**5**
3) Envie d'ailleurs les verbes aller/ retourner, venir/ revenir, ne...pas...ni, ne…ni…ni.	**4**
4) Voila l'été le comparatif, superlatif et l'accord du participe passe avec avoir.	**7**
5) Terre inconnue le plus-que parfait	**3**
6) Vivement dimanche le pronom en et y, le subjonctif et les conjugaisons irrégulières.	**5**

Total :30 Hours

COURSE OUTCOMES:

1) The students would be able to express certainty and uncertainty
2) The students would be able to express one's desire to do something
3) The students would be able to express one's willingness and unwillingness to do something
4) The students would be able to express one's joy and sorrow
5) The students would be able to express one's fear, concern and astonishment
6) The students would be able to express one's anger and regrets

Text/Reference book/Weblinks:

Prescribed book: LATITUDES 1 (A2/B1) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau
Reference book: SAISON A2 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

24LENG31 **ENGLISH-III**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To enhance reading comprehension skills for understanding complex texts in competitive exams.

CO2: To develop vocabulary and language proficiency to tackle verbal reasoning sections effectively.

CO3: To improve grammar and writing skills for precise and coherent expression in written exams.

CO4: To practice critical thinking and analytical reasoning abilities required for exam questions.

CO5: To familiarise students with exam formats, strategies, and time management techniques for success in competitive exams.

Credit Hours

Unit I -Vocabulary **6**

- Homophones, Homonyms, Note-taking, Paraphrasing

Unit II - Comprehension **6**

- Reading comprehension, Critical reading, Cloze test

Unit III - Grammar **6**

- Idioms and Phrases, Question tag, Verbal phrases, Prepositions

Unit IV - Grammar **6**

- Voices, Direct & Indirect speech, Simple, Compound, Complex

Unit V - Academic Writing **6**

- Precis writing, Report writing

Total :30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1 : Students imbibe the rules of language unconsciously and tune in to deduce language structure and usage

CO2 : Students develop their abilities as critical readers and writers

CO3 : Students decipher the mechanism of language and use it for success in competitive examinations and job related speaking and writing tasks.

References:

1. General English for competitive examinations by V. Rajagopalan (McGraw Hill Education) - 2010.
2. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta K. Sharma, Oxford Univ. Press, 2016, New Delhi.

24EVS031 **ENVIRONMENTAL STUDIES**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

- To inculcate the importance of environmental pollution, preservation of nature and environmental management for human welfare.

UNIT-I HUMAN COMMUNITIES AND THE ENVIRONMENT 9

The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment;

Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

UNIT II NATURAL RESOURCES AND SUSTAINABLE DEVELOPMENT 9

Renewable and non-renewable resources - Natural resources and associated problems. a) Forest resources b) Water resources c) Mineral resources d) Food resources e) Energy resources: f) Land resources; Role of an individual in conservation of natural resources- Equitable use of resources for sustainable lifestyles.

Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

UNIT-III ECOSYSTEM AND BIODIVERSITY 9

Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristics-forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance.

Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories. Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change. Major conservation policies: in-situ and ex-situ conservation approaches;

UNIT-IV ENVIRONMENTAL POLLUTION AND HEALTH 9

Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution; Causes, effects and

control measures of a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear hazards. Solid waste Management. Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

UNIT-V ENVIRONMENTAL TREATIES AND LEGISLATION 9

Major International Environmental Agreements: Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Vienna Convention for the Protection of the Ozone Layer;

Environmental laws:

Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act - Issues involved in enforcement of environmental legislation. Public awareness.

Total: 45 hours

COURSE OUTCOME:

At the end of this course, learners will be able to:

CO1: Gain insights into the international efforts to safeguard the Earth's environment and resources.

CO2: Understand the concept of natural resources; identify types of natural resources, their distribution and use with special reference to India.

CO3: Understand the concepts of ecosystems, biodiversity and conservation.

CO4: Sensitize themselves to adverse health impacts of pollution.

CO5: Understand the sectoral effects on the local, regional, and global environmental issues

Text Books:

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
2. William P. Cunningham and Mary Ann Cunningham, Environmental Science: A Global Concern 14th Edition, 2021.
3. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.
4. Climate change: Science and politics (2021), Centre science and Environment, New Delhi,

Reference Books

1. Daniel B. Botkin and Edward A. Keller, Environmental Science: Earth as a Living Planet, 9th Edition, New Age International 2022.
2. Jadhav H and Bhosale VM, Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs 2023.

Web link and we source:

1. https://easyengineering.net/ge6351-environmental-science-and/
2. https://learnengineering.in/ge8291-environmental-science-and-engineering
3. https://cpcb.nic.in/ standards/

24CBCS31 PROBLEM SOLVING USING PYTHON

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

The course is designed to provide basic knowledge of Python.

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to write functions and pass arguments in Python.
- To learn how to design object-oriented programs with Python classes.

UNIT -I BASIC OF PYTHON 9

Python - Variables - Executing Python from the Command Line - Editing Python Files -Python Reserved Words - Basic Syntax-Comments - Standard Data Types – Relational Operators - Logical Operators - Bit Wise Operators - Simple Input and Output.

UNIT-II CONTROL STATEMENTS, LISTS, TUPLES 9

CONTROL STATEMENTS: Control Flow and Syntax - Indenting - if Statement - statements and expressions- string operations- Boolean Expressions -while Loop - break and continue - for Loop. LISTS: List-list slices - list methods - list loop–mutability–aliasing - cloning lists - list parameters. TUPLES: Tuple assignment, tuple as return value -Sets–Dictionaries.

UNIT-III FUNCTIONS 9

Definition - Passing parameters to a Function - Built-in functions- Variable Number of Arguments –Scope – Type conversion-Type coercion-Passing Functions to a Function – Mapping Functions in a Dictionary – Lambda - Modules - Standard Modules – sys – math – time - dir – help Function.

UNIT-IV EXCEPTION HANDLING 9

Run Time Errors - Exception Model - Exception Hierarchy - Handling Multiple Exceptions – Data Streams - Access Modes Writing - Data to a File Reading - Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling IO Exceptions - Working with Directories.

UNIT-V OBJECT ORIENTED FEATURES 9

Classes Principles of Object Orientation - Creating Classes -Instance Methods - File Organization –Special Methods - Class Variables – Inheritance – Polymorphism - Type Identification – Simple Character Matches - Special Characters – Character Classes – Quantifiers - Dot Character –

Greedy Matches – Grouping - Matching at Beginning or End - Match Objects – Substituting - Splitting a String - Compiling Regular Expressions.

Total: 45 Hours

COURSE OUTCOME:

At the End of this course, the students will be able to:

CO 1: Evaluate a program incorporating all the python language constructs.

CO 2: Analyse the concepts of Lists, tuples and error handling mechanisms.

CO 3: Apply the concept of Decision making statements, looping constructs, functions for solving basic programs.

CO 4: Apply the various basic programming constructs like operators, expressions.

CO 5: Understand the basic concepts like editor, execution.

Text Books:

1.Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.

2. Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna Publishing House, 2023.

3. Sheetal Taneja & Naveen kumar: Python Programming a Modular approach – A Modular approach with Graphics, Database, Mobile and Web applications, Pearson, 2017.

Reference Books:

1. Think Python, by Allen Downey, 2 nd edition, 2015, O'Reilly.

2. An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.

3. Introduction to Computation and Programming using Python, by John Guttag, 2 nd edition, 2016, PHI India.

Web Sources:

1. www.learnpython.org
2. www.programiz.com/python-programming
3. www.udemy.com/topic/python/

24CBCS32 **MODERN OPERATING SYSTEM**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, input/output management and security protection.

UNIT-I: OPERATING SYSTEMS OVERVIEW 9

Operating Systems Overview- Overview and Functions of Operating Systems - History and Generation of Operating System - Protection and Security - Distributed Systems - Operating Systems Structures - Services - System Calls.

UNIT-II: PROCESS MANAGEMENT 9

Processes-Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication; Threads – Overview - Multicore Programming - Multithreading Models; Windows 7 – Thread and SMP Management. Process Synchronization – Critical Section Problem - Mutex Locks – Semaphores – Monitors - CPU Scheduling and Deadlocks.

UNIT-III: MEMORY MANAGEMENT 9

Memory: Swapping, contiguous memory allocation, paging, page table, segmentation, virtual memory, demand paging, page- replacement, Allocation of frames. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Least Recently used (LRU) Optimal (OPT) , Second Chance (SC), First in First Out (FIFO), Not recently used (NRU).

UNIT-IV: FILE SYSTEM INTERFACE AND MASS STORAGE STRUCTURE 9

File system Interface - Concept of a File – File Access – File Directories - File System Implementation- Mass-Storage Structure: RAID Structure - Disk Structure, Disk Attachment - Disk Scheduling - Swap-Space Management - Stable-Storage Implementation - Overview of Mass-Storage Structure - Tertiary Storage Structure.

UNIT-V: I/O SYSTEMS AND SECURITY PROTECTION 9

I/O systems - Hardware - Application I/O Interface - Kernel I/O Subsystem - Transforming I/O Requests to Hardware Operations – STREAMS - Protection & Security Protection – Protection - Goals of Protection - Principles of Protection - Domain of Protection Access Matrix- Implementation of Access Matrix - Access control - Security – Problems - Program Threats – Intruders – Accidental Data Loss - User Authentication - Implementing Security Defenses- Firewalls – Antivirus and Antivirus Techniques.

Total: 45 Hours

COURSE OUTCOME:

At the End of this course, the students will be able to:

CO1: Analyze the concepts of memory management techniques including virtual memory.

CO2: Understand about structures and history of operating systems and design issues associated with operating systems.

CO3: Understand various process management concepts including scheduling, synchronization.

CO4: Understand about deadlock, deadlock avoidance and prevention.

CO5: Understand about virus and anti virus techniques in OS.

Text Book:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.
3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India

Reference Books:

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

Web Sources:

1. www.tutorialandexample.com/operating-system-tutorial/
2. www.phptpoint.com/operating-system-tutorial/

24PBCS31 DATA STRUCTURES USING PYTHON LAB

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

The course should enable the students to

- Understand various data representation techniques in the real world.
- Implement linear and non-linear data structures.
- Analyze various algorithms based on their time and space complexity.
- Develop real-time applications using suitable data structure.
- Identify suitable data structure to solve various computing problems.

LIST OF PROGRAMS:

1. Write Python programs for implementing the Linear Search.
2. Write Python programs for implementing the Binary Search
3. Write Python programs for implementing the Bubble sort.
4. Write Python programs for implementing the Insertion sort.
5. Write Python programs for implementing the Quick sort.
6. Write Python programs to Design and implement Stack and its operations using List.
7. Write Python programs to Design and implement Queue and its operations using List.
8. Write Python programs to convert infix expression into postfix expression.
9. Write Python programs for implementing the Single Linked List.
10. Write Python programs to implement the Depth first search.
11. Write Python programs to implement the Breadth first search.
12. Write a Python program to implement binary search tree

Total: 30 Hours

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO 1: Create linear data structure application using Python.

CO 2: Create non linear data structure application using Python.

CO 3: Evaluate the implementation of sorting algorithm.

CO 4: Evaluate the implementation of binary search tree.

CO 5: Analyse the performance of Search algorithm.

Text Books:

1.Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.

2. Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna Publishing House, 2023.

3. Sheetal Taneja & Naveen kumar: Python Programming a Modular approach – A Modular approach with Graphics, Database, Mobile and Web applications, Pearson, 2017.

Reference Books:

1. Think Python, by Allen Downey, 2 nd edition, 2015, O'Reilly.

2. An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.

3. Introduction to Computation and Programming using Python, by John Guttag, 2 nd edition, 2016, PHI India.

Web Sources:

1. www.learnpython.org
2. www.programiz.com/python-programming
3. www.udemy.com/topic/python/

VELS
KNOWLEDGE IS POWER

24PBCS32 **OPERATING SYSTEM LAB**

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

This course gives practical training in Modern Operating System to perform the various UNIX commands. It gives hands on training in File operations in C Programming.

LIST OF PROGRAMS:

1. To study of Basic UNIX Commands and various UNIX editors such as vi, ed, ex and EMACS.
2. To write C Programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
3. To write a C program for implementation of Priority Scheduling Algorithms.
4. To write a C program for implementation of Round Robin Scheduling Algorithms.
5. To write a c program to implement IPC using Shared Memory.
6. To write a C program to implement Banker's Algorithm for Deadlock Avoidance.
7. To write a C program to implement algorithm for Deadlock Detection.
8. To write a c program to implement Threading and Synchronization Applications.
9. To write a c program to implement Paging Technique for Memory Management.
10. To write a C program for implementation of FIFO Page Replacement Algorithm.
11. To write C program to organize the file using Single Level Directory
12. To write a C program for random access file for processing the employee details.

Total: 30 Hours

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO1: Create an application to check scheduling algorithm.

CO2: Create an application to implement dead lock concept.

CO3: Evaluate implementation of FIFO page replacement algorithm.

CO4: Analyze file concept in Operating system.

CO5: Apply file concepts in Random access file.

Text Book:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022

2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.

3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India

Reference Books:

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.

2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

Web Sources:

1. www.tutorialandexample.com/operating-system-tutorial/
2. www.phptpoint.com/operating-system-tutorial/

SEMESTER IV

24LTAM41 **TAMIL-IV**

L	T	P	O	C
0	0	2	2	1

மரபுக்கவிதை,புதுக்கவிதை,ஊடகத்தமிழ்,கணினித்தமிழ்

பாடத்திட்ட நோக்கம்:

தமிழர்தம் தொன்மைச் சிறப்பையும், பண்பாட்டுச் செழுமையையும் உலகிற்குப் பறைசாற்றும் சங்க இலக்கியங்களான எட்டுத்தொகை, பத்துப்பாட்டு நூல்களை அறியச் செய்தல், அதன்வழி பண்டைத் தமிழரின் விழுமியங்களை எடுத்துரைத்தல், இலக்கால இலக்கிய வகைமையான நாடக இலக்கியத்தை அறியச் செய்தல், ஊடகங்களில் தமிழின் பயன்பாடு, கணினியில் தமிழ்ப்பயன்பாடு என்பனவற்றை மாணவர்களுக்கு கற்றுக்கொடுத்தல், மாணவர்களை ஆளுமை மிக்கவர்களாக உருவாக்கி, போட்டித்தேர்வுகளுக்குத் தயார் செய்தல் என்பன இந்தப் பாடத்திட்டத்தின் முக்கிய நோக்கமாகும்.

அலகு 1: மரபுக்கவிதை 8 மணி நேரம்

1. பாரதியார் - பாரத தேசம் என்னும் தலைப்பில் ஆறு பாடல்கள். (பாடல் எண்கள் 1, 6, 7, 9, 12, 13)
2. பாரதிதாசன் – தமிழுக்கும் அமுதென்று பேர் என்னும் தலைப்பிலான கவிதை.
3. தேசிக விநாயகம் பிள்ளை - உடல் நலம் பேணல் என்னும் தலைப்பிலான கவிதை
4. முடியரசன் - காவியப் பாவை – “புண்படுமா” என்னும் கவிதை.

அலகு 2: புதுக்கவிதை 8 மணி நேரம்

1. நா. காமராசன் - *கறுப்பு மலர்கள்* தொகுப்பில் *காகிதப்பூக்கள்* என்னும் தலைப்பிலான கவிதை.
2. அப்துல் ரகுமான் - *ஆலாபனை* தொகுப்பில் *போட்டி* என்னும் தலைப்பிலான கவிதை
3. ஆண்டாள் பிரியதர்ஷினி – *முத்தங்கள் தீர்ந்துவிட்டன* தொகுப்பில் *’இங்கே வரும் போது’* என்னும் தலைப்பிலான கவிதை

அலகு 3 :ஊடகத் தமிழ் 7 மணி நேரம்

இதழியல் - ஊடக வகைகள் - தலையங்கம்- நிகழ்ச்சியை செய்தியாக மாற்றுதல்- கருத்துப் பரிமாற்றம் நாடகம், திரைப்படம்,- வானொலி- தொலைக்காட்சி- மொழி நடையின் தன்மை -

அலகு 4 : கணினித் தமிழ் **7 மணி நேரம்**

கணினித் தமிழ்: கணினித் தமிழின் அடிப்படையும் பயன்பாடும் - கணிப்பொறியின் வரலாறும் வளர்ச்சியும், கணினியும் தமிழும், விசைப்பலகை (Keyboard) - எழுத்துருக்கள் (Fonts) - தமிழைத் தட்டச்சு செய்ய உதவும் மென்பொருள்கள், தமிழைத் தட்டச்சு செய்யும் முறைகள் - தமிழ்த் தட்டச்சுப் பயிற்சி - இணையமும் தமிழ்ப் பயன்பாடும் - தேடுபொறி (Search) - வலைப்பூ (Blog), மின்னூலகம் (Online e-Library), - மின்னகராதி(e-Dictionary), - மின் செய்தித்தாள் - e-Paper, - இணையவழித் தமிழ்க் கற்றலும்-கற்பித்தலும் - மின்வழிக் கற்றல் - e Learning.

மொத்தம்: 30 மணி நேரம்

பார்வை நூல்கள்

1. தமிழர் நாகரிகமும் பண்பாடும், டாக்டர் அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், 2001.
2. தவறின்றித் தமிழ் எழுதுவோம், மா. நன்னன், ஏகம் பதிப்பகம், 1999.
3. தவறின்றித் தமிழ் எழுத - மருதூர் அரங்கராசன், ஐந்திணைப் பதிப்பகம், 2003.
4. தமிழ் இலக்கிய வரலாறு, வரதராசன், மு., புது தில்லி : சாகித்திய அக்காதெமி, 2002.
5. புதிய தமிழ் இலக்கிய வரலாறு, நீல. பத்மநாபன், சிற்பி பாலசுப்ரமணியம், சாகித்திய அகாடெமி, 2007.
6. செம்மொழி தமிழின் சிறப்பியல்புகள் - முனைவர் மறைமலை இலக்குவனார்; https://www.youtube.com/watch?v=HHZnmJb4jSY
7. பாடநூல் தேடலுக்கான இணையம் - https://archive.org/

24LHIN41 **HINDI-IV**

L	T	P	O	C
2	0	0	1	2

(Medival & Modern Poetry, Translation)

COURSE OBJECTIVES:

- To develop interest in various style of Modern and Contemporary Hindi Poetry
- To enable them to know about the Official Language Hindi
- To enable them to converse in Hindi

UNIT I : भाितेन्दु हरिश्चंद्र की मुखरियाूँ – 4

Bharatendu Harishchandra ki Mukhariyan-4. 6

UNIT II : सुतमत्रानंदन पंत कृत 'भाितमाता ग्रामवासी' (कववता)

'Bharatmata Gramavasi' (Kavita) by Sumitranand Pant 6

UNIT III: ज्ञानेन्द्रपतत कृत 'बीज व्यिा' (कववता)

'Beej Vyatha' (Kavita) by Gyanendrapati 6

UNIT IV: िाजभार्ा हहन्दी का परिचय, अनुछेद से प्रश्न तनमाषण

Introduction to Official Language Hindi, framing questions from passages 6

UNIT V : मंच संचालन (साक्षात्काि) का परिचय

Introduction to Stage Management(Interview) 6

Total : 30 hours

COURSE OUTCOMES:

At the end of this course Students will be able to

CO1 CO2 & CO3 : Familiar with the different poetic expressions of Modern & Contemporary Hindi Poetry

CO4 : Know the importance of official language Hindi

CO5 : Become conversant in Hindi

Text Books

1. Bhartendu Harishchandra, Ed.Ramji Yadav, Bharatendu Sanchayan, Bharatiya Pustak Parishad, 2011.
2. Sumitranandan Pant, Gramya, Lokbharti Prakashan, 2017.
3. Gyanedrapati, Gyanendrapati, Prabhakar Publication, 2022.
4. Bhatia Kailashchandra, Rajbhasha Hindi, Vani Prakashan,2018.

