



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi and Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi and Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry



SCHOOL OF ARTS AND SCIENCE

BACHELOR OF COMPUTER APPLICATIONS

ACADEMIC REGULATIONS

2020(R-2020)

CURRICULUM AND SYLLABI

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

M1: Quality Education:

To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation:

To foster value based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship:

To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values:

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT OF COMPUTATIONAL STUDIES

VISION AND MISSION

Vision:

To come up with successfully as a high-quality human capital in Computer Science and related areas for the sustainable growth of the IT industry needs of the country.

Mission:

M1: Innovative Skills:

Ensuring deeper understanding of fundamentals and acquiring innovative skills within core areas of Computer Science.

M2: Motivated Graduates:

Producing highly skilled and motivated graduates with the ability of problem solving individually and in teams.

M3: Ethical Responsibilities:

Providing a deep awareness of our ethical responsibilities to our profession and to the society.



STRUCTURE FOR UNDERGRADUATE PROGRAMME

Sl. No	Course Category	Breakdown of Credits
1	Language	6
2	English	6
3	Discipline Specific Core Courses (DSC)	80
4	Discipline Specific Elective Courses (DSE)	12
5	Inter-Disciplinary C o r e courses (IDC)	16
6	Skill Enhancement Courses (SEC)	12
7	Employability Enhancement Courses (EEC*)	-
8	Ability Enhancement Compulsory Courses (AECC)	4
9	Open Elective (OE)	4
10	Extension Activity (EA)	1
Total		141

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	Course Category	Credits per Semester						Total Credits
		I	II	III	IV	V	VI	
1	Language Modern Indian Language (MIL)	3	3	-	-	-	-	6
2	English (ENG)	3	3	-	-	-	-	6
3	Discipline Specific Core Courses (DSC)	12	12	12	12	18	14	80
4	Discipline Specific Elective Courses (DSE)	-	-	3	3	3	3	12
5	Inter-Disciplinary courses (IDC)	4	4	4	4	-	-	16
6	Skill Enhancement Courses (SEC)	2	2	2	2	2	2	12
7	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-
8	Ability Enhancement Compulsory Courses (AECC)	2	2	-	-	-	-	4
9	Open Elective (OE)	-	-	2	2	-	-	4
10	Extension Activity (EA)	-	1	-	-	-	-	1
Total		26	27	23	23	23	19	141

* EEC will not be included for the computation of "Total of credits" as well as "CGPA" calculation

SEMESTER – I										
S. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT101 / A20HNT101 / A20FRT101	Tamil - I / Hindi – I / French – I	MIL	3	0	0	3	25	75	100
2	A20GET101	General English – I	ENG	3	0	0	3	25	75	100
3	A20CAT101	Problem Solving using C	DSC	4	0	0	4	25	75	100
4	A20CAT102	Digital Logic and Computer Organization	DSC	4	0	0	4	25	75	100
5	A20CAD101	Computational Mathematics	IDC	3	1	0	4	25	75	100
Ability Enhancement and Compulsory Course										
6	A20AET101	Environmental Studies	AECC	2	0	0	2	100	0	100
Practical										
7	A20CAL101	Programming in C Lab	DSC	0	0	4	2	50	50	100
8	A20CAL102	Digital Lab	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20CAS101	Communication Skills Lab	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
10	A20CAC101	Web Programming	EEC	0	0	4	0	100	0	100
							26	525	475	1000

SEMESTER – II										
S. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT202 / A20HNT202/ A20FRT202	Tamil - II / Hindi – II / French – II	MIL	3	0	0	3	25	75	100
2	A20GET202	General English-II	ENG	3	0	0	3	25	75	100
3	A20CAT203	Java Programming	DSC	4	0	0	4	25	75	100
4	A20CAT204	Data Structures and Algorithms	DSC	4	0	0	4	25	75	100
5	A20CAD202	Numerical Methods and Statistics	IDC	3	1	0	4	25	75	100
Ability Enhancement and Compulsory Course										
6	A20AET202	Public Administration	AECC	2	0	0	2	100	0	100
Practical										
7	A20CAL203	Java Programming Lab	DSC	0	0	4	2	50	50	100
8	A20CAL204	Data Structures Lab	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20CAS202	Quantitative Aptitude and Logical Reasoning	SEC	0	0	4	2	100	0	100
Extension Activities										
10	A20EAL201	National Service Scheme	EA	0	0	2	1	50	0	50
Employment Enhancement Course										
11	A20CAC202	Java Programming	EEC	0	0	4	0	100	0	100
							27	575	475	1050
SEMESTER – III										
S. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20CAT305	Python Programming	DSC	4	0	0	4	25	75	100
2	A20CAT306	Computer Networks	DSC	4	0	0	4	25	75	100
3	A20CAE3XX	Discipline Specific Elective – I	DSE	3	0	0	3	25	75	100
4	A20CAD303	Financial and Management Accounting - I	IDC	3	1	0	4	25	75	100
5	A20XXO3XX	Open Elective – I	OE	2	0	0	2	25	75	100
Practical Python Programming Lab										
6	A20CAL305	Python and Network Programming Lab	DSC	0	0	4	2	50	50	100
7	A20CAD304	Accounting Software Lab	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20CAS303	Android App Development	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20CAC303	Mobile Application Development	EEC	0	0	4	0	100	0	100
							23	425	475	900