Reference Book

1. Mahesh Sharma, Bhashan Kala, Prabhat Prakashan, 2019.
2. Raghavan T.E.S. Rajbhasha Hindi Amarkosh.

Weblinks:

1. http://kavitakosh.org
2. Bharatendu Harishchandra
3. https://www.amarujala.com/kavya/kavya-charcha/bhartendu-harishchandra-poems-naye-jamane-ki-mukariyan?page=5
4. Sumitranandan Pant- http://kavitakosh.org
5. https://www.hindiadda.com/beej-vyatha-gyanendrapati/
6. Hindi Rajbhasha: https://navodaya.gov.in

24LFRE41 **FRENCH-IV**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

The lessons are being chosen:

1) to propose to do something and respond to a proposal
2) to respond to a request
3) to accuse, to blame
4) to complain, to protest
5) to express cause and consequence
6) to express opinion about facts

Units:

1. Entreprendre

Les pronoms démonstratifs, les pronoms interrogatifs. **6**

2. Vous avez gagne

Les pronoms en et y, les formation des adverbes en-ment **5**

3. Ne quittez pas

La mise en relief (c'est ..... qui, c'est …….que). **4**

4. Argent trop cher

l'opposition- toujours/ne…jamais. **4**

5. Le pétrole fou

la cause et la consequence. **5**

6. Parlez-moi d'amour

le conditionnel present, le gérondif. **6**

Total : 30 hours

COURSE OUTCOMES:

1) The students would be able to propose to do something and respond to a proposal
2) The students would be able to respond to a request
3) The students would be able to accuse, to blame
4) The students would be able to complain, to protest
5) The students would be able to express cause and consequence
6) The students would be able to express opinion about facts

Text/Reference Book/Weblinks:

1) Prescribed book: LATITUDES 1 (A2/B1) MÉTHODE DE FRANÇAIS - Régine Mérieux and Yves Loiseau
2) Reference book: SAISON A2 - MÉTHODE DE FRANÇAIS - Marie-Noëlle Cocton, Élodie Heu, Catherine Houssa, Émilie Kasazian

24LENG41 **ENGLISH-IV**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To develop effective oral communication skills for professional contexts such as presentations and meetings.

CO2: To enhance written communication abilities, including business correspondence and reports.

CO3: To improve professional vocabulary and language usage appropriate for various fields and industries.

CO4: To practice critical thinking and problem-solving skills through case studies and discussions.

CO5: To prepare students for job interviews, networking, and career advancement through professional English proficiency.

Unit I - Technical Writing **6**

- Spelling, Punctuation, Spot the error
- Hints development,
- Cliches, Redundancies
- Modifiers.

Unit II - Creative Writing **6**

- Instructions and recommendations
- Interpretation of graphs, charts and pictures

Unit III - Professional Writing **6**

- Agenda
- Minutes of the meeting
- Review
- Circular

Unit IV - Organization of Writing **6**

- Paragraph Writing
- Essay writing
- Proposal Writing

Unit V - Speech Writing **6**

- Welcome address
- Vote of thanks

- Oral presentation
- E-mail and SMS text.

Total : 30 hours

COURSE OUTCOMES:

At the end of this course, students would have learnt to,

CO1 : Demonstrate proficiency in language use

CO2 : Master the nuances of spoken and written communication skills in professional contexts

CO3 : Develop confidence and clarity in professional English usage

References:

- Professional English by Meenakshi Raman and Sangeetha Sharma -2018.
- General English for all competitive examinations by S.C. Gupta -2016.

24CBCS41 **ADVANCED JAVA PROGRAMMING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course gives an insight into advanced features of Java which concentrates in Servlet Java Beans, EJB, RMI, JSP, ORB Protocol; Java beans API, writing RMI clients –Pushing data from RMI Servlet, HTML and XML.

UNIT-I : SERVLET 9

Overview – The Java Web Server – Your First Servlet – Servlet Life Cycle-Servlet Chaining – Server Side Includes- Session Tracking – Security – Introduction to HTML - Tags-Creating Forms – Using JDBC In Servlet – Applet To Servlet Communication- HTML to Servlet Communication.

UNIT- II : JSP 9

Introduction JSP- JSP Architecture - Life cycle of JSP -Examining MVC and JSP -JSP Scripting Elements & Directives-Working with Variables Scopes-Exception Handling- Session Management - Creating and Processing Forms - Using JSP Working with Java Mail- Understanding Java Messaging Services-Transactions.

UNIT III : RMI 9

Overview – Developing Applications With RMI: Declaring & Implementing Remote Interfaces-Stubs & Skeletons, Registering Remote Objects, Writing RMI Clients and Servers – Pushing Data From RMI Servlet – RMI Over Inter-ORB Protocol.

UNIT- IV JAVA BEAN AND EJB 9

The Software Component Assembly Model- The Java Beans Development Kit- Developing Session Beans- Notable Beans – Using the Java Beans API. Creating, Updating and Reading from JAR Files- Adding Controls to Beans. EJB Architecture- The EJB Model -EJB Requirements – Design and Implementation – EJB Session Beans- EJB Entity Beans.

UNIT- V NETWORKING AND CONNECTIVITY 9

Networking Basics: Transmission control Protocol (TCP) - Ports, Sockets -Working with URLS: Connecting to URLS - IDE - Servers - Interacting with database: Database Connectivity-Design of JDBC- Introduction to XML - Tags-Creating Forms-Creating tables-Spring. .

Total : 45 hours

COURSE OUTCOMES:

At the End of this course, the student will be able to:

CO-1: Create Java Mail application using JSP.

CO-2: Create data base application using JDBC.

CO-3: Apply RMI concept to develop client server application.

CO-4: Understand the concept build basic web application.

CO-5: Understand the concept of Java Bean and EJB.

Text Books:

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education
2. Schildt, H. (2022). Java: The Complete Reference. 12th edition.McGraw-Hill Education.
3. Java 2 Complete Reference, H. Schildt, 11th Edition, Tata McGraw-Hill, NewDelhi, 2018.
4. J2EE 1.4 Bible,J.McGovern,RAdatia,Y.Fain,Wiley-dreamtech India Pvt.Ltd, NewDelhi, 2003.

Reference Books:

1. Java Servlets, K. Moss, Second edition, Tata McGraw Hill, New Delhi, 1999.
2. Java EE Web Application Primer: Building Bullhorn: A Messaging App with JSP, Servlets, JavaScript, Bootstrap and Oracle PDF,2017

Web Sources:

1. www.journaldev.com/1877/servlet-tutorial-java
2. www.studentstutorial.com/jsp/jsp-tutorial

24CBCS42 **COMPUTER GRAPHICS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This Course Introduces The Concepts Of Computer Graphics And Its Components To Enrich The View Of The Image. It Also Gives An Idea About Two And Three Dimensional Modeling Concepts And Viewing Concepts.

UNIT I : INTRODUCTION TO COMPUTER GRAPHICS 9

Video Display Devices- Raster Scan Systems -Random Scan Systems - Interactive Input Devices - Hard Copy Devices - Graphics Software - Output Primitives - Line Drawing Algorithms - Initializing Lines - Line Function - Circle Generating Algorithms.

UNIT II : ATTRIBUTES OF OUTPUT PRIMITIVES 9

Line Attributes - Color And Grayscale Style - Area Filling Algorithms - Character Attributes Inquiry Functions - Two Dimensional Transformation - Basic Transformation - Composite Transformation - Matrix Representation - Other Transformations.

UNIT III : TWO - DIMENSIONAL VIEWING 9

Window- To View Port Co-Ordinate Transformation - Clipping Algorithms - Interactive Input Methods - Physical Input Devices - Logical Classification of Input Devices - Interactive Picture Construction Methods.

UNIT IV THREE - DIMENSIONAL CONCEPTS 9

Three Dimensional Display Methods - Parallel Projection - Perspective Projection - Depth Cueing - Visible Line and Surface Identification Three Dimensional Transformations.

UNIT V THREE DIMENSIONAL VIEWING 9

Projection - Viewing Transformation - Implementation of Viewing Operations - Hidden Surface and Hidden Line Removal – Back face Removals.

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Understand the basics of Computer Graphics.

CO-2: Discuss various algorithms for scan conversion and filling of basic objects.

CO-3: Transformation of that images to graphics display device by 2-D Viewing.

CO-4: Explore 3-D display methods and projections techniques for display of 3D images.

CO-5: Use of projection and viewing transformation for 3-D Viewing.

Text Books:

1. Marschner, S., & Shirley, P. (2016). *Computer Graphics: Principles and Practice* (3rd ed.). Addison-Wesley.

2. Angel, E., & Shreiner, D. (2022). *Interactive Computer Graphics: A Top-Down Approach with WebGL* (8th ed.). Pearson.

Reference Books:

1.Shirley, P., Marschner, S., et al. (2024). *Fundamentals of Computer Graphics* (5th ed.). A K Peters/CRC Press.

2. Akenine-Möller, T., Haines, E., & Hoffman, N. (2018). *Real-Time Rendering* (4th ed.). A K Peters/CRC Press.

Web Reference:

1. https://www.tutorialspoint.com/computer_graphics/index.htm
2. https://www.javatpoint.com/computer-graphics-3d-graphics
3. https://www.scribd.com/doc/13702209/3D-Display-Methods

24PBCS41 **ADVANCED JAVA PROGRAMMING LAB**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

This course gives practical training in HTML to Servlet Communication, JSP Beans used to create JSP program, RMI to create Web Services, Email creation and manipulation, Web applications and Session management is done by students.

LIST OF PROGRAMS:

1. HTML to Servlet Communications
2. Servlet to HTML Communication
3. Applet to Servlet Communication
4. Servlet to Applet Communication
5. Designing online applications with JSP
6. Creating JSP program using JavaBeans
7. Working with Enterprise JavaBeans
8. Performing Java Database Connectivity.
9. Creating Web services with RMI.
10. Creating and Sending Email with Java
11. Building web applications
12. Finding Simple Interest using Session Management.

Total: 30 Hours

COURSE OUTCOMES:

At the End of this course, the Student will be able to:

CO-1: Create HTML to Applet Communication application using Servlet.

CO-2: Create HTML to servlet application .

CO-3: Create data base application using JDBC.

CO-4: Apply use bean concepts in JSP.

CO-5: Apply Session Management application in JSP.

Text Books:

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India:

McGraw Hill Education

2. Schildt, H. (2022). Java: The Complete Reference. 12th edition.McGraw-Hill Education.
3. Java 2 Complete Reference, H. Schildt, 11th Edition, Tata McGraw-Hill, NewDelhi, 2018.
4. J2EE 1.4 Bible,J.McGovern,RAdatia,Y.Fain,Wiley-dreamtech India Pvt.Ltd, NewDelhi, 2003.

Reference Books:

1. Java Servlets, K. Moss, Second edition, Tata McGraw Hill, New Delhi, 1999.

2. Java EE Web Application Primer: Building Bullhorn: A Messaging App with JSP, Servlets, JavaScript, Bootstrap and Oracle PDF,2017

Web Sources:

1. www.journaldev.com/1877/servlet-tutorial-java
2. www.studentstutorial.com/jsp/jsp-tutorial

24PBCS42 **COMPUTER GRAPHICS LAB**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

Students undergoing this course are able to

- Understand in detail the graphics functions
- Able to know the various algorithms to draw a line, Circle and Ellipse
- Know the transformation of 2D and 3D
- Understand the clipping algorithms

LIST OF PROGRAMS:

1. Digital Differential Analyzer Algorithm
2. Bresenham's Line Drawing Algorithm
3. Midpoint Circle Generation Algorithm
4. Ellipse Generation Algorithm
5. Creating various types of texts and fonts
6. Creating two dimensional objects
7. Two Dimensional Transformations
8. Coloring the Pictures
9. Three Dimensional Transformations
10. Curve Generation
11. Simple Animations using transformations
12. Key Frame Animation

Total: 30 Hours

COURSE OUTCOMES:

At the end of the course, students can able to

- Draw a Line, Circle and Ellipse using algorithms
- Understand 2D and 3D transformations
- Using simple Graphics functions to draw a hut

Text Books:

1. Marschner, S., & Shirley, P. (2016). *Computer Graphics: Principles and Practice* (3rd ed.). Addison-Wesley.

2. Angel, E., & Shreiner, D. (2022). *Interactive Computer Graphics: A Top-Down Approach with WebGL* (8th ed.). Pearson.

Reference Books:

1.Shirley, P., Marschner, S., et al. (2024). *Fundamentals of Computer Graphics* (5th ed.). A K Peters/CRC Press.

2. Akenine-Möller, T., Haines, E., & Hoffman, N. (2018). *Real-Time Rendering* (4th ed.). A K Peters/CRC Press.

Web Sources:

4. https://www.tutorialspoint.com/computer_graphics/index.htm
5. https://www.javatpoint.com/computer-graphics-3d-graphics
6. https://www.scribd.com/doc/13702209/3D-Display-Methods

SEMESTER V

24CBCS51 WEB DEVELOPMENT USING ANGULAR JS AND MONGO

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

The course objectives of "Web Development Using AngularJS" are generally designed to help learners gain a deep understanding of AngularJS, build dynamic and interactive web applications, and develop skills for modern web development.

UNIT I: INTRODUCTION 9

Need of Scripting Language-Difference between client and server side scripting -Script tag in HTML-Java Script declaration-Output printing – document. Write, inner HTML window .alert, console.log-Java script statements-Comments and Variables-Java script Operators -Java Script Datatypes – Conditional statements:If else statements-Switch statements-Iteration statements--For each loop-Arrays Introduction and declaring-Accessing arrays-Array Properties : index, input length, prototype-Array Methods :concat, every, forEach

UNIT II: ARRAYS 9

Array Methods :indexOf, join, lasIndexOf, toString- Array Methods : reduce, reverse, slice, some, sort - Function Definition:Function Parameters-Calling a Function-Return Statements-Nested Functions-Web stacks introduction-LAMP and LEMP-Difference between php and java script-MEAN, MERN-Angular Environment set up – windows-Angular JS Framework-Angular JS with HTML-Angular ng directives-Angular directives-Angular JS Expressions-Angular JS Applications-Angular JS Module-Angular JS Controller-Angular JS Numbers-Angular JS Strings-Angular JS Objects

UNIT III: JS MODULES 9

Angular JS Arays - Angular JS Expressions vs Java Script Expressions-Angular JS Modules-Creating a Module-Adding a Controller-Adding a Directive-Modules in Files-Controllers in Files-Angular JS Directives-Data Binding-Repeating HTML Elements-ng-app directive-ng-init directive-Ng-model directive-Create new directives-Restrictions-Angular JS ng-model directive -Ng-model directive-Two-way binding-Validating use input-Angularjs Data Binding– Data Model Angular js Data Binding – ng Model-AngularJS Controller-Controller Methods

UNIT IV: JS SCOPE 9

Angular JS Scope -Understanding the scope-Angular JS Filters-Adding Filters to Directives-The filter Filter-Filter an Array Based on User Input-Sorting an Array based on User input-Custom

Filters-Creating own services-Angular JS $http and methods-Angular JS $http and Properties-Displaying Data in a Table-Displaying with CSS Style-Angular JS Select Box-Data Source as Object -Mongodb Datatypes Object ID-Installing Mongo DB in Windows, Linux and Mac Operating Systems- Installing and Working with MongoDB interfaces: i)Mongo Shell, ii)Mongo Compass

UNIT V: CRUD operation **9**

Document with different types of values-CRUD operation :Insert Operation i)insertOne() and ii)insertMany() with examples-Perform Query Operation -Update Operation-Insert and Query-Delete Operation-Operation on Mongodb Data: projection-Limiting Records Sorting Records-Indexes in Mongodb, default _id index-Creating and Index createIndex method-Single Field, Compound, Multikey-Geospatial,text Index, Hashed Index- Properties of Index- Aggregation in Mongodb

Total: 45 Hours

COURSE OUTCOMES:

At the end of this course, learners will be able to:

CO1 :Gain fundamental knowledge of JavaScript, scripting languages, and basic programming constructs like arrays, operators, and conditional statements.

CO2 : Understand advanced array methods and functions, compare scripting technologies, and set up the AngularJS framework.

CO3: Learn to create and manage AngularJS modules, controllers, directives, and implement two-way data binding and form validations.

CO4: Master AngularJS scopes, filters, custom services, $http methods, and work with MongoDB interfaces for database management.

CO5 : Develop CRUD operations, indexing, and aggregation techniques in MongoDB to manage and query data efficiently.

Text Books:

1. Marijn Haverbeke. "Eloquent JavaScript: A Modern Introduction to Programming" (2018)

2. Brad Dayley, Brendan Dayley, Caleb Dayley,"Learning Angular: A Guide to Modern Front-End Development" (2020)

Reference Books:

1. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow,"MongoDB: The Definitive Guide" (2019)
2. – Jon Duckett,"JavaScript and JQuery: Interactive Front-End Web Development" (2014)
3. Adam Freeman,"Pro Angular" (2021)

Web Sources:

1. AngularJS: https://angular.io/docs
2. MongoDB: https://docs.mongodb.com/manual/tutorial/getting-started/

24CBCS52 DATA COMMUNICATION AND NETWORKING

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The educational objectives of this course are

1. To Focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To Focus on different coding schemes.
4. Brief the students regarding protocols and standards. □
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices,etc

UNIT I: PROTOCOLS & MEDIA 9

Introduction to data communication – Network protocols & standards – Line configuration – Topology – Transmission mode – Categories of networks – OSI model – Layers of OSI model – Transmission media – Guided media – Unguided media.

UNIT II: SIGNALS & ERRORS 9

Analog and digital signals – Encoding and modulation – Parallel and serial transmission – DTE/DCE – Types of errors – Error detection and correction – Data link control – Line discipline – Flow control – Error control.