SEMESTER – IV										
S. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20CAT407	Operating Systems	DSC	4	0	0	4	25	75	100
2	A20CAT408	Data Base Management Systems	DSC	4	0	0	4	25	75	100
3	A20CAE4XX	Discipline Specific Elective– II	DSE	4	0	0	3	25	75	100
4	A20CAD404	Financial and Management Accounting – II	IDC	3	0	0	4	25	75	100
5	A20XXO4XX	Open Elective – II	OE	2	0	0	2	25	75	100
Practical										
6	A20CAL407	Operating Systems Lab	DSC	0	0	4	2	50	50	100
7	A20CAL408	DBMS Lab	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20CAS404	Office Automation Tools	SEC	0	0	2	2	100	0	100
Employment Enhancement Course										
9	A20CAC404	RDBMS	EEC	-	-	4	-	100	-	100
							23	425	475	900

SEMESTER – V										
S. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20CAT509	Web Technology	DSC	4	0	0	4	25	75	100
2	A20CAT510	Software Engineering	DSC	4	0	0	4	25	75	100
3	A20CAT511	Cloud Computing	DSC	3	0	0	3	25	75	100
4	A20CAT512	Artificial Intelligence	DSC	3	0	0	3	25	75	100
5	A20CAE5XX	Discipline Specific Elective–III	DSE	3	0	0	3	25	75	100
Practical										
6	A20CAL509	Web Technology Lab	DSC	0	0	4	2	50	50	100
7	A20CAP501	Mini Project(Java/Python/Web)	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20CAS505	Entrepreneurial Skills	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20CAC505	angularJS	EEC	0	0	4	0	100	0	100
							23	425	475	900

SEMESTER – VI										
S.No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20CAT613	Block chain Technology	DSC	3	0	0	3	25	75	100
2	A20CAT614	Internet of Things	DSC	3	0	0	3	25	75	100
3	A20CAT615	.Net Framework	DSC	3	0	0	3	25	75	100
4	A20CAE6XX	Discipline Specific Elective –IV	DSE	3	0	0	3	25	75	100
Practical										
5	A20CAP602	Project Work& Viva-voce	DSC	0	0	10	5	40	60	100
Skill Enhancement Course										
6	A20CAS606	Research Methodology	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
7	A20CAC606	Data science	EEC	0	0	4	0	100	0	100
							19	340	360	700

Annexure – I
DISCIPLINE SPECIFIC ELECTIVE COURSES

ELECTIVES										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Discipline Specific Elective (DSE - I) – offered in Third Semester										
1	A20CAE301	Data Mining and Warehousing	DSE	3	-	-	3	25	75	100
2	A20CAE302	Introduction to Data Science using Hadoop	DSE	3	-	-	3	25	75	100
3	A20CAE303	Computer Graphics and Multimedia	DSE	3	-	-	3	25	75	100
4	A20CAE304	Information Security	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - II) – offered in Fourth Semester										
1	A20CAE405	MANET	DSE	3	-	-	3	25	75	100
2	A20CAE406	Python for Data Science	DSE	3	-	-	3	25	75	100
3	A20CAE407	Image Processing	DSE	3	-	-	3	25	75	100
4	A20CAE408	Ethical Hacking	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - III) – offered in Fifth Semester										
1	A20CAE509	Wireless Sensor Network	DSE	3	-	-	3	25	75	100
2	A20CAE510	Data Science using R	DSE	3	-	-	3	25	75	100
3	A20CAE511	Animations and Game Development	DSE	3	-	-	3	25	75	100
4	A20CAE512	Cyber Security and Digital Forensics	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - IV) – offered in Sixth Semester										
1	A20CAE613	Client Server Technology	DSE	3	-	-	3	25	75	100
2	A20CAE614	Data Visualization using MATLAB	DSE	3	-	-	3	25	75	100
3	A20CAE615	Virtual Reality and Augmented Reality	DSE	3	-	-	3	25	75	100
4	A20CAE616	Security in Wireless Sensor Networks	DSE	3	-	-	3	25	75	100




Annexure – II
OPEN ELECTIVE COURSES

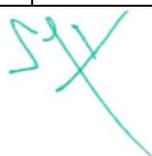
COMPLETE LIST OF OPEN ELECTIVES OFFERED BY ALL THE DEPARTMENTS

Open Elective – I (Offered in Semester III)				
Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO301	Boon and Bane of Microbes	Bioscience	Chemistry, Food Science, Physics
2	A20BTO302	Microbial Technology for Entrepreneurship	Bioscience	Chemistry, Food Science, Physics
3	A20BTO303	Origin of Life	Bioscience	Chemistry, Food Science, Physics
4	A20CHO304	Food Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
5	A20CHO305	Molecules of Life (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
6	A20CHO306	Water Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
7	A20CMO307	Fundamentals of Accounting and Finance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
8	A20CMO308	Fundamentals of Management	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
9	A20CMO309	Fundamentals of Marketing	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
10	A20CPO310	Data Structures	Computational Studies	Mathematics
11	A20CPO311	Programming in C	Computational Studies	Commerce and Management, Mathematics, Media Studies
12	A20CPO312	Programming in Python	Computational Studies	Commerce and Management, Mathematics, Media Studies
13	A20ENO313	Conversational Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
14	A20ENO314	Fine-tune your English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics




Academic Curriculum and Syllabi R-2020

15	A20ENO315	Interpersonal Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO316	Mathematical Modelling	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
17	A20MAO317	Quantitative Aptitude - I	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO318	Statistical Methods	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO319	Event Management	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO320	Graphic Design	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
21	A20VCO321	Role of social media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
22	A20NDO322	Basic Food Groups	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO323	Life Style Management	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
24	A20NDO324	Nutritive Value of Foods	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO325	Astrophysics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
26	A20PHO326	Basic of Modern Communication System	Physics	Bioscience, Chemistry, Computational Studies,