UNIT III: MULTIPLEXING & SWITCHING 9

Multiplexing – Types of multiplexing – LAN – Project 802 – Ethernet – Token bus – Token ring – FDDI – MAN – IEEE 802.6 – Circuit switching – Packet switching.

UNIT IV: ISDN & ATM 9

History of analog and digital network – Access to ISDN – ISDN layers – Broadband ISDN – Packet layer protocol – ATM – ATM architecture – ATM layers – Congestion control – Leaky bucket algorithm.

UNIT V: NETWORK & APPLICATION LAYER 9

Repeaters – Bridges – Routers – Gateway – Routing algorithms – TCP/IP – Overview – Network layer – Transport and application layers of TCP/IP – DNS – SMTP – HTTP – WWW.

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Understand the purpose of network layered models, network communication using the layered concept, and able to compare and contrast Open System Interconnect (OSI) and the Internet Model.

CO-2: To analyze the various types of transmission media and services.

CO-3: To understand connecting LAN's, backbone networks, and virtual LAN's. Students should understand operations of bridges and the spanning tree algorithm, Repeaters, Bridges, and Gateways.

CO-4 Understand the basic difference between data logical link control and media access control and realize the features of SMDS, switching techniques, ISDN, and ATM.

CO-5: To analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP. Understand distance vector routing and link state routing.

Text Books:

1.Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, 2012.

2. Mastering PC Hardware & Networking, Khanna Publishing House, 2024.

Reference Books:

1.Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019.

2. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2023.

Web Sources:

1. Cisco Networking Academy - Online Courses and Resources
2. NetworkLessons.com - Tutorials on Various Networking Topics

24CBCS53 **R PROGRAMMING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To use R for statistical programming, computation, graphics, and modeling, write functions and use R in an efficient way and be able to develop programs and use for their research.

UNIT I : INTRODUCTION 9

Introduction, How to run R, R Sessions, and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT II : R PROGRAMMING STRUCTURES 9

Control Statements, Loops, – Looping Over Non vector Sets,- If-Else, Arithmetic, and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT III : MATH AND SIMULATION IN R 9

Math Function, Extended Example Calculating Probability- Cumulative Sums and Products- Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT IV : GRAPHICS AND PROBABILITY DISTRIBUTIONS 9

Creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files. Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT-V : LINEAR MODELS 9

Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, – Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Understand the basics of R programming including matrix and vectors etc.

CO-2: Recognize and make appropriate use of different types of data structures.

CO-3: Design and write functions in R and implement simple iterative algorithms.

CO-4: Perform appropriate statistical tests using R Create and edit visualizations.

CO-5: To expand their knowledge of R and build the Linear Models in R.

Text Books:

1. The Book of R: A First Course in Programming and Statistics" by Tilman M. Davies (2024). 2. “Beginner's Guide for Data Analysis using R Programming” by Jeeva Jose, Khanna Publishing House, 2024.

Reference Books:

1) Venables, W. N., and Ripley, B. D. “Modern Applied Statistics with S”, 4th ed., Springer-Verlag, New York, 2012

2) "R for Everyone: Advanced Analytics and Graphics" by Jared P. Lander (2024)

Web links

1. https://www.w3schools.com/r/
2. https://www.geeksforgeeks.org/r-programming-language-introduction/

24PBCS51 WEB DEVELOPMENT USING ANGULAR JS LAB

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

The course objectives of "Web Development Using AngularJS" are generally designed to help learners gain a deep understanding of AngularJS, build dynamic and interactive web applications, and develop skills for modern web development.

LIST OF PROGRAMS:

1. Java Script Operators and Conditions
2. Looping Statements
3. Functions
4. Working with Angular js and HTML
5. Work with numbers, strings and objects
6. Working with Angular js modules
7. Work with Directives
8. Validating User input for a GUI
9. Apply Filters
10. Using http methods and properties
11. Create and manipulate database
12. Working with CRUD operations

Total: 30 Hours

Text Books:

1. Marijn Haverbeke. "Eloquent JavaScript: A Modern Introduction to Programming" (2018)

2. Brad Dayley, Brendan Dayley, Caleb Dayley,"Learning Angular: A Guide to Modern Front-End Development" (2020)

Reference Books:

4. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow,"MongoDB: The Definitive Guide" (2019)
5. – Jon Duckett,"JavaScript and JQuery: Interactive Front-End Web Development" (2014)
6. Adam Freeman,"Pro Angular" (2021)

Web Sources:

3. AngularJS: https://angular.io/docs
4. MongoDB: https://docs.mongodb.com/manual/tutorial/getting-started/

24PBCS52 **COMPUTER NETWORKS LAB**

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

The educational objectives of this course are

1. To Focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To Focus on different coding schemes.
4. Brief the students regarding protocols and standards. •
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices,etc

LIST OF PROGRAMS:

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in Detail.
3. Study of basic network command and Network configuration commands.
4. Performing an Initial Switch Configuration Performing an Initial Router Configuration
5. Configuring and Troubleshooting a Switched Network
6. Connecting a Switch
7. Using the Cisco IOS Show Commands
8. Examining WAN Connections Interpreting Ping and Traceroute Output
9. Using the Cisco IOS Show Commands
10. Examining WAN Connections
11. Interpreting Ping and Traceroute Output
12. Configuring RIP

Total: 30 Hours

Text Books:

1.Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, 2012.

2. Mastering PC Hardware & Networking, Khanna Publishing House, 2024.

Reference Books:

1.Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019.

2. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2023.

Web links

https://www.cisco.com/c/en_in/solutions/enterprise-networks/what-is-computer-networking.html

SEMESTER VI

24CBCS61 **THEORY OF COMPUTATION**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

1. To give an overview of the theoretical foundations of computer science from the perspectiveof formal languages
2. To illustrate finite state machines to solve problems in computing
3. To explain the hierarchy of problems arising in the computer sciences.
4. To familiarize Regular grammars, context frees grammar.

UNIT – I : FINITE AUTOMATA (FA) 9

Introduction, Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.

UNIT – II REGULAR EXPRESSIONS (RE) 9

Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions.REGULAR GRAMMARS: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular - Pumping lemma, applications, Closure properties of regular languages.

UNIT – III CONTEXT FREE GRAMMER (CFG): 9

Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL (Proof's omitted).

UNIT – IV PUSHDOWN AUTOMATA 9

Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA.TURING MACHINES (TM): Formal definition and behaviour, Languages of a TM, TM as accepters, and TM as a computer of integer

functions, Types of TMs.

UNIT V RECURSIVE LANGUAGES (REL): 9

Properties of recursive and recursively enumerable languages, Universal Turing machine, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCP), undecidability of PCP.

Total: 45 Hours

COURSE OUTCOMES:

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

1. To use basic concepts of formal languages of finite automata techniques
2. To Design Finite Automata's for different Regular Expressions and Languages
3. To Construct context free grammar for various languages
4. To solve various problems of applying normal form techniques, push down automata andTuring Machines
5. To participate in GATE, PGECET and other competitive examinations

Text Books:

1.John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages and Computation, 3rdedition, Pearson Education, India.

2. Sipser, M. (2024). *Introduction to the Theory of Computation* (3rd ed.). Cengage Learning.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

2. Mishra, K., & Chandrashekhar, D. (2024). *Theory of Computation* (1st ed.). Akash Books

Web links

1. *https://www.geeksforgeeks.org/introduction-of-theory-of-computation/*
2. https://www.javatpoint.com/automata-tutorial

24CBCS62 **SOFTWARE TESTING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To Study about fundamental concepts of software tests and its application in various scenarios with the help different testing strategies, methods and tools. The student can expose the criteria for test cases and learn the design of test cases. Be familiar with test management and test automation techniques.

UNIT I INTRODUCTION 12

Testing as an engineering activity – Testing as a process – Testing maturity model – Testing axioms – Basic definitions – Software testing principles – The tester's role in a software development organization – Origins of defects – Cost of defects – Defect classes – The defect repository and test design – Defect examples – Developer / Tester Support of developing a defect repository.

UNIT II TEST CASE DESIGN STRATEGIES 12

Test case Design Strategies – Using Box approach to test case design – Boundary value analysis – Equivalence class partitioning – State based testing – Cause- effect graphing – Compatibility testing – User Documentation testing – Domain testing – Random testing – Requirement based testing – Using White Box approach to test design- Test adequacy criteria – Static testing Vs Structural testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering code Logic – Paths – Code complexity testing – Additional white box testing approaches – Evaluating test adequacy criteria.

UNIT III LEVELS OF TESTING 12

The need for levels of testing – Unit test – Unit test planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and recording results – Integration tests – Designing integration tests – Integration test planning – Scenario testing – Defect bash elimination – System testing – Acceptance testing – Performance testing – Regression testing – Internationalization testing – Ad-hoc testing – Alpha , Beta tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing

UNIT IV TEST MANAGEMENT 12

People and organizational issues in testing – Organization structures for testing teams – testing services – Test planning –Test plan components – Test plan attachments – Locating test items – test management – test process – Reporting test results – Introducing the test specialist – Skills needed by a test specialist – Building a testing group – The structure of testing group – The technical training program.

UNIT V TEST AUTOMATION 12

Software test automation – Skills needed for automation – Scope of automation – Design and architecture for automation – Requirement for a test tool – Challenges in automation – Test metrics and measurements – Project , Progress and Productivity metrics

Total: 60 Hours

COURSE OUTCOMES:

CO - 1 - Understand importance of testing techniques in software quality management and assurance.

CO- 2 - Identify various types of software risks and its impact on different software application.

CO -3: Prepare test planning based on the document.

CO - 4: Document test plans and test cases designed. Design test cases suitable for a software development for different domains

CO – 5: Develop and validate a test plan and use of automatic testing tools.

Text Books:

1. "Experience of Test Automation: Case Studies of Software Test Automation" by Dorothy Graham and Mark Fewster (2024 Edition)
2. Ammann, P., & Offutt, J. (2016). Introduction to Software Testing (2nd ed.). Cambridge University Press.
3. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011

Reference Books:

1. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
2. "Software Testing with Generative AI" by Mark Winteringham (2024)
3. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012.

Web Sources:

1. https://www.geeksforgeeks.org/software-testing-basics/
2. https://www.javatpoint.com/software-testing-tutorial

24CBCS63 **CLOUD COMPUTING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course introduces the fundamental concepts of cloud computing model for enabling ubiquitous, convenient access to shared pool of configurable computing resources and storage solutions over a network.

Unit I :CLOUD COMPUTING 12

History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing– Companies in the Cloud Today – Cloud Services

Unit II : WEB-BASED APPLICATION 12

Pros and Cons of Cloud Service Development – Types of Cloud Service Development– Software as a Service – Platform as a Service – Web Services – On- Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

Unit III : CENTRALIZING EMAIL COMMUNICATIONS 12

Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events for the Corporation.

Unit IV COLLABORATING ON TASKMANAGEMENT 12

Exploring Online Scheduling Applications –Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases– Storing and Sharing Files

Unit V COLLABORATING VIA WEB-BASED COMMUNICATION TOOLS 12

Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis

Total: 60 Hours

COURSE OUTCOMES:

CO-1: Ability to understand architecture and concepts of different cloud models.

CO-2: Capable of creating applications by utilizing cloud platforms.

CO-3: Understand how to provide the appropriate cloud computing solutions and recommendations according to the applications used.

CO-4: Explore cloud computing driven commercial systems such as Google Apps and Microsoft Azure.

CO-5: To build private cloud.

Text Books:

1."Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Ricardo Puttini, Zaigham Mahmood (2024)

2."The Cloud Computing Book: The Future of Computing Explained" by Douglas E. Comer (2021)

Reference Books:

1. "Mastering Cloud Computing: Foundations and Applications Programming" by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi (2024)
2. Cloud computing with Windows Azure platform, Jennings, Roger, PHI,2009.

Web links

1. https://www.geeksforgeeks.org/cloud-computing/
2. https://aws.amazon.com/what-is-cloud-computing/

24CBCS64 **IOT FUNDAMENTALS**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

Student will understand the evolution of internet technology and need for IoT. The course will cover the basics of communications concepts, characteristics of sensors, protocols and the need of security in the Internet of Things.

UNIT I: EVOLUTION OF IOT 12

Review of computer communication concepts- OSI layers – components - packet communication – Networks - TCP-IP – subnetting - IPV4 addressing and challenges. IPV6 addressing - IoT architecture reference layer.

UNIT II: INTRODUCTION TO IOT COMPONENTS 12

Characteristics IoT sensor nodes - Edge computer - cloud and peripheral cloud - single board computers- open source hardwares - Examples of IoT infrastructure.

UNIT III: IOT PROTOCOLS AND SOFTWARES 12

MQTT – UDP - MQTT brokers - publish subscribe modes – HTTP - COAP - XMPP and gateway protocols – IoT Communication Pattern – IoT protocol Architecture - Selection of Wireless technologies.

UNIT IV: IOT SECURITY 12

Need for encryption - standard encryption protocol - lightweight cryptography - Quadruple Trust Model for IoT – Threat Analysis and model for IoT-A, Cloud security

UNIT V: ARDUINO PROGRAMMING 12

Arduino UNO-Setup-IDE Overview-Sktech structure- Data types-Operators-Control statement-Loops-Arrays-String- Math Library-Random Number-Interrupts-Example Program**.**

. **Total: 60 Hours**

COURSE OUTCOMES:

CO-1: Ability to analyze the concepts the network concepts like TCP-IP,subnetting, IPV4.

CO-2: Ability to analyze the characteristics sensors, edge computer cloud and its peripherals.

CO-3: Understand the protocols like MQTT, UDP, etc.,

CO-4: To know about the security issues and threat analysis.

CO-5: Study about the Arduino Programming.

Text Books:

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2016.
2. "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" (2024) by Maciej Kranz

Reference Books:

1. Vijay Madisetti , Arshdeep Bahga, Adrian McEwen (Author), Hakim Cassimally "Internet of Things A Hands-on-Approach" Arshdeep Bahga & Vijay Madisetti, 2014.
2. "Practical Internet of Things Security" (2024, 2nd Edition) by Brian Russell and Drew Van Duren

Web links

1. https://www.coursera.org/in/articles/internet-of-things
2. https://en.wikipedia.org/wiki/Internet_of_things

24PBCS61 **SOFTWARE TESTING LAB**

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

To Study about fundamental concepts of software tests and its application in various scenarios with the help different testing strategies, methods and tools. The student can expose the criteria for test cases and learn the design of test cases. Be familiar with test management and test automation techniques.

LIST OF PROGRAMS:

1. Write programs in C- Language to demonstrate the working of the following a. constructs: i) do.. .while ii) while….do iii) if…else iv) switch v) for 1
2. A program written in C- language for Matrix Multiplication fails Introspect the causes for its failure and write down the possible reasons for its failure.
3. A program written in C- language for Matrix Addition´Introspect the causes for its failure and write down the possible reasons for its failure.
4. Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
5. Write the test cases for any known application (e.g. Banking application)
6. Write the test cases for GMAIL
7. Write the test cases for FACEBOOK,TWITTER etc.,
8. Create a test plan document for any application (e.g. Library Management System)
9. Study of any web testing tool (e.g.Selenium)
10. Test case for calculator in windows application
11. BUG TRACKING TOOL Study of bug tracking tool (e.g. Bugzilla).
12. Study of any open source-testing tool (e.g. Test Link)

Total: 30 Hours

COURSE OUTCOMES:

On completion of the course, student will be able to

CO-1 : Recognize various parallel computing requirements.

CO-2 : Describe the basic concepts of Shared Memory and Message Passing.

CO-3 : Design solutions for Parallel Processor based Architectures.

CO-4 : Analyse a problem, design a solution and test their implementation.

CO-5 : Design and implement large scale machine as well as applications.

CO-6 : Implement parallel computing to a variety of applications in Mathematics and Engineering.

Text Books:

4. "Experience of Test Automation: Case Studies of Software Test Automation" by Dorothy Graham and Mark Fewster (2024 Edition)
5. Ammann, P., & Offutt, J. (2016). Introduction to Software Testing (2nd ed.). Cambridge University Press.
6. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011

Reference Books:

4. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
5. "Software Testing with Generative AI" by Mark Winteringham (2024)
6. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012.

Web Sources:

3. https://www.geeksforgeeks.org/software-testing-basics/
4. https://www.javatpoint.com/software-testing-tutorial

KNOWLEDGE IS POWER

SEMESTER VII

24CBCS71 **MACHINE LEARNING ESSENTIALS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course provides basics for understanding underlying machine learning theory and to formulate machine learning problems corresponding to different applications.

UNIT I : INTRODUCTION 9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II : NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.

UNIT III: BAYESIAN AND COMPUTATIONAL LEARNING 9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING 9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning- Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules

UNIT V ADVANCED LEARNING 9

Induction on Inverted Deduction – Inverting Resolution –Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task .

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Develop an appreciation for what is involved in learning models from data.

CO-2: Understand how to evaluate models generated from data.

CO-3: Provide understanding of techniques, mathematical concepts.

CO-4: Provide a way to evaluate performance of machine learning algorithms.

CO-5: Apply the algorithms to a real-world problem, optimize the models learned.

Text Books:

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop (2024)
2. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David (2024)
3. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.

Reference Books:

1. Foundations of Data Science. Avrim Blum, John Hopcroft and Ravindran Kannan. January 2017.
2. "AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence" by Laurence Moroney (2024)
3. Machine Learning: A Probabilistic Perspective, K. Murphy, MIT Press, 2012.

Web links

1. https://www.geeksforgeeks.org/machine-learning-algorithms/
2. https://www.javatpoint.com/machine-learning-algorithms

24CBCS72 **IMAGE PROCESSING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The objective of this course is to provide the fundamentals and different levels of processing of digital images. This course introduces the steps and components of image processing, how digital images are acquired, sampled, quantized and the relationship between pixels. It also deals with the techniques to extract features for image representation and recognition.

UNIT I : DIGITAL IMAGE FUNDAMENTALS 12

Digital Image Representation – Fundamental steps in Image Processing)– Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - colour models.

UNIT II : IMAGE ENHANCEMENT 12

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Digital - - Mean Filter -Order-statistics Filter - Adaptive Filter -Band Reject Filter -Notch Filter -Inverse Filter -Wiener Filter Region Based Lossy Compression Representation Description Chain Codes -Point Detection -Line Detection -Edge detection and edge linking -Region growing -Region splitting -Region merging -Boundary -Region Frequency Domain Spatial Domain Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: 2D Fourier Transform – Smoothing and Sharpening frequency domain filters.

UNIT III IMAGE RESTORATION AND SEGMENTATION 12

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. Segmentation: Edge detection Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation.

UNIT IV IMAGE COMPRESSION AND REPRESENTATION 12

Compression: Fundamentals – Image Compression models – Error Free Compression – Lossy compression– Image Compression standards

UNIT V IMAGE REPRESENTATION AND RECOGNITION 12

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments –

Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Total: 60 Hours

COURSE OUTCOMES:

At the end of the course learners will be able to

CO-1: Discuss digital image fundamentals.

CO-2: Analyze Articulate image enhancement and restoration techniques.

CO-3: Apply Examining image compression Techniques Apply

CO-4: Implementing image segmentation Techniques

CO-5: Apply Representation and recognition of images

Text Books:

1."Image Processing Recipes in MATLAB" (2024) by Gustavo Benvenutti Borba

2."Artificial Intelligence and Machine Learning Techniques in Image Processing and Computer Vision" (2024)

Reference Books:

1. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.

2. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

Web links

1. *https://www.geeksforgeeks.org/digital-image-processing-basics/*
2. *https://www.coursera.org/learn/introduction-image-processing*

24CBCS73 **SOFT COMPUTING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

UNIT I : INTRODUCTION TO SOFT COMPUTING 12

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II : ARTIFICIAL NEURAL NETWORKS 12

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III : FUZZY SYSTEMS 12

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV : GENETIC ALGORITHMS 12

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V : HYBRID SYSTEMS 12

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy Art Map: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

Total: 60 Hours

COURSE OUTCOMES:

Upon completion of this course, the students should be able to

CO-1: To understand of Soft Computing Fundamentals

CO-2: To classify and construct various artificial neural network models

CO-3: To apply fuzzy logic principles in decision-making processes

CO-4: To develop and apply genetic algorithms

CO-5: To integrate neural networks, fuzzy systems, and genetic algorithms

Text Books:

1. Samarjeet Borah, Ratna Raja Kumar Jambi, Sharifah Sakinah Syed Ahmed (Soft Computing: Recent Advances and Applications in Engineering and Mathematical Sciences, 2024)
2. D.E.Goldberg ”Genetic Algorithms in search, optimization and Machine learning”, Second Edition, Addison Wesley, 2007.

Reference Books:

1. Om Prakash Verma, Tanu Wadehra (2023). Lecture Notes in Networks and Systems. Springer.
2. J.S.R Jang,C.T Sun and E.Mizutani, ”Neuro-Fuzzy and Soft Computing”, Second Edition, Prentice Hall of India, 2002.

Web links

1. https://www.javatpoint.com/what-is-soft-computing
2. https://en.wikipedia.org/wiki/Soft_computing

24PBCS71 **MACHINE LEARNING LAB**

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES:

The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches for data science. The students implement Algorithms such as Decision trees, SVM, KNN, Naïve Bayes.

LIST OF PROGRAMS:

1. Functions in Python Libraries using Numpy.
2. Functions in Python Library using Pandas.
3. Functions in Python Library using Scikit
4. Perform Data exploration and preprocessing in Python
5. Implement regularized Linear regression
6. Implement Naive Bayes classifier for dataset stored as CSV file.
7. Implement regularized logistic regression
8. Build models using different Ensembling techniques
9. Build models using Decision Trees
10. Build model using SVM with different kernels
11. Implement K-NN algorithm to classify dataset.
12. Build model to perform Clustering using K-means after applying PCA and determining the value of K using Elbow Method.

Total: 30 Hours

Text Books:

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop (2024)
2. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David (2024)
3. Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.

Reference Books:

1. Foundations of Data Science. Avrim Blum, John Hopcroft and Ravindran Kannan. January 2017.
2. "AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence" by Laurence Moroney (2024)

3. Machine Learning: A Probabilistic Perspective, K. Murphy, MIT Press, 2012.

Web links

1) https://www.geeksforgeeks.org/machine-learning-algorithms/
2) https://www.javatpoint.com/machine-learning-algorithms

SEMESTER VIII

24CBCS81 **BIG DATA ANALYTICS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To explore, design, and implement basic concepts of big data & analytics methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and its application to the business needs.

UNIT I INTRODUCTION TO BIG DATA 9

Introduction to Big Data Platform – Challenges of Conventional Systems - Nature of Data- Evolution Of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools

UNIT II MINING DATA STREAMS 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream –Real time Analytics Platform (RTAP) Applications

UNIT III ADVANCED ANALYTICS 9

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis

UNIT IV HADOOP 9

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop - Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming

UNIT V FRAMEWORKS 9

Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications - Real Time Sentiment Analysis, Stock Market Predictions.

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Understand the fundamental concepts of big data platform and know about the basic concepts of nature and evolution of big data.

CO-2: To work with big data platform learn intelligent data analysis and compare old and modern data analytic tool.

CO-3: To understand the k means, naïve, decision tree, time series and text analysis.

CO-4: Learn the fundamental concepts like history and components of Hadoop.

CO-5: Understand the framework of Visual data analysis techniques, interaction techniques.

Text Books:

1. Brad Dayley, “NoSQL with MongoDB in 24 Hours”, 1st edition, Sams Publishing, 2024

2. Prajapati, Big Data Analytics with R and Hadoop, 2014

3. Stephan Kudyba, Big Data, Mining, and Analytics: Components of Strategic Decision Making,Auerbach Publications, March 12, 2014.

Reference Books:

1. Nathan Marz, James Warren."Big Data: Principles and Best Practices of Scalable Real-Time Data Systems" (2015)

2. Jure Leskovec, Anand Rajaraman, Jeff Ullman ,"Mining of Massive Datasets" (2020)

Web links

1) https://www.coursera.org/in/articles/big-data-analytics
2) https://www.geeksforgeeks.org/what-is-big-data-analy

24CBCS82 **MOBILE COMPUTING**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course introduces the basic concepts of mobile computing, communication systems, mobile and wireless devices, GSM – Architecture – Routing Strategies –TCP.

UNIT I INTRODUCTION 9

Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing –Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control – Comparisons.

UNIT II TELECOMMUNICATION SYSTEMS 9

GSM – Architecture – Sessions –Protocols – Hand Over and Security – UMTS and IMT – 2000 – Satellite Systems - Types of Satellite System - Routing- Localization.

UNIT III WIRELESS LAN 9

IEEE S02.11: System Architecture-Protocol Architecture, Physical Layer, 802.11b and 802.11a– Hiper LAN: WATM, BRAN, HYPERLAN2 – Bluetooth: User Scenarios, Architecture, Radio Layer, Base band Layer, Link Manager Protocol, L2CAP, Security, SDP – Security and Link Management.

UNIT IV MOBILE NETWORK LAYER 9

Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

UNIT V MOBILE TRANSPORT LAYER 9

Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance - Smart Phone Enhanced Shopping, Advances on Sensors for Health Systems.

Total: 45 Hours

COURSE OUTCOMES:

CO-1: Introduce various wireless systems and standards and their basic operation cases.

CO-2: To understand how the various signal processing and coding techniques of GSM and its Architecture.

CO-3: Understand the architecture, protocols, and security features of IEEE 802.11, HiperLAN, and Bluetooth technologies.

CO-4: Analyze the mechanisms of Mobile IP, including packet delivery, tunneling, and routing strategies in mobile and ad-hoc networks.

CO-5: Examine TCP adaptations for mobile environments, congestion control methods, and advancements in mobile technology applications.

Text Books:

1. Mobile Communications, J. Schiller, Pearson Education, Delhi, 2nd edition, 2003.

2. "The Changing World of Mobile Communications: 5G, 6G and the Future of Digital Services" (2023) – Edited by Marja Matinmikko-Blue, Seppo Yrjölä, and others.

Reference Books:

3. "Advances in Mobile Computing and Multimedia Intelligence" (2023) – Proceedings of MoMM 2023, Bali, Indonesia.

4. Principle of wireless Networks: A unified Approach, Pahalavan, Krishnamurthy, Pearson Education, Delhi, 2003.

Web links

1) https://www.javatpoint.com/mobile-computing
2) https://en.wikipedia.org/wiki/Mobile_computing

24CBCS83 **RESEARCH METHODOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To familiarize the students to the principles of scientific methodology in business enquiry, to develop analytical skills of business research, and to develop the skills for scientific communications.

UNIT I: INTRODUCTION 12

Meaning, objectives and motivations in research, Characteristics and limitations of research – Components of research work - Criteria of good research, Research process – Types of Research, Fundamental, Pure or Theoretical Research –Applied Research –Descriptive Research – Evaluation Research –Experimental Research – Survey Research – Qualitative Research – Quantitative Research – Historical Research.

UNIT II: RESEARCH DESIGN & LITERATURE REVIEW 12

Research Design – definition – essentials and types of research design – errors and types of errors in research design. Research problem: Selecting and analyzing the research problem – problem statement formulation – formulation of hypothesis. Literature review: purpose, sources, and importance - literature review procedure. Objectives: Learning Objectives; Definitions; Formulation of the research objectives.

UNIT III: MEASUREMENT. SCALING AND SAMPLING 12

Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument. Data Collection methods – primary and secondary data – Construction of questionnaire and instrument – validation of instruments. Sample size determination - Sample design and sampling techniques.

UNIT IV: DATA ANALYSIS AND TOOLS: 12

Processing of Data: Editing of Data – Coding of Data – Classification of Data – Statistical Series. Qualitative vs Quantitative data analyses – Univariate, Bivariate and Multivariate statistical techniques Measures of Central Tendency, Dispersion, correlation and Regression, Chi-square test: Applications, Steps, characteristics, limitations, Analysis of Variance and Covariance, Factor analysis – Discriminant analysis – cluster analysis – multiple regression and correlation – multidimensional scaling – Conjoint Analysis

UNIT V: RESEARCH REPORT WRITING: 12

Research report – Different types – Contents of report –executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – Ethical issues in research: Code of Ethics in Research – Ethics and Research -Process – Importance of Ethics in Research.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students can able to

CO-1: Understand the fundamentals, types, and characteristics of research, including its objectives, limitations, and processes.

CO-2: Acquire the ability to design robust research frameworks, define objectives, formulate hypotheses, and conduct effective literature reviews.

CO-3: Develop skills to design, validate, and implement effective research instruments and sampling techniques for data collection.

CO-4: Gain proficiency in statistical methods and tools for qualitative and quantitative data analysis, including advanced multivariate techniques.

CO-5: Learn to create structured, ethical, and audience-appropriate research reports with a focus on clarity, tone, and readability.

Text Books:

1. C.R. Kothari, Gaurav Garg, "Research Methodology: Methods and Techniques" (4th Edition, 2020)
2. Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams,"The Craft of Research" (4th Edition, 2016)
3. Creswell, J.W. and Creswell, J.D, Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications. 2017.

Reference Books:

2. "Research Methods for Business Students" (8th Edition, 2019) – Mark Saunders, Philip Lewis, Adrian Thornhill.

3 "Social Research Methods" (6th Edition, 2021) – Alan Bryman.

Web links

1.https://www.geeksforgeeks.org/introduction-to-research-methodology/

24PBCS81 **BIG DATA ANALYTICS LAB**

L	T	P	O	C
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COURSE OBJECTIVES:

To explore, design, and implement basic concepts of big data & analytics methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and its application to the business needs.

LIST OF PROGRAMS:

1. To Study of Big Data Analytics and Hadoop Architecture
2. Install, configure and run python, numPyand Pandas.
3. Install, configure and run Hadoop and HDFS.
4. Visualize data using basic plotting techniques in Python.
5. Install, configure and run python, numPyand Pandas.
6. Install, configure and run Hadoop and HDFS.
7. Visualize data using basic plotting techniques in Python.
8. Develop a MapReduce program to calculate the frequency of a given word in a given file.
9. Develop a MapReduce program to find the maximum temperature in each year.
10. Develop a MapReduce program to find the grades of student's.
11. Develop a MapReduce program to implement Matrix Multiplication.
12. Python program that demonstrates basic data operations using the pandas library

Text Books:

1. Brad Dayley, "NoSQL with MongoDB in 24 Hours", 1st edition, Sams Publishing, 2024

2. Prajapati, Big Data Analytics with R and Hadoop, 2014

3. Stephan Kudyba, Big Data, Mining, and Analytics: Components of Strategic Decision Making,Auerbach Publications, March 12, 2014.

Reference Books:

1. Nathan Marz, James Warren."Big Data: Principles and Best Practices of Scalable Real-Time Data Systems" (2015)

2. Jure Leskovec, Anand Rajaraman, Jeff Ullman ,"Mining of Massive Datasets" (2020)

Web links

1) https://www.coursera.org/in/articles/big-data-analytics
2) https://www.geeksforgeeks.org/what-is-big-data-analy

24PBCS82 **ANDROID STUDIO LAB**

L	T	P	O	C
0	0	2	2	1

LIST OF PROGRAMS:

1. a) Create an android application to display VISTAS Text Message. b) Create an android application to display VISTAS Message by using Button.
2. Create an android application to call different activities by using Implicit and Explicit Intents.
3 Create an android application to display dropdown menu items and pick one item by using Spinner Component.
4 Create an android application to display internal storage data using Array Adapter.
5. Create an android application to display WhatsApp videos in grid view by using Custom Adapter.
6. Create an android application to display webpage by using Web view Component.
7. Create an android application to display different webpages in fragments by using Fragments Component.
8. Create an android application to store the data by using Shared Preferences.
9. Create an android application to demonstrate concept of SQLite Database Storage method.
10.Create an android application to perform different types of operations (Send SMS, Making call and sending email) by using Telephony app.
11. Write an android program to develop Media player application.
12 Write an android program to develop Video view application

Text Books:

1."Android Programming: The Big Nerd Ranch Guide" (5th Edition, 2020) – Bill Phillips, Chris Stewart, and Kristin Marsicano.
2. "Head First Android Development: A Brain-Friendly Guide" (2nd Edition, 2017) – Dawn Griffiths, David Griffiths.

Reference Books:

1. "Android Studio 4.0 Development Essentials" (2020) – Neil Smyth.
2. "Android Development for Beginners" (2021) – Michael S. Rainer.

Web links

https://developer.android.com/

DESCIPLINE ELECTIVE COURSES

24DBCS11 **INTRODUCTION TO CYBER SECURITY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course provides the foundation for understanding the key issues associated with protecting information assets. The purpose of the course is to provide the student with an overview of the field of information security and assurance.

UNIT I INTRODUCTION 9

Introduction to Cyber Security - Importance and challenges in Cyber Security - Cyberspace - Cyber threats - Cyber warfare - CIA Triad - Cyber Terrorism - Cyber Security of Critical Infrastructure - Cyber security -Organizational Implications.

UNIT II HACKERS AND CYBER CRIMES 9

Types of Hackers - Hackers and Crackers - Cyber-Attacks and Vulnerabilities - Malware threats - Sniffing - Gaining Access - Escalating Privileges - Executing Applications - Hiding Files - Covering Tracks - Worms - Trojans - Viruses - Backdoors

UNIT III ETHICAL HACKING AND SOCIAL ENGINEERING 9

Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance - Threat Modeling - Enterprise Information Security Architecture - Vulnerability Assessment and Penetration Testing - Types of Social Engineering - Insider Attack - Preventing Insider Threats - Social Engineering Targets and Defense Strategies.

UNIT IV CYBER FORENSICS AND AUDITING 9

Introduction to Cyber Forensics - Computer Equipment and associated storage media - Role of forensics Investigator - Forensics Investigation Process - Collecting Network based Evidence - Writing Computer Forensics Reports - Auditing - Plan an audit against a set of audit criteria - Information Security Management System Management. Introduction to ISO 27001:2013.

UNIT V CYBER ETHICS AND LAWS 9

Introduction to Cyber Laws - E-Commerce and E-Governance - Certifying Authority and Controller - Offences under IT Act- Computer Offences and its penalty under IT Act 2000 - Intellectual Property Rights in Cyberspace.

Total: 45 Hours

COURSE OUTCOMES:

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

CO-1: Understand the broad set of technical, social & political aspects of Cyber Security.

CO-2: Explore about Various types of Hackers and Threats and ways of sniffing.

CO-3: Understand the importance of ethical hacking tool and Process.

CO-4: Implementing ethical hacking tools in an organization.

CO-5: Apply methods for authentication, access control, intrusion detection andprevention and conduct research in Cyber Security.

Text Books:

1. Donaldson, S., Siegel, S., Williams, C.K., Aslam, A (2015), "Enterprise Cyber security - How to Build a Successful Cyber defense Program against Advanced Threats", Apress, 1st Edition.
2. Dr. Gerald Auger, Jaclyn "Jax" Scott, Jonathan Helmus, Kim Nguyen, "Cybersecurity Career Master Plan" (2024)

Reference Books:

1. Roger Grimes (2017), "Hacking the Hacker", Wiley, Ist Edition
2. The Cybersecurity Playbook: How Every Leader and Employee Can Contribute to a Culture of Security" (2022) – J. B. Wood, Brian O'Neill

Web links

https://www.javatpoint.com/what-is-cyber-security

24DBCS12 **OPEN SOURCE TECHNOLOGY**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To demonstrate different open source technology like Linux, PHP & MySQL with different packages. To lustrate Linux commands for programming. To explore programs of PHP with MySQL connection.

UNIT I INTRODUCTION TO OPEN SOURCE 9

Open Source Definition, The distribution terms of open source software, open source technology importance Free and open Source Software (FOSS), LAMP (Linux, Apache, MySQL, PHP, Python, and Perl) Benefits, Perspective of Open Source software Linux and Open Source, basic commands of Linux. Introduction to PHP – what does PHP Do? – a brief history of PHP – language basics – lexical structure – data types – variables – expressions and operators – flow control statements – including code – embedding PHP in web pages.

UNIT II FUNCTIONS & STRINGS 9

Functions & Strings: Calling a function – defining a function – variable scope – function parameters – return values – variable functions anonymous function. Strings: Accessing individual characters – cleaning strings – encoding and escaping – comparing strings – manipulating and searching strings – regular expression.

UNIT III ARRAYS & OBJECTS 9

Arrays and Objects : Indexed Vs associative arrays – identifying elements of an array – storing data in arrays – multidimensional arrays – extracting multiple values – converting between arrays and variables – traversing arrays – sorting. Objects: Creating an object – accessing properties and methods – declaring a class – introspection.

UNIT IV MYSQL AN OVERVIEW 9

Introduction – Entering queries – Creating and using a database – Creating and selecting a database – creating a table – loading data into a table – Retrieving information from a table – selecting all data – selecting particular rows – selecting particular columns – sorting rows – date calculations – working with NULL values – pattern matching – counting rows – using more than one tables.

UNIT V WORKING WITH MYSQL ADMIN 9

Working with PHP Myadmin - Getting Information about Databases and Tables -Examples of Common Queries - Create student information and Emplyee database.

TOTAL: 45 hours

COURSE OUTCOMES:

CO-1: To explore different open source technology like Linux, PHP & MySQL with different packages.

CO-2: To understand the String functions.

CO-3: To understand the concepts of Arrays.

CO-4: To understand the concepts of connecting and MySQL.

CO-5: To be well versed in creating an application using PHP and MySQL.