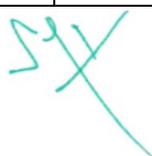



Academic Curriculum and Syllabi R-2020

				Mathematics, Media Studies
27	A20PHO327	Bio-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
28	A20TMO328	அடிப்படைத்தமிழ்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO329	வாழ்வியல் இலக்கணம்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
30	A20TMO330	புதுக்கவிதைப் பட்டறை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics

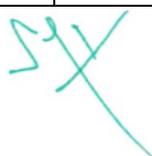
Open Elective – II (Offered in Semester IV)

Sl. No.	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO401	Fermented Food	Bioscience	Chemistry, Food Science, Physics
2	A20BTO402	Herbal Technology	Bioscience	Chemistry, Food Science, Physics
3	A20BTO403	Self-Hygiene	Bioscience	Chemistry, Food Science, Physics
4	A20CHO404	C++ Programming and its Application to Chemistry	Chemistry	Computational Studies, Mathematics, Physics
5	A20CHO405	Computational Chemistry Practical	Chemistry	Computational Studies, Mathematics, Physics
6	A20CHO406	Instrumental Methods of Analysis	Chemistry	Computational Studies, Mathematics, Physics
7	A20CMO407	Essential Legal Awareness	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
8	A20CMO408	Essentials of Insurance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics




Academic Curriculum and Syllabi R-2020

9	A20CMO409	Practical Banking	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
10	A20CPO410	Database Management Systems	Computational Studies	Commerce and Management, Media Studies, Mathematics
11	A20CPO411	Introduction to Data Science using Python	Computational Studies	Chemistry, Commerce and Management, English, Media Studies, Mathematics, Physics
12	A20CPO412	Web Development	Computational Studies	Commerce and Management, Media Studies, Mathematics
13	A20ENO413	English for Competitive Exam	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
14	A20ENO414	English Next-India	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
15	A20ENO415	Functional English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO416	Discrete mathematics	Mathematics	Chemistry, Computational Studies, Physics
17	A20MAO417	Operations Research	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO418	Quantitative Aptitude - II	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO419	Basics of News Reporting	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO420	Scripting for media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics,




				Physics
21	A20VCO421	Video Editing	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
22	A20NDO422	Food Labelling	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO423	Hygiene and Sanitation	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
24	A20NDO424	Nutrition for Adolescent	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO425	Digital Electronics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
26	A20PHO426	Geo-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
27	A20PHO427	Space Science	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
28	A20TMO428	சிறுகதைப் பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO429	செய்தி வாசிப்பு பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science,

Academic Curriculum and Syllabi R-2020

				Mathematics, Media Studies, Physics
30	A20TMO430	நிகழ்த்துக்கலை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics



Bachelor of Computer Applications



மொழித்தாள்
தமிழ் - I
(B.A., B.Sc., B.Com., B.B.A. & B.C.A., பாடப்பிரிவுகளுக்குமான பொதுத்தாள்)

A20TAT101

L T P C Hrs
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பாடத்திட்டத்தின் நோக்கம்

- இரண்டாயிரம் ஆண்டுகால தமிழின் தொன்மையையும் வரலாற்றையும் அதன் விழுமியங்களையும் பண்பாட்டையும் எடுத்துரைப்பதாக இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.
- தமிழ் இலக்கியம் உள்ளடக்கத்திலும், வடிவத்திலும் பெற்ற மாற்றங்கள், அதன் சிந்தனைகள், அடையாளங்கள் ஆகியவற்றை காலந்தோறும் எழுதப்பட்ட இலக்கியங்களின் வழியாகக் கூறுவதற்கு இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.
- மொழியின் கட்டமைப்பைப் புரிந்துகொள்வதற்கு ஏதுவாக பாடத்திட்டம் வடிவமைக்கப்பட்டுள்ளது.
- வாழ்வியல் சிந்தனைகள், ஒழுக்கவியல் கோட்பாடுகள், சமத்துவம், சூழலியல் எனப் பல கூறுகளை மாணவர்களுக்கு எடுத்துரைக்கும் விதத்தில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது.
- சிந்தனை ஆற்றலைப் பெருக்குவதற்குத் தாய்மொழியின் பாங்களிப்பினை உணர்த்த இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.

பாடத்திட்டத்தின் வெளிப்பாடுகள்

- CO1- இலக்கியங்கள் காட்டும் வாழ்வியல் நெறிமுறைகளைப் பேணிநடத்தல்.
CO2 - நமது எண்ணத்தை வெளிப்படுத்தும் கருவியாகத் தாய்மொழியைப் பயன்படுத்துதல்.
CO3 - தகவல் தொடர்புக்குத் தாய்மொழியின் முக்கியத்துவத்தை உணர்தல்.
CO4 - தாய்மொழியின் சிறப்பை அறிதல்.
CO5 - இலக்கிய இன்பங்களை நுகரும் திறன்களை வளர்த்தல்.