Text Books:

1. Red Hat Linux Bible by Christopher Negus (2010). Wiley Publishing ISBN: 0-7645-4333-4,
2. Open Source Software: The Secret to Effective Digital Transformation by O'Reilly Media (2024),

Reference Books

1. Lee Babin, Nathan A. Good, Fran4k M. Kromann, Jon Stephens (2005), "PHP 5 Recipes, A problem solution approach", après Special edition.

2.The Complete Reference PHP by Steven Holzner MCGrawHill, Indian edition, First Edition

Web links

1. https://www.tutorialspoint.com//cakephp/cakephp_form_handling.htm
2. http://www.php.net/tut.php

24DBCS21 DATA STRUCTURES AND ALGORITHMS

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To familiarize the students with linear and nonlinear data structures, to understand sorting and searching, to manipulate the complexity of data structures using asymptotic notations and to apply the data structures in solving problems.

UNIT I INTRODUCTION TO DATA STRUCTURES 12

Introduction to Data Structures- Why Data Structures – Operations of Data Structures – Data Types – Arrays and Lists – Representation Of Arrays – Operations On Arrays - Abstract Data Types (ADTs) – List ADT.

UNIT II LINEAR DATA STRUCTURE 12

Stack: Operations of Stack – Representation – Implementation – Infix to Postfix Conversion – Postfix Evaluation – Recursion – Maze Problem – Queue: Operations of Queue – Representation – Implementation – Job Processing using Queue – Circular Queue – Double Ended Queue – Linked List: Representation – Implementation – Polynomial Addition – Doubly Linked List – Circular List – Circular Doubly Linked List.

UNIT III NON LINEAR DATA STRUCTURES 12

Non Linear Data Structures – Trees: Terminologies in Trees – Representation – Types of Trees – Forest – Transforming Forest into Binary Trees - Traversal Techniques – Applications of Trees – Graphs: Terminologies in Graphs – Representation – Depth First Search – Breadth First Search – Applications of Graphs – Shorest Path- Travelling Salesman Problem – Dijkstra's Algorithm – Types of Graphs.

UNIT IV SORTING AND SEARCHING 12

Sorting: Bubble Sort – Selection Sort – Merge Sort – Insertion Sort – Quick Sort – Heap Sort – Searching: Linear Search – Binary Search – Divide and Conquer – Hashing - Hash Table – Direct Address Method – Mapping Function – Handling Collision.

UNIT V COMPLEXITY AND CASE STUDIES 12

Asymptotic Notation – Big Oh Notation – Omega Notation – Tita Notation – Complexity: Space Complexity – Time Complexity – Space and Time Complexities of Data Structures – Case Studies: Searching for Patterns- Inventing a new sorting Algorithm - Synthesizing Concurrent

Graph Data Structures.

Total: 60 Hours

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO 1: Analyze unstructured problems and design computer solutions.

CO 2: Apply or create suitable algorithm to solve a particular problem.

CO 3: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

CO 4: Apply use recursion to solve a problem with a binary search tree or graph.

CO 5: Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.

Text Books:

1. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein (2023).
2. Horowitz, S. Sahni, and S. Rajasekaranm (2012), Computer Algorithms, Galgotia Pub. Pvt. Ltd.,

Reference Books:

1. R. Kruse C.L. Tondo and B. Leung (1997), Data Structures and Program design in C, PFU
2. Gav Pai (2017), "Data structures and algorithms, concepts, techniques and Applications", McGraw Hill

Web links:

1. www.nptel.com
2. www.hackerearth.com/practice/data-structures/arrays/1-d/tutorial/

24DBCS22 COMPUTER ARCHITECTURE AND ORGANIZATIONS

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course introduces the basic concept of computer architecture, addressing modes, floating-point arithmetic operations, pipelining, hazards, parallelism, hierarchical memory system, direct memory access, I/O processors

UNIT I OVERVIEW & INSTRUCTIONS 12

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS 12

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT 12

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM 12

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS 12

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 60 Hours

COURSE OUTCOMES:

CO-1: To make students understand the basic structure and operation of digital computer.

CO-2: To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.

CO-3: To understand the concepts of hazards and exceptions.

CO-4: To impart knowledge about concept of parallelism.

CO-5: To familiarize the students with hierarchical memory system including cache memories and virtual memory.

Text Books:

1. Jim Ledin, Modern Computer Architecture and Organization: Learn x86, ARM, and RISC-V architectures and the design of smartphones, PCs, and cloud servers, 2nd Edition, 2022
2. Linda Null, Julia Lobur, *Essentials of Computer Organization and Architecture*, 5th Edition, 2018

Reference Books:

1. Vincent P. Heuring, Harry F. Jordan (2005), "Computer System Architecture", Second Edition, Pearson Education.
2. John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, 6th Edition, 2017

Web links

1. http://nptel.ac.in/.

24DBCS31 **MULTIMEDIA AND ITS APPLICATIONS**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course introduces the basic concepts of multimedia and its components such as text, image, video, Graphics and Animation. Also provides the emerging trends of multimedia.

Unit I: INTRODUCTORY CONCEPTS 9

Multimedia – Definitions, CD-ROM And The Multimedia Highway, Uses Of Multimedia, Introduction To Making Multimedia – The Stages Of Project, The Requirements To Make Good Multimedia, Multimedia Skills And Training, Training Opportunities In Multimedia. Motivation For Multimedia Usage, Frequency Domain Analysis, Application Domain.

Unit II MULTIMEDIA 9

Hardware And Software: Multimedia Hardware – Macintosh And Windows Production Platforms, Hardware Peripherals – Connections, Memory And Storage Devices, Media Software – Basic Tools, Making Instant Multimedia, Multimedia Software And Authoring Tools, Production Standards.

Unit III MULTIMEDIA MAKING IT WORK 9

Multimedia Building Blocks – Text, Sound, Images, Animation And Video, Digitization Of Audio And Video Objects, Data Compression: Different Algorithms Concern To Text, Audio, Video And Images Etc., Working Exposure On Tools Like Dream Weaver, Flash, Photoshop Etc.,

Unit IV: MULTIMEDIA AND THE INTERNET 9

History, Internet Working, Connections, Internet Services, The World Wide Web, Tools For The WWW – Web Servers, Web Browsers, Web Page Makers And Editors, Plug-Ins And Delivery Vehicles, HTML, VRML, Designing For The WWW – Working On The Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media Games.

Unit V MULTIMEDIA-LOOKING TOWARDS FUTURE 9

Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling And Delivering A Project-Planning And Costing, Designing And Producing, Content And Talent, Delivering, CD-ROM Technology.

TOTAL: 45 Hours

COURSE OUTCOMES:

CO-1: To understand the basic components of a multimedia project.

CO-2: Identify the basic hardware and software requirements for multimedia development and playback.

CO-3: Describe different multimedia data in digital formats and compare text, audio, image and video data.

CO-4: Ability to designing for the WWW and Web page makers and editors.

CO-5: To understand the Multimedia conferencing and CD-ROM technology.

Text Books:

1. K. S. Rajasekaran, *Introduction to Multimedia Systems*, 2023, Wiley
2. V.K. Agarwal, *Multimedia Systems*, 2023, Springer
3. Multimedia System Design, K. Andleigh and K. Thakkar, PHI, New Delhi, 2000.

Reference Books:

1) A. Gupta & R. Verma, *Multimedia Communication Systems*, 2023, Wiley.
2) R. K. Gupta, *Multimedia Communication Systems: Techniques, Standards, and Applications*, 2023,

Web links

1) https://www.geeksforgeeks.org/what-is-multimedia/
2) https://www.tutorialspoint.com/multimedia/multimedia_introduction.htm

24DBCS32 **DATA VISUALIZATION**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

To understand the concepts of different types of visualization and how humans perceive information. Learn the processes, mechanics in implementing principles of design and color to make effective visualizations, learn how to visualize graphs, be exposed to visualization dashboards, and to apply techniques from user-interface design to create an effective visualization system.

UNIT I: THE COMPUTER AND THE HUMAN 9

Defining data visualization - Visualization workflow-describing data visualization- Work flow process in practice

UNIT II: VISUALIZATION OF NUMERICAL DATA 9

Data Representation: chart types: categorical, hierarchical, relational, temporal & spatial; 2-D: bar charts, Clustered bar charts, dot plots, connected dot plots, pictograms, proportional shape charts, bubble charts, radar charts, polar charts, Range chart.

UNIT III: VISUALIZATION OF NON-NUMERICAL DATA 9

Range chart, Box-and-whisker plots, univariate scatter plots, histograms word cloud, pie chart, waffle chart, stacked bar chart, back-to-back bar chart.

UNIT IV: VISUALIZATION DASHBOARD 9

Visualization system for large datasets and dashboards, Tools for dashboard, graph data visualization; Annotation.

UNIT V: 2-D & 3-D DATA VISUALISATION 9

Relevant 2-D charts. 3-D: surfaces, contours, hidden surfaces, 3d coloring, 3D mapping: multi dimensional data visualization.

TOTAL: 45 Hours

COURSE OUTCOMES:

On Completion of this course, the students can able to

CO1: Discuss the concepts of what data visualization is, how it's used, and how Computers display

information.

CO2: Implement principles of design and color to make data visualizations more Effective

CO3: Learn how to visualize graphs that depict relationships between data items.

CO4: Use and designing own visualization system for large datasets and dashboards

CO5: To interpret 2D and 3D visualization system.

Text Books:

1. Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016

2. "Storytelling with Data: A Data Visualization Guide for Business Professionals" Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015.

Reference Books:

1. "Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press, 2018.

2. "Analyzing Data with Power BI and Power Pivot for Excel", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017.

3. "Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition, 2018.

Web links

1. https://www.geeksforgeeks.org/introduction-to-data-visualisation

24DBCS41 **SOFTWARE ENGINEERING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course introduces the basic concepts of Software Engineering, the phases of Software Development Life Cycle, the metrics of Software projects, Software Cost Estimation Techniques and quality assurance.

Unit-I – FUNDAMENTAL CONCEPTS OF SOFTWARE ENGINEERING 12

Introduction - Generic view of Software Process- Software Engineering: A Layered Technology - A Process Framework- The Capability Maturity Model Integration (CMMI)-Process Patterns- Process Assessment- Personal and Team Process Model- Process Technology- Software Process Models- Evolutionary Process Models- Specialized Process Models- The Formal Methods Model- The Unified Process- View of Agile Process Models- Software Cost Estimation- Cost Estimation Factors, Techniques- Planning a software Project- Project Scheduling.

Unit II - REQUIREMENT ANALYSIS 12

System Engineering Hierarchy-System Modelling -Requirements Engineering - Initiating the Requirement Engineering Process- Eliciting Requirements- Developing use cases- Building an Analysis Model- Negotiation Requirements- Validating Requirements.

Unit III- SOFTWARE DESIGN CONCEPTS 12

Design Concepts- Quality Elements, Quality Attributes- Fundamentals of Software Design Concepts- Design Models- Design Elements -Pattern Based Software Design-Describing a design Pattern- Using Pattern in Design- Frameworks-Architectural Design-Importance of Software Architecture -The Architectural Style-The Design Categories of Architectural Style Includes-Architecture Design-Defining Archetype-Architecture Trade-Off Analysis Method (ATAM)-Architectural Style for SW Design-Modelling Component Level Design-. User Interface –Analysis and Design

Unit IV- SOFTWARE TESTING 12

Introduction to Testing-Test Strategies for Conventional Software-Unit Testing- Integration Testing-Test Strategies for Object Oriented Software-Validation Testing-Validation Test Criteria-Configuration Review-Alpha and Beta Testing-System Testing- Testing Tactics-White box Testing-Basis Path Testing -Control Structure Testing- Black Box Testing.

Unit V - SOFTWARE MANAGEMENT 12

Change Management- Software Configuration Management- The SCM Repository- The SCM Process-Quality Management- Quality Concepts- Software Quality Assurance- Software Review- Formal Technical Reviews- Formal Approaches to SQA- Software Reliability- The ISO 2000 Quality Standards- The SQA Plan

TOTAL: 60 Hours

COURSE OUTCOMES:

CO-1: Identify, formulate, analyze, and solve problems, as well as identify the computing requirements appropriate to their solutions.

CO-2: Ability to Learn Software Requirement Specifications.

CO-3: Design, implement, and evaluate software-based systems, or programs of varying complexity that meet desired needs, satisfy realistic constraints, and demonstrate accepted design and development principles.

CO-4: Master various software testing strategies and techniques, including white-box and black-box testing, for ensuring software reliability and quality.

CO-5: Understand software configuration, change, and quality management processes, including adherence to ISO standards and software reliability assurance.

Text Books:

1. Software Engineering, N.S. Gill, Khanna Publishing House, 2023 (AICTE Recommended)

2. Software Engineering, Ian Somerville, 9th edition, Pearson education.

3. Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.

Reference Books:

1. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007

2.Waman S Jawadekar, Software Engineering: a Primer, First Edition, 2008, Tata McGraw Hill. New Delhi.

.*Web links*

1. https://www.javatpoint.com/software-engineering
2. https://www.computerscience.org/careers/software-engineer/

24DBCS42 **NEURAL NETWORKS**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

Provide an understanding of the basic mathematical elements of the theory of fuzzy sets. Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories. Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.

UNIT I :BASIC LEARNING ALGORITHMS 12

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feed forward and Feedback – Learning Process: Error Correction Learning – Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space– Pattern Association – Pattern Recognition – Perceptron Learning Algorithm – Perceptron Convergence Theorem – Least Mean Square Learning Algorithm – Multilayer Perceptron – Back Propagation Algorithm

UNIT II: RADIAL-BASIS FUNCTION NETWORKS 12

Cover's Theorem on the Separability of Patterns - Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks - Learning in Radial Basis Function Networks Applications: XOR Problem – Image Classification. SUPPORT VECTOR MACHINES: Optimal Hyper plane for Linearly Separable Patterns and Non separable Patterns – Support Vector - insensitive Loss Function – Support Vector Machine for Pattern Recognition – XOR Problem - Machines for Nonlinear Regression

UNIT III: NEURODYNAMICS SYSTEMS 12

Ensemble Averaging - Boosting – Associative Gaussian Mixture Model – Hierarchical Mixture of Experts Model(HME) – Model Selection using a Standard Decision Tree – A Priori and Post priori Probabilities – Maximum Likelihood Estimation – Learning Strategies for the HME Model – EM Algorithm – Applications of EM Algorithm to HME Model - Dynamical Systems – Attractors and Stability – Non-linear Dynamical Systems- Lyapunov Stability – Neuro dynamical Systems – The Cohen-GrossbergTheorem.

UNIT IV : ATTRACT OR NEURAL NETWORKS 12

Associative Learning – Attractor Neural Network Associative Memory – Linear Associative

Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos- Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs –Applications

UNIT V : SELF ORGANISING MAPS AND PULSED NEURON MODELS 12

Self-organizing Map – Maximal Eigenvector Filtering – Sanger's Rule – Generalized Learning Law – Competitive Learning - Vector Quantization – Mexican Hat Networks - Self-organizing Feature Maps – Applications - Spiking Neuron Model – Integrate-and-Fire Neurons – Conductance Based Models – Computing with Spiking Neurons.

COURSE OUTCOMES:

CO1: Understanding basic neural network architectures, learning algorithms, and their applications in pattern recognition.

CO2: Analyzing radial-basis function networks, support vector machines, and their applications in classification and regression.

CO3: Exploring neurodynamics systems, ensemble methods, and the EM algorithm for advanced learning strategies.

CO4: Learning attractor neural networks, associative memories, and stability analysis for solving complex problems.

CO5: Gaining insights into self-organizing maps, competitive learning, and spiking neuron models for feature mapping and computation.

Text Books:1. Nunes Da SilvaI, Artificial Neural Networks A Practical Course", SPRINGER,ISBN- 9783319431611 , January 2017

2. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi,2004.

Reference Books:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi,2001.

Web links

1. https://www.geeksforgeeks.org/neural-networks-a-beginners-guide/

2. https://en.wikipedia.org/wiki/Neural_network_(machine_learning)

24DBCS51 FOUNDATION OF ARTIFICIAL INTELLIGENCE

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To learn the overview of artificial intelligence principles and approaches. To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents. This course also covers fundamental areas of Local Search Algorithms, Adversarial Searching and Neural Networks.

UNIT I : BASICS OF AI 12

Introduction: Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents: Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. Learning: Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

UNIT II :DIFFERENT TYPES OF SEARCHING ALGORITHMS 12

Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, production system, constraint satisfaction problems, and issues in the design of search programs. Search techniques: Solving problems by searching: Problem solving agents, searching for solutions; Heuristic search strategies: Greedy best-first search, A* search, Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

UNIT III :KNOWLEDGE & REASONING 12

Knowledge & Reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. Using predicate logic: Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

UNIT IV: KNOWLEDGE REPRESENTATION 12

Representing knowledge using rules: Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge. Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets, and fuzzy logics.

UNIT V :DIFFERENT FIELDS OF AI 12

Natural Language Processing: Introduction, Syntactic processing, semantic analysis, discourse, and pragmatic processing. Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition. Basic knowledge of programming language like Prolog

Total: 60 Hours

COURSE OUTCOMES:

CO-1: Understand the concepts of Artificial intelligence

CO-2: Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions.

CO-3: Represent knowledge of the world using logic and infer new facts from that Knowledge.

CO-4: Build awareness of AI facing major challenges and the complexity of typical problems within the field.

CO-5: Demonstrate working knowledge in PROLOG in order to write simple PROLOG programs and explore more sophisticated PROLOG code on their own.

Text Books:

1. M.C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company, 2024

2. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI Learning 2010.

3. Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company, 2024.

Reference Books:

1. M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024.

2. Russell, S. and Norvig, P., “Artificial Intelligence - A Modern Approach”, 3rd edition, Prentice Hall

Web links

1) https://en.wikipedia.org/wiki/Artificial_intelligence
2) https://www.geeksforgeeks.org/what-is-artificial-intelligence/

24DBCS52 **NATURAL LANGUAGE PROCESSING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

The Course provides the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks, such as speech recognition, machine translation ,spam filtering, text classification and spell checking.

UNIT I: OVERVIEW AND LANGUAGE MODELLING 12

Overview - Origins and challenges of NLP-Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval - Language Modeling: Various Grammar - based Language Models - Statistical Language Model.

UNIT II : WORD LEVEL AND SYNTACTIC ANALYSIS 12

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

UNIT III : SEMANTIC ANALYSIS AND DISCOURSE PROCESSING 12

Semantic Analysis - Meaning Representation - Lexical Semantics – Ambiguity - Word Sense Disambiguation - Discourse Processing – Cohesion - Reference Resolution – Discourse Coherence and Structure.

UNIT IV :NATURAL LANGUAGE GENERATION 12

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

UNIT V :INFORMATION RETRIEVAL AND LEXICAL RESOURCES 12

Information Retrieval - Design features of Information Retrieval Systems – Classical - Nonclassical - Alternative Models of Information Retrieval – valuation Lexical Resources: World Net - Frame Net - Stemmers - POS Tagger - Research Corpora.