அலகு-1

(9 Hrs)

இக்காலக் கவிதைகள்-1

- | | | |
|--------------------|---|----------------------------------|
| 1. பாரதியார் | - | கண்ணன் என் சேவகன் |
| 2. பாரதிதாசன் | - | தமிழ்ப்பேறு |
| 3. அத்துல் ரகுமான் | - | அவதாரம் |
| 4. மீரா | - | கனவுகள் + கற்பனைகள் = காசிதங்கள் |
| 5. து.நரசிம்மன் | - | மன்னித்துவிடு மகனே |

அலகு-2

(9 Hrs)

இக்காலக் கவிதைகள்-2

- | | | |
|----------------------|---|--------------------------------|
| 1. ராஜா சந்திரசேகர் | - | கைவிடப்பட்ட குழந்தை |
| 2. அனார் | - | மேலும் சில இரத்தக் குறிய்புகள் |
| 3. சுகிர்தராணி | - | அம்மா |
| 4. நா.முத்துக்குமார் | - | தூர் |

அலகு-3

(9 Hrs)

சிற்பிலக்கியங்கள்

- | | | |
|-------------------------|---|---------------------------------------|
| 1. கலிங்கத்துப் பரணி | - | பொருடக்கை வாள் எங்கே... (பாடல்-485) |
| 2. அழகர்கிள்ளைவிடு தூது | - | இதமாய் மனிதருடனே... (பாடல்-45) |
| 3. நந்திக் கலம்பகம் | - | அம்பொன்று வில்லொடிதெல்... (பாடல்-77) |
| 4. முக்சுடற் பள்ளு | - | பாயும் மருதஞ் செழிக்கவே... (பாடல்-47) |
| 5. குற்றாலக் குறவஞ்சி | - | ஓடக் காண்பதுமே... (பாடல்-9) |

காப்பியங்கள்

மணிமேகலை-உலகறவி புக்க காதை- 'மாகஇல் வால்ஒளி! - இந்நாள் போலும் இளங்கொடி கெடுத்தனை'. (28-அடிகள்)

Bachelor of Computer Applications

அலகு-4

(9 Hrs)

தமிழ் இலக்கிய வரலாறு

1. சிற்றிலக்கியம்- தோற்றமும் வளர்ச்சியும்
2. புதுக்கவிதை- தோற்றமும் வளர்ச்சியும்
3. சிறுகதை -தோற்றமும் வளர்ச்சியும்
4. புதினம் -தோற்றமும் வளர்ச்சியும்
5. உரைநடை - தோற்றமும் வளர்ச்சியும்

அலகு 5

(9 Hrs)

மொழிப்பயிற்சி

1. கலைச்சொல்லாக்கம்
2. அகரவரிசைப்படுத்துதல்
3. மரபுத்தொடர்/பழமொழி
4. கலை விமர்சனம்
5. நேர்காணல்

உரைநடைப் பகுதி

1. உ.வே.சாமிநாதையர் - சிவதருமோத்திரச் சுவடி பெற்ற வரலாறு.
2. தஞ்சாவூர் - கஜாவின கோபம்.
3. இரா. பச்சியப்பன் - மாடல்ல மற்றையவை.

பார்வை நூல்கள்

1. கைலாசபதி, க., தமிழ் நாவல் இலக்கியம், குமரன் பதிப்பகம், வடபுலனி, 1968.
2. சுந்தரராஜன், பே.கோ. சிவபாதசுந்தரம். சோ., தமிழில் சிறுகதை வரலாறும் வளர்ச்சியும், கரியா, சென்னை, 1989.
3. பரந்தாமனார், அ.கி., நல்ல தமிழ் எழுத வேண்டுமா, பாரி நிலையம், சென்னை, 1998.
4. பாக்கியமேரி, வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, என்.சி.எச். பதிப்பகம், சென்னை, 2011.
5. வல்லிக்கண்ணன், புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும், அன்னம், சிவகங்கை, 1992.

உரைநடை நூல்கள் :

1. சக்திவேல், சு., தமிழ் மொழி வரலாறு, மாணிக்கவாசகர் பதிப்பகம், சிதம்பரம், 1988.
2. சிற்பி பாலசுப்ரமணியம் மற்றும் நீலபத்மநாபன், புதிய தமிழ் இலக்கிய வரலாறு, தொகுதி-1, 2, 3, சாகித்திய அகாதமி, புதுவடல்லை, 2013.
3. பாரதியார், பாரதியார் கவிதைகள், குமரன் பதிப்பகம், சென்னை, 2011.

இணையத்தளங்கள் :

<http://www.tamilkodal.com>
<http://www.languageelab.com>
<http://www.tamilweb.com>




A20FRT101	FRENCH - I (Common to B.A., B.Sc., B.Com., B.B.A. & B.C.A)	L	T	P	C	Hrs
		3	0	0	3	45

OBJECTIVES

- To enable the students read, understand, and write simple sentences.
- To grasp relevant grammar for communication
- To learn about the land, people and culture of France.

UNITÉ - 1

Je m'appelle Elise. Et Vous ?

Vous Dansez ? D'accord

Monica, Yukiko et compagnie

UNITÉ - 2

Les Voisins de Sophie

Tu vas au Luxembourg ?

UNITÉ - 3

Nous Venons pour l'inscription

A Vélo, en tain, en avoin

Pardon, monsieur, le BHV s'il vous plait ?

UNITÉ - 4

Au marche

On déjeune ici ?

UNITÉ - 5

On va chez ma copine ?

Chez Susana

TextBook

Prescribed Textbook : *FESTIVAL 1* - Méthode de Français

Authors : Sylvie POISSON-QUINTON

Michèle MAHEO-LE COADIC

Anne VERGNE-SIRIEYS

Edition : CLE International, Nouvelle Édition révisée : 2009.