Total: 60 Hours

COURSE OUTCOMES:

At the End of this course, the Student will be able to:

CO-1: Analyze experimental results and write reports for each course project to develop scientific writing skills

CO-2: Apply core computer science concepts and algorithms, such as dynamic programming.

CO-3: Apply the methods to new NLP problems and will be able to apply the methods to problems outside NLP.

CO-4: Understand the linguistic phenomena and to explore the linguistic features relevant to each NLP task.

CO-5: Understand natural language processing and to learn how to apply basic algorithms in this field.

Text Books:

1. Hobson Lane, Cole Howard, and Hannes Hapke ,"Natural Language Processing in Action" (2021)

2. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

Reference Books:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2008.

2. Delip Rao and Brian McMahan ,"Natural Language Processing with PyTorch" (2020)

Web links

1. https://www.geeksforgeeks.org/natural-language-processing-overview/
2. www.javatpoint.com/nlp

24DBCS61 **PRINCIPLES OF DATA SCIENCE**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

It is designed to provide students with a solid grounding in essential concepts and skills necessary for understanding and applying data science principles. Students will be introduced to the fundamentals of data collection, cleaning, and exploration, gaining proficiency in techniques for preparing data for analysis.

UNIT I : INTRODUCTION 12

Data Science: Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model– presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data

UNIT II: DESCRIBING DATA 12

Types of Data – Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores

UNIT III : DESCRIBING RELATIONSHIPS 12

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

UNIT IV: PYTHON LIBRARIES FOR DATA WRANGLING 12

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT V : DATA VISUALIZATION 12

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.

TOTAL: 60 hours

COURSE OUTCOMES:

CO1: Understanding the data science process, data mining, and basic statistical concepts for effective data analysis.

CO2: Gaining skills to describe data using tables, graphs, averages, and variability measures.

CO3: Analyzing relationships through correlation, regression, and interpreting statistical models.

CO4: Mastering Python libraries (NumPy and Pandas) for efficient data manipulation and wrangling.

CO5: Developing proficiency in data visualization techniques using Matplotlib, Seaborn, and geographic data plotting.

Text Books:

1. "Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python" (2020) – Peter Bruce, Andrew Bruce, and Peter Gedeck.

2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron (2022)

Reference Books:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi,2001.

2. "Data Science from Scratch" (2020) – Joel Grus.

Web links

1. https://www.geeksforgeeks.org/what-is-data-science/
2. https://en.wikipedia.org/wiki/Data_science

24DBCS62 **PARALLEL PROCESSING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This is a graduate level course on parallel computing with the objective to familiarize students with the fundamental concepts, techniques and tools of parallel computing. Participation in this course will enable you to better use parallel computing in your application area, and will prepare you to take advanced courses in more specific areas of parallel computing.

UNIT I :INTRODUCTION & NUMBER THEORY 12

Parallel Processing–Shared Memory Multiprocessing–Distributed Shared Memory–Message Passing Parallel Computers. Processes & Shared Memory Programming Processes-Shared Memory Programming–General Model Of Shared Memory Programming–Forking-Creating Processes–Joining Processes Process Model Under UNIX

UNIT II : BASIC PARALLEL PROGRAMMING TECHNIQUES: 12

Basic Parallel Programming Techniques: Loop Splitting–Ideal Speedup–Spin-Locks, Contention And Self Scheduling. Scheduling :Loop Scheduling–Variations OnLoop Scheduling–Self Scheduling–Variations On Self-Scheduling–Indirect Scheduling–Block Scheduling.

UNIT III : BARRIERS AND RACE CONDITIONS 12

Barriers And Race Conditions The Barrier Calls–Expression Splitting-Thread-Based Implementation Thread Management–The POSIX Thread Application Programmer Interface-Synchronization Primitives in POSIX-Example With Threads–Attributes Of Threads–Mutual Exclusion With Threads Mutex Usage Of Threads–Thread Implementation–Events And Condition Variables–Deviation Computation With Threads

UNIT IV : MESSAGE PASSING PARADIGM 12

Programming Using the Message Passing Paradigm Principles of Message-Passing Programming. The Building Blocks:Send and Receive Operations. MPI:The Message Passing Interface. Topologies and Embedding-Overlapping Communication with Computation. Collective Communication and Computation Operations-Algorithms For Parallel Machines

UNIT V : MODELS OF COMPUTATION 12

Models Of Computation–Analysis Of Parallel Algorithms–Prefix Computation–Histogram Computation–Parallel Reduction–Sorting Networks-Matrix Multiplication

Total: 60 Hours

Text Books:

1. An Introduction to Parallel Programming, Peter S. Pacheco; Matthew Malensek,·2021

2 Introduction to Parallel Computing: From Algorithms to Programming on State-of-the-Art Platforms ,2018

Reference Books:

1 Introduction To Parallel Processing– By M.Sasikumar, Dinesh Shikhare And P. Ravi Prakash.

Web links

1. https://www.geeksforgeeks.org/what-is-parallel-processing/
2. https://www.techtarget.com/searchdatacenter/definition/parallel-processing

VES
KNOWLEDGE IS POWER

24DBCS71 **CRYPTOGRAPHY AND ITS APPLICATIONS**

L	T	P	O	C
4	3	1	2	4

COURSE OBJECTIVES:

To understand the fundamentals of Cryptography, acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity. To understand the various key distribution and management schemes and to explore how to deploy encryption techniques to secure data in transit across data networks.

UNIT I :INTRODUCTION & NUMBER THEORY 12

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Finite Fields and Number Theory: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm - Finite fields - Polynomial Arithmetic – Prime numbers - Fermat's and Euler's theorem -Testing for primality –The Chinese remainder theorem- Discrete logarithms.

UNIT II : BLOCK CIPHERS & PUBLICKEY CRYPTOGRAPHY 12

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III : HASH FUNCTIONS AND DIGITAL SIGNATURES 12

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature &authentication Protocols.

UNIT IV :SECURITY PRACTICE & SYSTEMSECURITY 12

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles –Trusted systems.

UNIT IV : E-MAIL, IP &WEBSECURITY 12

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy - authentication of the source - Message Integrity - Non-repudiation - Pretty Good Privacy - S/MIME. IPSecurity: Overview of IPSec - IP and IPv6 - Authentication Header - Encapsulation Security Payload (ESP) - Web Security: SSL/TLS Basic Protocol-computing the keys - Encoding-Secure Electronic Transaction (SET).

Total: 60 Hours

COURSE OUTCOMES:

CO-1: Identify computer and network security threats, classify the threats and develop a Security model to prevent, detect and recover from the attacks.

CO-2: Knowledge and understanding of Basics of number theory, Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms.

CO-3: Will develop their skills in the programming of symmetric and/or asymmetric ciphers and their use in the networks.

CO-4: Develop SSL or Firewall based solutions against security threats, employ access Control techniques to the existing computer platforms such as Unix and Windows NT.

CO-5: Identify E-mail-attacks and establishing keys privacy E-Mail attacks.

Text Books:

1. Marcelo Sampaio de Alencar, , Cryptography and Network Security,2022
2. Behrouz A.Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill Second Edition,2010.

Reference Books:

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, India Edition,2017.

Web links

1. *https://www.geeksforgeeks.org/cryptography-and-its-types/*
2. *https://www.javatpoint.com/cryptography-definition*

24DBCS72 UI/UX DESIGN FUNDAMENTALS AND APPLICATIONS

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES

The course aims to provide students with a comprehensive understanding of UI/UX design, focusing on the key differences between User Interface and User Experience. Students will learn essential design principles, user-centered design methodologies, and tools for creating effective and accessible interfaces. The course will also cover advanced topics such as usability testing, interaction design, and current trends in UI/UX, preparing students for practical application in modern software development and emerging technologies.

Unit 1: Introduction to UI/UX Design 12

Overview of UI/UX - Understanding the difference between User Interface (UI) and User Experience (UX) design - Importance of UI/UX in Software Development - How good UI/UX impacts user satisfaction, engagement, and product success - Design Principles - Introduction to principles like clarity, consistency, simplicity, accessibility, and visual hierarchy - User-Centered Design (UCD) - Understanding the concept of designing with the user in mind - Ethics in UI/UX Design - Ethical considerations in user interface design (privacy, data security, inclusivity).

Unit 2: UI Design Principles 12

Visual Design Basics - Typography, color theory, iconography, and layout design - Wireframing and Prototyping - Creating basic wireframes, mockups, and interactive prototypes - UI Design Tools - Introduction to tools like Figma, Adobe XD, Sketch, and InVision - Responsive and Adaptive Design - Techniques for designing interfaces that work on various screen sizes (desktop, tablet, mobile) - Design Systems and Style Guides - Importance of consistency across platforms and the role of style guides.

Unit 3: UX Research and User Testing 12

User Research Methods - Conducting interviews, surveys, and observations to gather user needs - Personas and User Stories - Developing personas and creating user stories to define user needs - Usability Testing - Methods of testing user interfaces with real users, interpreting results, and iterating designs based on feedback - Heuristic Evaluation - Conducting expert reviews based on established heuristics to identify usability issues - A/B Testing and Analytics - Analyzing and comparing variations of design to optimize for user behavior.

Unit 4: Interaction Design and Information Architecture 12

Principles of Interaction Design - Understanding how users interact with interfaces and how to design for effective communication - Information Architecture (IA) - Structuring and organizing content in a way that is intuitive and logical for users - Navigation Design - Designing clear and user-friendly navigation systems (menus, buttons, links) - Microinteractions - Designing small, subtle interactions to enhance user experience (e.g., button hover states, loading animations) -

Accessibility in UI/UX Design - Ensuring that interfaces are usable by people with disabilities (WCAG guidelines, screen readers).

Unit 5: UI/UX in Modern Development **12**

Agile UI/UX Design - Integrating UI/UX processes into Agile development methodologies - Design Handoff to Development - Best practices for delivering design assets and specifications to developers - UI/UX in Mobile Applications - Best practices and differences in UI/UX design for mobile apps (iOS and Android) - Design for Emerging Technologies - UI/UX design considerations for VR/AR, AI, and IoT applications - Current Trends in UI/UX Design - Exploring current trends such as dark mode, neumorphism, voice UI, and conversational UI.

COURSE OUTCOMES

CO1: Students will understand the key concepts of UI/UX, design principles, and the impact of UI/UX on software development and user satisfaction.

CO2: Students will gain proficiency in visual design basics, wireframing, prototyping, and using UI design tools for responsive and adaptive design.

CO3: Students will learn how to conduct user research, create personas, and implement usability testing to improve user interfaces.

CO4: Students will develop skills in interaction design, information architecture, and accessibility to create intuitive, user-friendly interfaces.

CO5: Students will explore UI/UX practices in agile development, mobile applications, and emerging technologies like VR/AR, AI, and IoT.

Text Books:

1. Steve Krug, *Don't Make Me Think: A Common Sense Approach to Web Usability* (2023)

2. Don Norman, *The Design of Everyday Things* (2022)

3. Jesse James Garrett, *The Elements of User Experience: User-Centered Design for the Web* (2022)

Reference Books

1. Jeff Gothelf, *Lean UX: Applying Lean Principles to Improve User Experience* (2023)

2. Alan Cooper, *About Face: The Essentials of Interaction Design* (2022)

Web Links:

1.https://www.coursera.org/specializations/ui-ux-design

24DBCS81 **BLOCK CHAIN TECHNOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course covers the technical aspects of public distributed ledgers, blockchain systems, crypto currencies, and smart contracts. Students will learn how these systems are built, how to interact with them, how to design and build secure distributed applications.

UNIT-I : BLOCK CHAIN BASICS 12

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof positions.

UNIT-II INTRODUCTION TO BLOCKCHAIN 12

Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain.

UNIT-III: DISTRIBUTED CONSENSUS AND CRYPTO CURRENCY 12

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate. History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin.

UNIT-IV: CRYPTO CURRENCY REGULATION 12

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain.

UNIT V: CASE STUDY ON BLOCKCHAIN 12

Case study on Naive Blockchain construction, Memory Hard algorithm – Hash cash implementation, Direct Acyclic Graph, Play with Go-ethereum, Smart Contract Construction, Toy

application using Blockchain, Mining puzzles

TOTAL: 60 Hours

COURSE OUTCOMES:

CO-1: Understanding blockchain fundamentals, distributed systems, and cryptographic techniques.

CO-2: Gaining insights into blockchain networks, mining, and the differences between private and public blockchains.

CO-3: Exploring consensus mechanisms, cryptocurrency protocols, and blockchain vulnerabilities.

CO-4: Examining cryptocurrency regulations, legal aspects, and blockchain applications across industries.

CO-5: Applying theoretical knowledge to practical blockchain implementation through case studies and development tasks.

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19,2016).

2. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press,2019

Reference Books:

Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform,2017.

Web links

1. https://www.blockchainexpert.uk/book/blockchain-book.pdf
2. https://www.lopp.net/pdf/princeton_bitcoin_book.pdf
3. https://bitcoinbook.cs.princeton.edu/

24DBCS82 **FUNDAMENTALS OF ROBOTICS**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course introduces the basic concepts of robotics, sensors, robot controls, robot cell design, and micro robotics and Nano robotics system.

UNIT I :INTRODUCTION 12

Robot anatomy – Definition - law of robotics - History and Terminology of Robotics- Accuracy and repeatability of Robotics - Simple problems - Specifications of Robot - Speed of Robot - Robot joints and links - Robot classifications - Architecture of robotic systems- Rob ot Drive systems - Hydraulic, Pneumatic and Electric system.

UNIT II :END EFFECTORS ANDROBOTCONTROLS 12

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type- Magnetic grippers - Vacuum grippers - Air operated grippers-Gripper force analysis - Gripper design - Simple problems - Robot controls - Point to point control, Continuous path control, Intelligent robot - Control system for robot joint - Control actions - Feedback devices - Encoder, Resolver, LVDT - Motion Interpolations - Adaptive control.

UNIT III : ROBOT TRANSFORMATIONS AND SENSORS 12

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation - Homogeneous coordinates, multiple transformation - Simple problems. Sensors in robot – Touch sensors - Tactile sensor – Proximity and range sensors – Robotic vision sensor - Force sensor - Light sensors, Pressuresensors.

UNIT IV :ROBOT CELL DESIGN AND APPLICATIONS 12

Robot work cell design and control - Sequence control, Operator interface, Safety monitoring devices in Robot - Mobile robot working principle, actuation using MATLAB, NXT Software Introductions - Robot applications - Material handling - Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersearobot.

UNIT V :MICRO/NANO ROBOTICS SYSTEM AND CASE STUDY 12

Micro/Nanorobotics system overview - Scaling effect - Top down and bottom up approach -

Actuators of Micro / Nano robotics system - Nano robot communication techniques –Fabrication of micro / nano grippers - Wall climbing, micro robot working principles - Biomimetic robot - Swarm robot - Nano robot in targeted drug delivery system.

Total : 60 hours

COURSE OUTCOMES:

CO-1: To understand the basics of robot like accuracy, speed of robot, joint and links in robots.

CO-2: To understand the purpose of end effectors like magnetic grippers, vacuum grippers and gripperdesign**.**

CO-3: Explains various sensors like touch sensors, tactile sensor, vision sensors, light and pressure sensors which are used in robots.

CO-4: Explains robot applications like Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot.

CO-5: Effectively discuss Actuators of Micro/Nano robotic system.

Text Books:

1.S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education, 2009.

2."Robot Revolution: The Impact of Artificial Intelligence on Society" (2023) by Mark A. Wilson

Reference Books:

1."Robotics: Everything You Need to Know" (2023) by Peter M. R. Rony

2. "The Age of AI: Robotics and Beyond" (2023) by Sarah J. Thompson

Web links

1. https://www.infineon.com/cms/en/discoveries/fundamentals-robotics/
2. https://www.coursera.org/learn/fundamentals-of-robotics--industrial-automation

MULTIDISCIPLINARY COURSES

24BMA001 **MATHEMATICS-I**

L	T	P	O	C
2	1	0	2	3

COURSE OBJECTIVES:

- To learn various concept in matrix
- To apply the concept of Sets to promote critical thinking, problem-solving technique and interdisciplinary connections.
- To analyse the relationships, decisions making and modeling complex systems using Partial Order Relations.

UNIT-IMATRICES& DETERMINANTS: 9

Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramer's Rule, Rank of Matrix Dependence of Vectors**. Determinants:** Definition, Minors, Cofactors, Properties of Determinants

UNIT-II:SETS 9

Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

UNIT-III: RELATIONS & FUNCTIONS 9

Relations: Properties of Relations, Equivalence Relation. **Functions:** Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions,

UNIT-IV: PARTIAL ORDER RELATIONS 9

Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, GLB, LUB.

UNIT-V: NUMBER SYSTEM AND CONVERSIONS 9

Number Systems: Binary Numbers, Octal Numbers, Decimal numbers, Hexa Decimal numbers. **Number base conversions**: Octal and Hexa Decimal Numbers - Complements - Signed Binary Numbers - Binary Arithmetic - Binary Codes - Decimal Code

Total: 45 Hours

COURSE OUTCOMES:

CO1: Apply the concept of Matrix and solving simultaneous equations

CO2: Understand the ideas of Sets and its applications.

CO3: Identify the relations for various functions .

CO4: Apply the concept of partial order relation for various sets.

CO5: Understand the conversion of various number system.

Textbook

1. Kolman, Busby, Ross and Rehman (2003), Discrete Mathematical Structures for Computer Science, Pearson Education, 5th Edition,

Reference Books

1.D.S. Malik and M.K. Sen(2004), Discrete Mathematical Structures: Theory and Applications, Thomson.

2. Goodaire & Parmenter (2000), Discrete Mathematics & Graph Theory, Pearson Education.

3. Kenneth H. Rosen, (2004), Discrete Mathematics and its Applications, Tata McGraw Hill, 5th Ed.

4. C.L. Liu (1986), Elements of Discrete Mathematics, 2nd Edition, McGraw Hill

Web Links:

1. https://www.geeksforgeeks.org/mathematics-partial-orders-lattices/

2. https://www.ipsgwalior.org/download/number%20system.pdf

24BMA002 **MATHEMATICS-II**

L	T	P	O	C
2	1	0	2	3

COURSE OBJECTIVES:

- To enable professional undergraduate students to understand the importance of Mathematics
- To provide basic knowledge of Discrete Mathematics and Probability.
- The main aim of this course is to help the students to read, classify and then interpret the data given to them and draw conclusions. Students understand the concepts like Logic, tautology and Probability.

UNIT 1: FUNDAMENTALS OF LOGIC 9

Fundamentals of logic: Introduction to logic, propositional logic, logical connectives and truth table, negation conjunction, disjunction.

UNIT 2: LOGIC AND TATUOLOGY 9

Conditional, bi-conditional or double implication, converse, inverse and contra positive, tautology and contradiction.