Reference Book : Festival 1

A20GET101	GENERAL ENGLISH I (Common to B.A., B.C.A. and B.Sc.)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To recognize the rhythms, metrics and other musical aspects of poetry
- To read a variety of texts critically and proficiently
- To enable the students to enjoy the flair of literature through the work of great writer
- To make the students to know the functions of basic grammar and frame sentences without grammatical error
- To enable them understanding the intrinsic nuances of writing in English language

Course Outcomes

After the completion of this course, the students will be able to **CO1** - Comprehend and discuss the various facets of selected poems. **CO2** - Analyze and interpret texts written in English.

CO3 - Read drama with graduate-level interpretive and analytical proficiency. **CO4** - Improve the fluency and formation of grammatically correct sentence. **CO5** - Enhance the writing skills for specific purposes.

UNIT I POETRY (9 Hrs)

1. John Milton: On His Blindness
2. William Wordsworth: Daffodils
3. Percy Bysshe Shelly: Ozymandias
4. Emily Dickinson: Because I could not stop for Death
5. Sarojini Naidu: The Queen's Rival

UNIT II PROSE (9 Hrs)

1. Francis Bacon: Of Love
2. Charles Lamb: A Dissertation upon Roast Pig

UNIT III DRAMA (9 Hrs)

1. Oscar Wilde: Lady Windermere's Fan

UNIT IV GRAMMAR (9 Hrs)

1. Parts of Speech
2. Tenses
3. Subject-Verb Agreement

UNIT V COMPOSITION (9 Hrs)

1. Essay Writing
2. Email



Text Books

1. "Brookside Musings: A Selection of Poems and Short Stories: Board of Editors", Orient Longman Limited, 2009
2. Wilde Oscar, "Lady Windermere's Fan. Published in The Importance of Being Earnest and Other Plays" London: Penguin, 1940. ISBN 0-14-048209-1.
3. Gale, Emily Dickinson's Because I could not stop for Death, Cengage Learning, 2015

Reference Books

1. Lalitha Natarajan and Sasikala Natesan, "English for Excellence: Poetry", Anuradha Publications, 2015
2. "Literary Pursuits: Board of Editors", Orient Longman Limited, 2015
3. "Literary Pinnacles: An Anthology of Prose and Poetry. Board of Editors", Orient Longman Limited, 2015
4. "The Approach to Life: A Selection of English Prose", Orient Longman Limited, 2009
5. JeetThayil, "60 Indian Poets", Penguin Books, 2008

Web References

1. <https://poets.org/poem/because-i-could-not-stop-death-479>
2. <https://www.enotes.com/topics/an-astrologers-day>
3. <https://www.poetryfoundation.org/poems/46565/ozymandias>
4. <https://www.dltk-holidays.com/spring/poem/daffodils.htm>
5. <https://www.bartleby.com/4/313.html>



A20CAT101	PROBLEM SOLVING USING C (Common to B.Sc. CS and B.C.A)	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study the basic terminologies of C language and arrays
- To understand the Functions, Structures and Unions.
- To understand the concepts of Pointers.
- To study about File Management Operations in C.

Course Outcomes

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

CO1 – Develop simple applications in C using basic constructs.

CO2 – Incorporating the use of sequential, selection and repetition control structures into a program.

CO3 – Develop simple programs using functions, structures and unions.

CO4 – Design and develop programs using Pointers.

CO5 – Understand the File management Operations and Pre-processor Directives.

UNIT I INTRODUCTION TO C

(12 Hrs)

Fundamentals of Computer: Computer Definition – Block Diagram of Computer – Types of Computer – Characteristics of Computer – Applications of Computer. C programming: Overview of C – Constants – Compiling a C Program - Variables and Data Types-Technical Difference between Keywords and Identifiers-Types of C Qualifiers and format specifiers - Operators and Expressions-Operators Precedence-Type conversion-Input-Output Statements.

UNIT II DECISION MAKING

(12 Hrs)

Decision making and branching - Relational operators – Logical operators – if – if else-if else if –nested if, Switch-case.

UNIT III LOOPING AND ARRAYS

(12 Hrs)

Looping: while - do while – for – break – continue - nested loop. Arrays: One Dimensional Arrays-Two-Dimensional Arrays-Multi-Dimensional Array-Dynamic arrays-Character Arrays and String-Sorting - Searching.

UNIT IV FUNCTIONS, POINTERS

(12 Hrs)

Functions: Introduction - Definition – Declaration – Categories of Functions - Nesting of Functions, Recursive functions - Passing Arrays to Functions - Strings – String library function. Pointers: Introduction - Declaring Pointer Variables - Initialization of Pointer Variables - Accessing the address of a variable - Accessing a variable through Pointer - Chain of Pointers - Pointer Expressions - Pointers and arrays – Pointers and functions – Call by Reference - Pointers and character strings - Array of Pointers - Pointers and Structures.

UNIT V STRUCTURES AND UNIONS, FILE MANAGEMENT

(12 Hrs)

User defined data types: Introduction – Structure: definition - declaration - Arrays of Structures – Nested structures –Passing structures to functions – Union - Enumeration and Typedef. Introduction to File Handling in C, Input and Output operations on a file – Error Handling - Random access to files – command line arguments. Introduction to pre- processor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8th Edition, 2019.
2. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, 4th Edition, New Delhi, 2015.
3. Herbert Schildt, "C: The Complete Reference", McGraw Hill, 4th Edition, 2014.
4. YashwantKanetkar, "Let us C", BPB Publications, 16th Edition, 2017.
5. Archana Kumar, "Computer Basics with Office Automation", Dreamtech Press – Wiley Publisher, 2019.
6. ReemaThareja, "Fundamentals of Computing & C Programming" Oxford University Press, 2012.