UNIT 3: PERMUTATIONS AND COMBINATIONS 9

Introduction -Fundamental Principle of Counting-Permutations: Problems on permutations – Combinations - Problems on combinations, Difference between permutations and combinations.

UNIT 4: BASICS OF PROBABILITY 9

Basics of probability: Basic Probability- Axioms of Probability- Addition and Multiplication theorem without proof-Conditional Probability-simple problems

UNIT 5: RANDOM VARIABLES 9

Random variable - Discrete random variables- Mean- Expectations- Variance- Independent random variables- simple problems, Continuous random variables- Mean- Expectations- Variance- simple problems.

Total : 45 Hours

COURSE OUTCOMES:

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

CO1: Apply the basic concepts of Mathematical reasoning.

CO2: Understand the types of logic

CO3: concept based on permutation and combinations.

CO4: Apply the concepts of Probability.

CO5: Understand the concepts of Random Variables.

Text books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill.
2. R A Johnson And C.B.Gupta., Probability and statistics for engineers (Erwin Miller And John E.Freund), 7th edition, Pearson Education / PHI.

Reference Books:

1. R. P. Grimaldi (2007), "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition
2. Thomas Koshy (2005), "Discrete Mathematics with Applications", Academic Press
3. S.I.Resnick (1999), A Probability Path, Birhauser, Berlin

Web links:

1. https://courses.umass.edu/phil110-gmh/text/c01.pdf
2. https://www.cuemath.com/data/permutations-and-combinations/
3. https://www.toppr.com/guides/maths/probability/introduction-to-probability/

24BMA003 **STATISTICS-I**

L	T	P	O	C
2	1	0	2	3

COURSE OBJECTIVE:

To develop the skills of the students in the concepts of Statistics and Design of Experiments. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT 1: Measures of Central tendency and Dispersion 9

Introduction – Scope and Limitations of Statistical methods Measures of Central tendency: Mean, Median, Mode. Measures of Dispersion- Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of variation.

UNIT II: Correlation and Regression Analysis 9

Introduction – Correlation: Types of Correlation, Scatter diagram method, Karl Pearson's Coefficient of correlation, Spearman's Rank Correlation Coefficient.Regression: Regression Lines and Regression equations and simple problems.

UNIT III: Testing of Hypothesis 9

Introduction – Concept of Sampling and Sampling Distribution- Standard error – Tests of Significance for small samples: Student's Distribution : Single- two sample and paired t-test, The F-test(variance –Ratio test) , Chi-Square tests for Goodness of Fit and test for independence of attributes in contingency table.

UNIT IV: Probability 9

Introduction to Probability- Different approaches of Probability-Addition theorem, Multiplication theorem-Conditional probability- Baye's theorem.

UNIT V: Probability Distribution 9

Introduction – Discrete distribution : Binomial distribution , Poisson distribution, Geometric distribution. Continuous distribution : Exponential distribution , Uniform distribution , Normal distribution.

Total: 45 Hours

Text Books:

1. S.P. Gupta, Statistical Methods, 44th Edition, Sultan Chand & Sons,2014.

Reference Books:

1. P.R. Vittal and V. Malini, Statistical and Numerical Methods, Margham Publications,1st Edition,2007.

2. S.C. Gupta and V.K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand & Sons, 3rd Edition, 2001.

3. Beri G, Business Statistics, Tata McGraw Hill Publishing Company Limited, 2009.

MULTIDISCIPLINARY ELECTIVE

24EMDE31 **INDIAN KNOWLEDGE SYSTEM**

L	T	P	O	C
2	0	0	0	2

COURSE OBJECTIVES

- To Gain an understanding of Indian Knowledge System.
- To Develop an ability to apply the Indian Knowledge System to societal challenges faced today in areas such asholistic health, governance, public administration and sustainable living.
- To Promote the youths to do research in the various fields of Indian knowledge system.

Unit1: An Overview of Indian Knowledge System **6**

Introduction- Organization of Indian Knowledge System- The IKS corpus- A Classification framework- Historicity of Indian Knowledge System -Some salient aspects of Indian Knowledge System

Unit 2: Philosophical system **6**

Introduction to Philosophy- Development of Indian Philosophical system - Unique features of Indian Philosophical system- Introduction to Yoga.

Unit 3 : Governance and Public Administration **6**

Introduction - Understanding Governance from ancient to modern times- Relevance of Arthashastra- Glimpses of Nitishastra- Vidura Niti.

Unit 4 : Wisdom through the Ages **6**

Gateways of ancestral wisdoms-Introduction to Purāṇa- The Purāṇic repository- Issues of interest in Purāṇas- Introduction to Itihāsas- Key messages in Itihāsa-Wisdom through Nīti-śāstra.

Unit 5 Mathematics **6**

Introduction to Indian Mathematics- Unique aspects of Indian Mathematics- Indian Mathematicians and their Contributions.

Total 30 hours

COURSE OUTCOMES:

CO1 : Classify the key concepts of Indian Knowledge System and discuss the multi-faceted nature of knowledge contained in the Traditional Systems of India.

CO2 : Identify the rich heritage of governance in Indian Knowledge System.

CO3 : Recognize the relevance of Arthash astra in public administration.

CO4 :Identify the Wisdom through Ages through Ithihasas.

CO5 : Knowledge of Indian Mathematicians and their contributions.

Text Books:

1. Mahadevan B., Bhat V R, Nagendra Pavana R.N., Indian Knowledge System Concepts andApplication, PHI Learning Pvt. Ltd., 2022.
2. Kapoor Kapil, and Singh Avadesh Kumar, Indian Knowledge System Vol.1, DK Print World,Ltd., 2005.

Reference Books

1. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan.

2. Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata

Weblink:

1. https://onlinecourses.swayam2.ac.in/imb23_mg54/preview
2. https://digest.iimb.ac.in/2022/04/book-indian-knowledge-systems-co-authored-dr-b-mahadevan/
3. https://www.summarize.tech/www.youtube.com/watch?v=jcV0LIp570A

VALUE ADDED COURSES

24DVAC11 **UNIVERSAL HUMAN VALUES**

L	T	P	O	C
1	0	0	1	1

COURSE OBJECTIVES:

The candidates will be able to appreciate the complementarity between the values and skills for sustained happiness and prosperity. To influence the students to approach the life and profession with a holistic perspective towards a value-based living in a natural way. To highlight plausible implications of holistic understanding of ethical human conduct.

UNIT- I INTRODUCTION TO VALUE EDUCATION 5

Living a fulfilling life. Value education. Skill education. Complementarity of Values and Skills. Development of a holistic perspective. Right understanding, relationship and physical facility. Understanding the happiness and prosperity.

UNIT-II HARMONY AT MULTIPLE LEVELS 5

Human being as co-existence of the self and the human body. Understanding harmony in the self. Harmony in the family and understanding values in human-human relationships. Harmony in the society and understanding universal human order. Harmony in nature and understanding the interconnectedness, self-regulation and mutual fulfillment. Harmony in existencedot and understanding co-existence at various levels.

UNIT-III IMPLICATIONS OF THE RIGHT UNDERSTANDING 5

Ethical human conduct. Implications of value-based living. Right understanding of professional ethics. Humanistic education. Holistic technologies, production systems and management models. Strategies for transition towards value-based life and profession.

Total: 15 Hours

COURSE OUTCOMES:

At the end of the course learners will be able to:

CO1: Develop qualities like responsibility and the ability to handle problems with sustainable solutions.

CO2: Appraise human values and the harmony at various levels.

CO3: Perceive a better critical ability.

CO4: Develop qualities pertaining to value-based living.

CO5: Apply what they have learnt to their own self in real life settings.

Text Books:

1. R.R. Gaur, R. Asthana, G.P. Bagaria. (2023). A Foundation Course in Human Values and Professional Ethics. 3rd Revised Edition. Excel Books, New Delhi.

Reference Books:

1. A. Nagaraj, Jeevan Vidya Prakashan, Amar Kantak. Jeevan Vidya (1999), Ek Parichaya
2. Rakesh Gupta. Jeevan Vidya (2008), An Introduction (Introductory Book to Madhyasth Darshan-Coexistentialism). English Version.
3. A. N. Tripathi (2004), Human Values. First Edition. New Age International Publishers, New Delhi.

24DVAC21 **COMMUNICATION SKILLS**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To develop effective verbal and non-verbal communication techniques for various contexts.

CO2: To enhance listening skills for better comprehension and engagement in conversations.

CO3: To improve written communication abilities, focusing on clarity, coherence, and style.

CO4: To build confidence in public speaking through practice and constructive feedback.

CO5: To cultivate interpersonal skills for successful collaboration and professional interactions.

Unit I –Introduction to Communication Skills 6

- Fundamentals of Communications
- Elements of Communication, Types of Communication

Unit II - Practical English 6

- Importance of the language - Word Usage and Jargon
- Tenses and the effectiveness - Basics of grammar (Noun/Verb/Adverb/Conjunction)

Unit III - Effective Communication 6

- LSRW (Listening, Speaking, Reading & Writing)
- Pronunciation - Vocabulary Building
- Intonations & its importance

Unit IV - Workplace Communication 6

- Basics of telephone etiquette
- E-Mail writing
- Presentation Skills
- Interpersonal Skills
- Business English

Unit V - Quantitative Ability 6

- Verbal Ability - Verbal Analogy
- Debating Skills - Public Speaking

Total : 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1 Enhance participants' business communication skills

CO2 Enhance LSRW Skills (LSRW – Listening, Speaking, Reading & Writing)

CO3 Express opinions at free will in social/ personal gathering

CO4 Impact leadership qualities among participants

CO5 Engage in conversation with others to exchange ideas

Text Books:

1. Andreja. J. Ruther Ford (2011),Basic communication skills for Technology, 2nd Edition, Pearson Education.
2. Barun K Mitra (2011), Personality development and soft skills, 1 st Edition, Oxford Press.
3. Elizabeth Harren, 7 April (2022), last updated: 16 November, (2023)
4. Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler (McGraw-Hill)

Reference Books:

1. Ethan Beute and Stephen Pacinelli (Greenleaf)
2. Francis Peters SJ (2011), Soft skills and professional communication, 1stEdition, McGraw Hill Education.

24DVAC41 **YOGA EDUCATION**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

The students will be able to:

- Understand the philosophy, aims, and health benefits of Yoga.
- Gain practical knowledge of yogic postures, breathing techniques, and relaxation practices.
- Apply yogic methods for stress reduction, emotional balance, and focus enhancement.
- Incorporate Yoga as a tool for lifestyle improvement, well-being, and inner awareness.

UNIT-I INTRODUCTION TO YOGA 5

Definition and meaning of Yoga – Classical and modern perspectives. -Philosophy and objectives of Yoga-Benefits of Yoga for physical, mental, and emotional health -Relevance of Yoga in daily life, especially for students and professionals - Guidelines for safe and mindful Yoga practice

UNIT II YOGA PRACTICES – ASANAS AND BREATHING 5

Loosening and warm-up exercises Neck, shoulder, spine, and joint movements - Standing AsanasTadasana, Trikonasana, Vrikshasana - Sitting AsanasVajrasana, Ardha Matsyendrasana, Bhadrasana - Prone and Supine AsanasBhujangasana, Shalabhasana, Pavanamuktasana - Breathing Practices (Pranayama)Anulom Vilom, Bhramari, Sheetali, Sheetkari - Relaxation TechniquesDeep Relaxation Technique (DRT)

UNIT-III YOGA FOR MENTAL WELL-BEING & LIFESTYLE MANAGEMENT 5

Ecosystems and ecosystem services: Major ecosystem types in India and their basic Role of Yoga in managing stress, anxiety, and fatigue - Importance of meditation and breath regulation - Basics of meditation: breath-based and mindfulness - Yogic lifestyle guidelines – diet, discipline, sleep, and conduct - Integrating Yoga into student routine for balance and productivity

Total: 15 hours

Text Books & Reference Books

1. Ministry of AYUSH. (2023). Common Yoga Protocol. Government of India
2. Swami Satyananda Saraswati. Asana, Pranayama, Mudra, Bandha. Bihar School of Yoga
3. Dr. R. Nagarathna & Dr. H. R. Nagendra. Yoga for Students. SVYASA
4. NCERT. (2020). Yoga – A Healthy Way of Living (Upper Primary and Secondary)

Course Outcomes (CO):

At the end of this course, learners will be able to:

CO1: Explain the meaning and relevance of Yoga for overall well-being.

CO2: Demonstrate basic asanas and breathing techniques with proper alignment.

CO3: Practice guided relaxation and introductory meditation.

24SNSS41 **NATIONAL SERVICE SCHEME**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

The students will be able to understand the concept of youth and the importance of youth population in Nation Building. The course also enable the students to appraise the nature and growth of national service scheme in India. The course enable the students to perceive the aims, objectives, logo, emblem and organizational structure of NSS.

UNIT-I INTRODUCTION 5

Introduction to National Service Scheme. Philosophy of NSS. Basic concepts of NSS-Motto, Symbol, Badge, NSS Day. NSS programs and activities; NSS Components-Programme Officer, Volunteer, Community. Classification of NSS Programme.

UNIT-II ACTIVITIES OF NSS 5

Regular activities of NSS – Adoption of villages, slums etc., Coordination with Voluntary Organizations, National Service Volunteer Scheme (NSVS), Day Camps, Special Camping Program-objectives, contributions and activities.

UNIT-III ADMINISTRATION, PLANNING & IMPLEMENTATION OF NSS PROGRAMS 5

Administrative structure of NSS at National, State and University levels. NSS advisory committees. Planning and Implementation of NSS Programs-Off campus activities- Rally, Swatchatha Programme, Visit to heritage sites, conserving ancient monuments, Women empowerment program, Blood donation, Water conservation program etc.

Total : 15 Hours

COURSE OUTCOMES:

At the end of the course, learners will be able to:

CO1: To explain the philosophy and basic concepts of NSS.

CO2: To appraise the activities of NSS.

CO3: To discuss the concepts of Special Camping Program.

Textbooks:

1. National Service Scheme Manual (Revised), (2006), Government of India, Ministry of

Youth Affairs and Sports, New Delhi.

2. Afsal Mohammad B, (2020), An introduction to volunteerism in India.

24DVAC51 **VALUE EDUCATION**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

The course aims to nurture ethical principles, holistic living, and moral values, fostering responsible and balanced individuals. It equips students with essential life skills like decision-making, teamwork, and time management while promoting awareness of human rights and environmental conservation. Additionally, it sensitizes learners to social issues and prepares them to address societal challenges effectively.

Unit I **6**

Value education-its purpose and significance in the present world – Value system – The role of culture and civilization-Holistic living – Balancing the outer and inner – Body, Mind and Intellectual level- Duties and responsibilities.

Unit II **6**

Salient values for life- Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity , and inclusiveness, Self esteem and self confidence, punctuality – Time, task and resource management -Problem solving and decision making skills- Interpersonal and Intra personal relationship – Team work – Positive and creative thinking

Unit III **6**

Human Rights – Universal Declaration of Human Rights – Human Rights violations – National Integration – Peace and non-violence – Dr. A P J Kalam's ten points for englightened citizenship – Social Values and Welfare of the citizen – The role of media in value building.

Unit IV **6**

Environment and Ecological balance – interdependence of all beings – living and non-living. The binding of man and nature – Environment conservation and enrichment.

Unit V **6**

Social Evils – Corruption, Cyber crime, Terrorism – Alcoholism, Drug addiction – Dowry – Domestic violence – untouchability – female infanticide – atrocities against women- How to tackle them

Total: 30 Hours

COURSE OUTCOMES

CO1: Understand the significance of value systems, holistic living, and individual responsibilities to achieve personal and societal balance.

CO2: Develop core values such as integrity, empathy, and time management skills, along with problem-solving and effective decision-making abilities.

CO3: Gain awareness of human rights, social welfare, and the role of media in fostering peace, unity, and enlightened citizenship.

CO4: Comprehend the importance of environmental conservation, ecological balance, and the interconnectedness of all living and non-living beings.

CO5: Identify and analyze social evils like corruption, cybercrime, and domestic violence, and explore strategies to combat these issues.

Text Books:

1. Roger Packham, Margaret Taplin, Kevin Francis - How Values Education Can Improve Student and Teacher Wellbeing - 2024

2. Various Authors - Value-Creating Education: Teachers' Perceptions and Practice - 2021

Reference Books:

1. Nucci, Larry, and Ilten-Gee, Robyn. Moral Education for Social Justice. 2021

2. John Chi-Kin Lee, *Spiritual, Life and Values Education for Children*, 2023



SKILL ENHANCEMENT COURSES

24SSKU11 **SOFT SKILLS-I**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To learn and apply basic etiquette for personal and professional interactions.

CO2: To develop effective stress management techniques for maintaining mental and emotional well-being.

CO3: To enhance self-awareness for personal growth and informed decision-making.

CO4: To gain an overview of essential 21st-century skills necessary for success in a rapidly changing world.

CO5: To foster creativity and critical thinking skills for innovative problem-solving and adaptability.

UNIT I INTRODUCTION TO SOFT SKILLS 6

- Soft Skills vs Hard Skills
- 15 important Soft Skills
- Communication Skills, Time Management, Leadership Skills

UNIT II - OVERVIEW OF 21ST CENTURY SKILLS. 6

- Lateral Thinking – Left Brain/Right Brain Functionality
- Problem solving skills

UNIT III - SELF AWARENESS 6

- Human Values
- Mindfulness
- SWOT Analysis
- PDCA Approach

UNIT IV - CREATIVITY/CRITICAL THINKING 6

- Six Thinking Traits
- Creative writing exercises
- Open mindedness

UNIT V - PERSONAL HYGIENE AND STRESS MANAGEMENT 6

- Basic Etiquettes
- Health and Personal Grooming
- Stress-meaning and nature, Eustress, Distress
- Stress management strategies

Total: 30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1: Demonstrate basic etiquette in various personal and professional settings.

CO2: Effectively manage stress using learned techniques.

CO3: Show increased self-awareness and make informed decisions.

CO4: Understand and articulate key 21st-century skills.

CO5: Apply creativity and critical thinking to solve problems innovatively.

References:

1. Alex, Dr. K. (2014), Soft Skills (1st edition) S Chand & Company
2. Taylor,(2005), Grant English Conversation Practice. Tata McGraw Hill Education Pvt. Ltd
3. Tiko, Champa& Jaya Sasikumar (1979), Writing with a purpose. OUP New Delhi
4. Nelson-Jones, R. (1992), Life skills, a handbook, Trowbridge, Wilts: Detesios Ltd.
5. Tuhovsky, Ian (2019), Communication Skills Training (2nd edition) Rupa Publication India.

24SSKU21 **SOFT SKILLS-II**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

CO1: To develop strategies to enhance teamwork and collaboration in professional settings.

CO2: To cultivate a positive attitude and mindset to foster constructive relationships and productivity.

CO3: To develop leadership, decision-making and team bonding skills

UNIT I - PROFESSIONAL BEHAVIOUR 6

- Team Building – Team Bonding
- Inter-Personal Relationship– Intra-Personal Relationship

UNIT II - PERSONALITY DEVELOPMENT 6

- Types of Personality
- Self-Confidence - Confidence Building
- Attitude (Positive/Negative)

UNIT III - TELEPHONE ETIQUETTE 6

- Basics of telephone etiquette
- Giving clear and concise information
- Tone & rate of speech
- Intonations & its Importance
- WhatsApp Communications

UNIT IV - DECISION MAKING 6

- Types of Decisions – planned-unplanned, individual-group, major-minor
- Types of Leadership styles – Autocratic, democratic, lesse-faire, participative,bureaucratic.

UNIT V- PROFESSIONAL ETIQUETTE 6

- Respect – Salutations
- Official Behaviour

Total :30 Hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1: Understand the principles of effective team building and apply strategies to foster team bonding and cohesion in professional settings.

CO2: Become self-confident individuals by mastering interpersonal skills, team management skills, and leadership skills.

CO3: Practice techniques for effective communication in telephone conversations.

CO4: Evaluate decision-making processes and their implications in professional settings.

CO5: Exhibit professional conduct and demeanor in various professional situations.

Reference Books:

2. Language Service, Universitat Oberta de Catalunya
3. Taylor (2005, Grant English Conversation Practice. Tata McGraw Hill Education Pvt. Ltd.
4. Tiko, Champa& Jaya Sasikumar(1979), Writing with a purpose. OUP New Delhi
5. Alex, Dr. K. (2014), Soft Skills (1st edition) S Chand & Company.
6. Nelson-Jones, R. (1992), Life skills, a handbook, Trowbridge, Wilts: Detesios Ltd.

24SSKU31 **SOFT SKILLS-III**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES

- To hone the creative and critical faculties of learners.
- To enhance descriptive and narrative skills through short story creation.
- To acquire professional reports and review writing skills for various mediums.
- To gain practical writing skills for television, radio, magazines, and the web, emphasizing freelance opportunities.

UNIT 1 Introduction **12**

- Meaning and Significance of Creative Writing Refining Vocabulary, Word order, Developing Hints

Unit II Writing Skills **12**

- Genres of Writing
- Descriptive Passages, Short Stories, Narration of incidents

Unit III Academic Writing **12**

- Report Writing, Writing of book reviews and film reviews

Unit IV Writing for Media **12**

- Writing for TV, Radio and Magazine, Freelance Writing, Preparation of Web Content.

Unit V Advertisement Writing **12**

- Types of advertising and advertising media, Writing techniques
- Ineffective advertisement, Code of ethics for advertisement Advertising and marketing.

Total 30 hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1 : Craft rhymes, free verse, jokes, and articles proficiently

CO2 :Create descriptive passages and short stories to exhibit their creative writing prowess.

CO3 : Write informative reviews and structured reports for diverse media.

CO4 : Create compelling content for various platforms, adhering to ethical standards in Advertising and marketing principles.

Text/Reference Books:

1. Creative Writing Log by Swan, published by Emerald in 2009.
2. Creative Writing by Isabelle Krishnan, published by Fairfield in 2013.
3. The Practice of Writing by David Lodge, published by Vintage in 2011.

24SBCS41 INDUSTRY ORIENTED EMPLOYABILITY SKILLS

(CAREER SKILLS)

L	T	P	O	C
1	0	2	1	2

COURSE OBJECTIVES

- To develop practical job search strategies, including resume writing and interviewing skills.
- To enhance communication and presentation skills for professional environments.
- To cultivate teamwork and collaboration abilities through group projects and activities.
- To build problem-solving and critical thinking skills applicable to real-world industry scenarios.
- To understand and adapt to workplace ethics, culture, and professional behaviour.

Unit I - Employee/Employer Expectations **6**

- Loyalty, Growth Chart
- Hierarchy – Escalation Matrix

Unit II - Current Affairs & GK **6**

- Technology, Sports
- National Politics
- International Affairs

Unit III - Job Preparedness **6**

- Bio-data, Resume, CV
- Social Media –Professional Presence (LinkedIn, FB, Instagram, Twitter)
- Cover Letter.

Unit IV - Interview Skills **6**

- Types of Interviews
- Dress Code & Attire
- Group Discussion
- Self Selling

Unit V - Practical & Project **6**

- Mock GD – Mock Interview
- Individual project presentation – viva voce

Total 30 hours

COURSE OUTCOMES:

At the end of this course, the students would have learnt to

CO1: Effectively create resumes and perform well in job interviews.

CO2: Demonstrate strong communication and presentation skills in professional settings.

CO3 : Efficiently in teams and collaborate on projects.

CO4 : Apply problem-solving and critical thinking skills to industry-related challenges.

CO5 : Understand and exhibit appropriate workplace ethics and professional behaviour.

Text/Reference Books:

1. "Cracking the Coding Interview: 189 Programming Questions and Solutions" by Gayle McDowell

2. "What to Say in Every Job Interview: Word-for-Word Scripts for Acing the Interview" by Don Georgevich

3. "The Art of Interviewing: How to Ace Your Next Job Interview" by Peter Roberts

24SBCS51 **ENTREPRENEURIAL DEVELOPMENT**

L	T	P	O	C
2	0	0	1	2

COURSE OBJECTIVES:

To enrich the students towards the knowledge of entrepreneurial skills and to make the students understand the approaches to attain the goals of the business.

Unit 1: Introduction to Entrepreneurship 6

Introduction, Concept of Entrepreneur, Entrepreneurship and Enterprise, Definition of Entrepreneurship, Objectives of Entrepreneurship Development, Phases of Entrepreneurship Development, Role of Entrepreneurship, The Entrepreneurial Mindset, Characteristics of Entrepreneurship, Traits of Entrepreneurship, Introduction to Entrepreneurship Skills

Unit 2: Entrepreneurship Development Skills 6

Meaning of Entrepreneurship skill, Types of Entrepreneurship Skills: Business management skills, Teamwork and leadership skills, Communication and listening, Customer service skills, Financial skills, Analytical and problem-solving skills, Critical thinking skills, Strategic thinking and planning skills, Technical skills, Time management and organizational skills, Branding, marketing and networking skills, How to improve entrepreneurial skills, Entrepreneurial skills in the workplace.

Unit 3: Types of Entrepreneurs 6

Classification and Types of Entrepreneurs; Women Entrepreneurs; Social Entrepreneurship; Corporate Entrepreneurs, Family Business: Concept, structure, and kinds of family firms; Culture and evolution of family firm; Managing Business.

Unit 4: Entrepreneur Project Development & Business Plan 6

Generation of Ideas-Innovation, Invention, Creativity, Business Idea and change. Idea generation. Kinds of Business Analysis-Concept of Environmental scanning and SWOT analysis. Business Planning Process-The business plan as an Entrepreneurial tool, scope and value of Business plan. Fundamental Elements of Business-Plan, Objectives, Market and Feasibility Analysis, Marketing, Finance, Organisation & Management and Ownership.

Unit 5: Mobilizing Resources 6

Resource Mobilization for entrepreneurship: Resources mobilization, types of resources, Process of resource mobilization, Arrangement of funds; writing a Funding Proposal, Traditional sources of financing, Venture capital, Angel investors, Business Incubators

Total: 30 Hours

COURSE OUTCOMES:

At the end of the course, a student will be able to

CO1 To Understand the concept of Entrepreneurship

CO2 To Identify, create and analyze entrepreneurial opportunities.

CO3 To Assess techno economic feasibility of a Business Plan

CO4 To Create Business Plans

CO5 To State various statutory institutions involved in the process of Entrepreneurship development

Text books:

1. Madhurima Lall and Sultan Ahmad (2021). Fundamentals of Entrepreneurship and Project Planning. S. Chand & Sons.
2. Bhatia. RC (2020). Entrepreneurship: Business and Management. S. Chand & Sons.
3. Nitin Zaware, Shilpa R Kankonkar and Yogesh S. Daudkhane (2019), Entrepreneurship Development. Thakur Publications Pvt. Ltd.

Web References:

1. https://openpress.usask.ca/entrepreneurshipandinnovationtoolkit/chapter/chapter-1-introduction- to-entrepreneurship/
2. https://articles.bplans.com/10-great-websites-for-entrepreneurs/
3. https://www.entrepreneur.com/article/272185

24SBCS61 **MINI PROJECT**

L	T	P	O	C
2	0	0	2	2

COURSE OBJECTIVES:

The objective of the mini project is to help the student develop the ability to apply theoretical and practical tools / techniques to solve real life problems related to industry academic institutions.

Students are to take up sample project development activities with the guidelines given below:

1. Preparing a project - brief proposal including:
   - Problem Identification
   - Developing a model for solving the problem
   - A statement of system / process specifications proposed to be developed (Data
   - FlowDiagram)
   - List of possible solutions including alternatives and constraints
   - Cost benefit analysis
   - Time line activities
2. A report highlighting the design finalization [based on functional requirements & standards(if any)]
3. A presentation including the following:
   - Implementation phase (Hardware / Software / both)
   - Testing & Validation of the developed system
   - Learning in the Project Consolidated report preparation.

Total: 30 Hours

COURSE OUTCOMES:

At the End of this Course, the Student will be able to:

CO-1: Create new project with Report:

CO-2: Evaluate project scope and Objectives.

CO-3: Analyze Software, Hardware and tools needed for the Project.

CO-4: Apply technical knowledge to solve project problem.

CO-5: Understand the implementation of Project



SUMMER INTERNSHIP

24IBCS31 **INTERNSHIP-I**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

The internship aims to:

1. Provide hands-on experience with software development, programming, and problem-solving.
2. Expose participants to real-world IT workflows, software life cycles, and project management.
3. Enhance understanding of core computer science domains such as data structures, algorithms, and system design.
4. Develop skills in emerging technologies like cloud computing, machine learning, and cybersecurity.
5. Build teamwork, communication, and technical documentation abilities.

COURSE MODULES

Module 1: Introduction to Software Development

- Overview of SDLC
- Tools for Software Development (e.g., Git, JIRA, IDEs)
- Agile and Scrum Methodologies

Module 2: Programming Fundamentals and Development

- Review of Core Programming Languages (C++, Java, Python, etc.)
- Hands-on: Developing Algorithms and Solving Problems
- Working with APIs and Libraries

Module 3: Web and Mobile Application Development

- Basics of Web Technologies (HTML, CSS, JavaScript)
- Backend Development (Node.js, Django, or Flask)
- Mobile App Development (Flutter or React Native)
- Hands-on: Developing a Full-Stack Application

Module 4: Data Structures and Algorithms

- Problem Solving with Data Structures (Arrays, Trees, Graphs, etc.)
- Algorithmic Techniques (Sorting, Searching, Dynamic Programming)

- Competitive Programming Exercises

Module 5: Database Design and Management

- Relational Databases (SQL) and NoSQL Databases (MongoDB)
- Database Modeling and Normalization
- Hands-on: Building and Querying Databases

Module 6: Emerging Technologies

- Basics of Cloud Computing (Azure, AWS, or Google Cloud)
- Introduction to Machine Learning and AI
- Cybersecurity Essentials
- Hands-on: Implementing Cloud or ML Features in a Project

Module 7: Final Project

- Selection of a Domain-Specific Problem (E.g., E-Commerce, IoT Integration)
- Team Collaboration and Milestone Planning
- Project Development, Testing, and Deployment
- Final Presentation and Documentation

Total: 15 Hours

COURSE OUTCOMES:

Upon completion of this internship, participants will be able to:

CO1:Apply computer science concepts to real-world problems effectively.

CO2: Develop, test, and deploy software applications.

CO3: Demonstrate proficiency in programming languages and frameworks used in the internship.

CO4: Understand and contribute to software development lifecycle (SDLC) processes.

CO5: Work collaboratively on team projects, using agile or other methodologies.

CO6: Present technical findings and document project outcomes effectively.

24IBCS51 **INTERNSHIP-II**

L	T	P	O	C
0	0	2	1	1

COURSE OBJECTIVES:

The internship aims to:

4. Provide hands-on experience with software development, programming, and problem-solving.
5. Expose participants to real-world IT workflows, software life cycles, and project management.
6. Enhance understanding of core computer science domains such as data structures, algorithms, and system design.
7. Develop skills in emerging technologies like cloud computing, machine learning, and cybersecurity.
8. Build teamwork, communication, and technical documentation abilities.

COURSE MODULES

Module 1: Introduction to Software Development

- Overview of SDLC
- Tools for Software Development (e.g., Git, JIRA, IDEs)
- Agile and Scrum Methodologies

Module 2: Programming Fundamentals and Development

- Review of Core Programming Languages (C++, Java, Python, etc.)
- Hands-on: Developing Algorithms and Solving Problems
- Working with APIs and Libraries

Module 3: Web and Mobile Application Development

- Basics of Web Technologies (HTML, CSS, JavaScript)
- Backend Development (Node.js, Django, or Flask)
- Mobile App Development (Flutter or React Native)
- Hands-on: Developing a Full-Stack Application

Module 4: Data Structures and Algorithms

- Problem Solving with Data Structures (Arrays, Trees, Graphs, etc.)

- Algorithmic Techniques (Sorting, Searching, Dynamic Programming)
- Competitive Programming Exercises

Module 5: Database Design and Management

- Relational Databases (SQL) and NoSQL Databases (MongoDB)
- Database Modeling and Normalization
- Hands-on: Building and Querying Databases

Module 6: Emerging Technologies

- Basics of Cloud Computing (Azure, AWS, or Google Cloud)
- Introduction to Machine Learning and AI
- Cybersecurity Essentials
- Hands-on: Implementing Cloud or ML Features in a Project

Module 7: Final Project

- Selection of a Domain-Specific Problem (E.g., E-Commerce, IoT Integration)
- Team Collaboration and Milestone Planning
- Project Development, Testing, and Deployment
- Final Presentation and Documentation

Total: 15 Hours

COURSE OUTCOMES:

Upon completion of this internship, participants will be able to:

CO1:Apply computer science concepts to real-world problems effectively.

CO2: Develop, test, and deploy software applications.

CO3: Demonstrate proficiency in programming languages and frameworks used in the internship.

CO4: Understand and contribute to software development lifecycle (SDLC) processes.

CO5: Work collaboratively on team projects, using agile or other methodologies.

CO6: Present technical findings and document project outcomes effectively.



RESEARCH PROJECT

24RBCS71 **RESEARCH PROJECT-I**

L	T	P	O	C
0	0	12	2	6

COURSE OBJECTIVES

The research projects program aims to:

1. Equip students with the ability to conduct independent and team-based research.
2. Develop skills in identifying, formulating, and solving complex research problems.
3. Enhance proficiency in research methodologies, tools, and techniques.
4. Foster critical thinking, innovation, and analytical reasoning.
5. Prepare students to publish and present their findings in academic or industrial forums.

COURSE MODULES

Module 1: Introduction to Research

- Understanding Research in Computer Science
- Types of Research: Exploratory, Descriptive, and Experimental
- Importance of Problem Identification and Research Questions

Module 2: Literature Review and Gap Analysis

- Techniques for Conducting a Literature Review
- Tools for Reference Management (e.g., Zotero, Mendeley)
- Identifying Gaps and Formulating Objectives

Module 3: Research Methodology

- Qualitative vs. Quantitative Research
- Data Collection Techniques (Surveys, Experiments, Simulations)
- Research Tools and Platforms (MATLAB, R, Python)

Module 4: Proposal Development

- Writing a Research Proposal
- Setting Goals, Deliverables, and Milestones
- Ethical Guidelines and Considerations

Module 5: Implementation and Experimentation

- Designing and Conducting Experiments
- Data Analysis and Interpretation
- Tools for Data Visualization (Tableau, matplotlib, Power BI)

Module 6: Documentation and Reporting

- Structuring Research Papers (Abstract, Introduction, Methods, Results, Conclusion)

- Writing Technical Reports and Presentations
- Formatting and Publishing in Journals/Conferences

Module 7: Final Project Presentation

- Developing Final Deliverables (Prototype, Model, or Software)
- Presentation to Peers and Evaluators
- Peer Reviews and Feedback Integration

Total: 180 Hours

COURSE OUTCOMES

Upon completing the research project course, students will be able to:

1. Identify and define research problems within a domain of interest.
2. Conduct thorough literature reviews and gap analyses.
3. Apply appropriate research methodologies and tools to explore solutions.
4. Develop and test hypotheses or prototypes based on research objectives.
5. Analyze and interpret research data effectively.
6. Present findings through well-structured reports, presentations, or publications.
7. Understand ethical considerations in research and intellectual property rights.
8. Collaborate effectively with peers and mentors to achieve research objectives.

24RBCS81 **RESEARCH PROJECT-II**

L	T	P	O	C
0	0	12	2	6

COURSE OBJECTIVES

The research projects program aims to:

6. Equip students with the ability to conduct independent and team-based research.
7. Develop skills in identifying, formulating, and solving complex research problems.
8. Enhance proficiency in research methodologies, tools, and techniques.
9. Foster critical thinking, innovation, and analytical reasoning.
10. Prepare students to publish and present their findings in academic or industrial forums.

COURSE MODULES

Module 1: Introduction to Research

- Understanding Research in Computer Science
- Types of Research: Exploratory, Descriptive, and Experimental
- Importance of Problem Identification and Research Questions

Module 2: Literature Review and Gap Analysis

- Techniques for Conducting a Literature Review
- Tools for Reference Management (e.g., Zotero, Mendeley)
- Identifying Gaps and Formulating Objectives

Module 3: Research Methodology

- Qualitative vs. Quantitative Research
- Data Collection Techniques (Surveys, Experiments, Simulations)
- Research Tools and Platforms (MATLAB, R, Python)

Module 4: Proposal Development

- Writing a Research Proposal
- Setting Goals, Deliverables, and Milestones
- Ethical Guidelines and Considerations

Module 5: Implementation and Experimentation

- Designing and Conducting Experiments
- Data Analysis and Interpretation
- Tools for Data Visualization (Tableau, matplotlib, Power BI)

Module 6: Documentation and Reporting

- Structuring Research Papers (Abstract, Introduction, Methods, Results, Conclusion)

- Writing Technical Reports and Presentations
- Formatting and Publishing in Journals/Conferences

Module 7: Final Project Presentation

- Developing Final Deliverables (Prototype, Model, or Software)
- Presentation to Peers and Evaluators
- Peer Reviews and Feedback Integration

Total: 180 Hours

COURSE OUTCOMES

Upon completing the research project course, students will be able to:

9. Identify and define research problems within a domain of interest.
10. Conduct thorough literature reviews and gap analyses.
11. Apply appropriate research methodologies and tools to explore solutions.
12. Develop and test hypotheses or prototypes based on research objectives.
13. Analyze and interpret research data effectively.
14. Present findings through well-structured reports, presentations, or publications.
15. Understand ethical considerations in research and intellectual property rights.
16. Collaborate effectively with peers and mentors to achieve research objectives.