Reference Books

1. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2012.
2. VikasVerma, "A Workbook on C ", Cengage Learning, 2rd Edition, 2012.
3. Dr. P. Rizwan Ahmed, "Office Automation", Margham Publications, 2016.
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", 4th Edition, Sri Krishna Publications, 2012.
5. PradipDev, ManasGhoush, "Programming in C", 2rd Edition, Oxford University Press, 2011.

Web References

1. <https://www.programiz.com/c-programming>
2. <https://www.geeksforgeeks.org/c-language-set-1-introduction/>
3. <https://www.tutorialspoint.com/cprogramming>
4. <https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c>
5. <https://nptel.ac.in/courses/106/104/106104128/>
6. <https://www.coursera.org/courses?query=c%20programming>
7. <https://www.udemy.com/course/c-programming-for-beginners-/>



A20CAT102	DIGITAL LOGIC AND COMPUTER ORGANIZATION (Common to B.Sc. CS and B.C.A)	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives:

- To understand the basic concepts of Digital design and number systems.
- To expose with the Combinational circuits
- To expose with the Sequential circuits
- To study the fundamentals of Computer systems.
- To be familiar with the memory organization and CPU in a computer systems.

Course Outcomes:

After the completion of this course, the students will be able to:

- CO1** – Explain the concepts of Digital design and number systems.
CO2 – Design the digital system using combinational system design.
CO3 – Design the digital system using Sequential system design.
CO4 – Explain fundamentals of Computer systems.
CO5 – Explain memory organization and CPU in a computer system.

UNIT I INTRODUCTION TO DIGITAL DESIGN (12 Hrs)

Data Representation - Data Types - Number Systems - Complements - Arithmetic Operations - Representations - Fixed Point, Floating Point - Error detection codes - Binary Codes- Logic Gates - Boolean Algebra - Map Simplification- Karnaugh maps: SOP and POS forms - QuineMcClusky method

UNIT II COMBINATIONAL CIRCUIT DESIGN (12 Hrs)

Combinational Circuits, Half adder - full adder - code converters - combinational circuit design - Multiplexers and demultiplexers – encoders – decoders - Combinational design using MUX and DE-MUX.

UNIT III SEQUENTIAL CIRCUIT DESIGN (12 Hrs)

Sequential Circuit Design, Flip flops (RS, Clocked RS, D, JK, JK Master Slave, T) - Counters - Shift registers and their types - Counters: Synchronous and Asynchronous counters.

UNIT IV COMPUTER ORGANIZATION (12 Hrs)

Instruction Codes - Computer Registers - Computer Instructions - Timing And Control - Instruction Cycle - Memory Reference Instructions - I/O And Interrupt — Machine Language — Assembly Language - Assembler - Peripheral Devices - Input-Output Interface - Asynchronous Data Transfer - Modes of Transfer - Priority Interrupt - DMA - IOP - Serial Communication

UNIT V MEMORY ORGANIZATION AND CPU (12 Hrs)

Memory Hierarchy - Main Memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual Memory - Memory Management Hardware - CPU: General Register Organization - Control Word - Stack Organization - Instruction Format - Addressing Modes - Data Transfer And Manipulation - Program Control.

Text Books

1. Morris Mano M, "Digital Logic and Computer Design", Pearson Education, 4th edition, 2014
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th edition, McGraw Hill, 2002.
3. V.Rajaraman, T. Radhakrishnan, "Digital Logic and Computer Design", PHI Learning, 2006.




Reference Books

1. B Ram, Computer Fundamentals: Architecture and Organization (TWO COLOUR EDITION), New Age International (P) Ltd Publishers, 6th Edition 2020.
2. FLOYD, Digital Fundamentals, PEARSON INDIA, 11th Edition.
3. Alan B. Marcovitz, "Introduction to Logic design", Tata Mcgraw Hill, 2rd Edition, 2005.

Web References

1. <https://www.sanfoundry.com/best-reference-books-computer-organization-architecture/>
2. <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>
3. https://www.tutorialspoint.com/computer_logical_organization/index.htm



A20CAD101	COMPUTATIONAL MATHEMATICS (Common to B.Sc. CS and B.C.A.)	L	T	P	C	Hrs
		4	0	0	4	60

Course objectives

- To develop the use of matrix algebra techniques for practical applications.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To learn the different concepts of topics in Probability.
- To learn the different concepts of topics in statistics.

Course Outcomes

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

CO1 – Acquire the knowledge about matrices and able to compute Eigen values and Eigen.

CO2 – Analyze and solve Differential Equations.

CO3 – Understand the use of Integrals and able to apply it.

CO4 – Understand the use probability.

CO5 – Understand the use Statistics.

UNIT I MATRICES**(12 Hrs)**

Rank of a Matrix- Consistency of system of equations. Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigenvectors. Cayley - Hamilton Theorem - Diagonalization of matrices- Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

UNIT II DIFFERENTIAL EQUATIONS**(12 Hrs)**

Linear differential equations of higher order - with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method

UNIT III INTEGRALS AND APPLICATIONS**(12 Hrs)**

Double Integrals and Triple Integrals-Applications: Areas by double integration and volumes by triple integration.

UNIT IV PROBABILITY**(12 Hrs)**

Discrete Random variable: Introduction Random variables and their event spaces The probability Mass function. Distribution functions Special discrete distributions: The Bernoulli PMF. Bernoulli Poisson, continuous random variablenormal distribution.

UNIT V STATISTICS**(12 Hrs)**

Measures of central tendency- Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Skewness and Kurtosis - Simple correlation Karl Pearson's coefficient of correlation, Rank correlation, Regression lines of regression, properties of regression coefficient.

Text Books

1. M.K. Venkataraman, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Madras, 2001.
2. M.K. Venkataraman, Engineering Mathematics (Third Year-Part A), The National Publishing Company, Madras, 2001.
3. T. Veerarajan, - Probability, statistics and Random Processes, Tata Mc.Graw-Hill Publishing Company Ltd., 3rd Edition, 2008.



Reference Books

1. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 2007.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
3. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008
4. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi.

Web References

1. <https://www.youtube.com/watch?v=xyAuNHPsq-g>
2. https://link.springer.com/chapter/10.1007/978-1-4757-2024-2_1
3. <https://ncert.nic.in/ncerts/l/lemh203.pdf>
4. <https://users.math.msu.edu/users/gnagy/teaching/ode.pdf>
5. https://www.stat.pitt.edu/stoffer/tsa4/intro_prob.pdf
6. <https://www.math.arizona.edu/~jwatkins/statbook.pdf>
7. <http://www.utstat.toronto.edu/mikevans/jeffrosenthal/book.pdf>
8. https://homepage.divms.uiowa.edu/~rdecook/stat2020/notes/ch3_pt1.pdf



A20AET101	ENVIRONMENTAL STUDIES (Common for all B.A.,B.Sc.,B.Com.,B.B.A,B.C.A.)	L	T	P	C	Hrs
		2	0	0	2	30

Course Objectives

- To gain knowledge on the importance of natural resources and energy.
- To know the structure and function of an ecosystem
- To imbibe an aesthetic value with respect to biodiversity, understand the threats and its conservation and appreciate the concept of interdependence
- To know the causes of types of pollution and disaster management
- To observe and discover the surrounding environment through field work.

Course Outcomes

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

CO1 – Understand about the various resources

CO2 – Learn about the biodiversity

CO3 – Learn the different types of pollution and to prevent the pollution

CO4 – Know about the pollution Act

CO5 – Observe various environmental issues in surroundings

UNIT I INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL RESOURCES (6 Hrs)

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

UNIT II ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION (6 Hrs)

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem. Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity – Insitu & Exsitu.

UNIT III ENVIRONMENTAL POLLUTION AND MANAGEMENT (6 Hrs)

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Landslides. Role of individuals in prevention of pollution - pollution case studies.

UNIT IV SOCIAL ISSUES - HUMAN POPULATION (6 Hrs)

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act - Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

UNIT V FIELD WORK (6 Hrs)

Visit to a local area / local polluted site / local simple ecosystem - Report submission REFERENCES

Text Books

1. Bharucha Erach, "Textbook of Environmental Studies for Undergraduate Courses", Telangana, India: Orient Black Swan, 2nd Edition, 2013.
2. Basu Mahua, Savarimuthu Xavier, "SJ Fundamentals of Environmental Studies". Cambridge, United Kingdom: Cambridge University Press, 2017.
3. Agarwal, K.C "Environmental Biology", Nidi Publ. Ltd. Bikaner, 2001 .




Reference Books

1. Kumarasam.K., A. Alagappa Moses AND M.Vasanthi, "Environmental studies", Bharathidasan university pub, 1, trichy2004.
2. Rajamannar, "Environmental studies", EVR College PUB, Trichy 2004.
3. Kalavathy, S. (ED.), "Environmental Studies", Bishop Heber College PUB., Trichy 2004.

Web References

1. <https://www.youtube.com/watch?v=78prsPYm98g>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2792934/>
3. <https://www.frontiersin.org/articles/505570>



A20CAL101**PROGRAMMING IN C LAB**
(Common to B. Sc. CS and B.C.A)

L	T	P	C	Hrs
0	0	4	2	60

Course Objectives

- To practice the fundamental programming methodologies in the C programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To design, implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design modular programming and provide recursive solution to problems.
- To understand the miscellaneous aspects of C and comprehension of file operations.

Course Outcomes

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

CO1 – Apply and practice logical formulations to solve simple problems leading to specific applications.

CO2 – Develop C programs for simple applications making use of basic constructs, arrays and strings.

CO3 – Develop C programs involving functions, recursion, pointers, and structures.

CO4 – Design applications using sequential and random access file processing.

CO5 – Build solutions for online coding challenges.

List of Exercises

1. Simple programming exercises to familiarize the basic C language constructs.
2. Develop programs using identifiers and operators.
3. Develop programs using decision-making and looping constructs.
4. Develop programs using functions as mathematical functions.
5. Develop programs with user defined functions – includes parameter passing.
6. Develop program for one dimensional and two dimensional arrays.
7. Develop program to illustrate pointers.
8. Develop program with arrays and pointers.
9. Develop program for dynamic memory allocation.
10. Develop programs for file operations.

Reference Books

1. Zed A Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", 1st Edition, Pearson Education, 2011.
3. Yashwanth Kanethkar, "Let us C", 13th Edition, BPB Publications, 2008.
4. Maureen Sprankle, Jim Hubbard, "Problem Solving and Programming Concepts," 9th Edition, Pearson, 2011.

Web References

1. <https://alison.com/course/introduction-to-c-programming>
2. <https://www.geeksforgeeks.org/c-programming-language/>
3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
4. <https://www.tenouk.com/clabworksheet/clabworksheet.html>
5. <https://fresh2refresh.com/c-programming/>
6. <http://www.skiet.org/downloads/cprogrammingquestion.pdf>



A20CAL102	DIGITAL LAB (Common to B.Sc. CS and B.C.A.)	L	T	P	C	Hrs
		0	0	4	2	60

Course Objectives

- To acquire knowledge about basic logic gates.
- To develop the skills in writing assembly programs.
- To develop the skill for error corrections in the micro level.
- To design and analyze combinational logic circuits.
- To expose with the Sequential circuits

Course Outcomes

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

- CO1** – Acquire knowledge about basic logic gates.
CO2 – Develop the skills in writing assembly programs.
CO3 – Develop the skill for error corrections in the micro level.
CO4 – Design Combinational Logic Circuits.
CO5 – Design Sequential Logic Circuits.

List of Exercises

1. Study of Integrated Circuits and their working Logics.
2. Verification of Boolean Theorems using Digital Logic Gates.
3. Design and Implementation of Combinational Circuits using Basic Gates Code Converters.
4. Design and Implementation of 4-Bit Binary Adder / Subtractor using Basic Gates and MSI Devices
5. Design and Implementation of Parity Generator / Checker using Basic Gates and MSI Devices.
6. Design and Implementation of Magnitude Comparator.
7. Design and Implementation of Application using Multiplexers/Demultiplexers.
8. Design and Implementation of Shift Registers.
9. Design and Implementation of Synchronous and Asynchronous Counters.
10. Design and Implementation of Johnson and Ring Counters.

Reference Books

1. Albert Paul Malvino, Donald P Leach, Digital principles and applications, TMH, 2007.
2. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
3. Hamacher, "Computer Organisation and System Software", EXCEL BOOKS.
4. Ghosh & Pal, Computer Organization & Architecture (TMH WBUT Series), TMH.

Web References

1. www.geeksforgeeks.org > computer-organization-and-architecture
2. www.javatpoint.com > computer-organization-and-architecture-tutorial
3. www.geeksforgeeks.org > digital-electronics-logic-design-tutorials



A20CAS101**COMMUNICATION SKILLS LAB****(Common to B.A., B.Sc., B.Com., B.B.A.& B.C.A.)**

L	T	P	C	Hrs
0	0	4	2	30

Course Objectives

- To improve the students' speed in reading.
- To decode the correspondence between sound and spelling in English.
- To train students to organize, revise and edit ideas to write clearly and effectively.
- To enhance the sense of social responsibility and accountability of the students.
- To expound the significance of time and stress management.

Course Outcomes

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

CO1 – Understand the pattern to communicate effectively.

CO2 – Impart Speaking skills with confidence.

CO3 – Use writing strategies to improve their drafting skills and comprehending of articles.

CO4 – Demonstrate leadership qualities to Participate in Group Discussion and Interview efficiently.

CO5 – Expertise in Managerial skills.

UNIT I COMMUNICATION SKILLS SPEAKING**(6 Hrs)**

Aspects of speaking - Process and techniques of effective speech – Presentations - topic to be given to students for short speech.

UNIT II SELF - MANAGEMENT SKILLS**(6 Hrs)**

Time Management - Stress management – Perseverance – Resilience - Mind mapping – Self- confidence

UNIT III COMMUNICATION SKILL - READING**(6 Hrs)**

Phonics – Self-Introduction – Vocabulary – Comprehension - skimming and scanning.

UNIT IV SOCIAL SKILLS**(6 Hrs)**

Negotiation and Persuasion – Leadership – Teamwork – Problem solving – Empathy – Decision making.

UNIT V COMMUNICATION SKILL - WRITING**(6 Hrs)**

Descriptive – Narrative – Persuasive – Expository – Picture composition

Text Books

1. Syamala, V, " Effective English Communication for you", Chennai: Emerald Publishers, 2002
2. Balasubramanian, T, " A Textbook of English Phonetics for Indian Students", New Delhi: Trinity Press 1981
3. Sardana, C.K., " The Challenge of Public Relations", New Delhi: Har- Anand Publications, 1995.

Reference Books

1. Morley, David and Philip Neilson, editors”, The Cambridge Companion to Creative Writing”, Cambridge: 2012.
2. Eastwood, John, ”Oxford Grammar”, Oxford University Press, 1999.
3. Prasad, Hari Mohan, ” A Handbook of Spotting Errors:” McGraw Hill Education, 2010.
4. Murphy, John J, ”Pulling Together: 10 Rules for High-Performance Teamwork”, SimpleTruths, 2016.

Web References

1. www.softwaretestinghelp.com › how-to-crack-the-gd
2. www.businessballs.com › communication-skills › prese...
3. www.teachingenglish.org.uk › article › public-speaking...
4. www.teachingenglish.org.uk › article › public-speaking...
5. www.monster.com › career-advice › article › boost-you...



மொழித்தாள்
தமிழ் - II
(B.A., B.Sc., B.Com., B.B.A., & B.C.A. பாடப்பிரிவுகளுக்கான பொதுத்தாள்)

L T P C Hrs
3 0 0 3 45

A20TAT202

பாடத்திட்டத்தின் நோக்கம்

- இரண்டாயிரம் ஆண்டுகால தமிழின் தொன்மையையும் வரலாற்றையும் அதன் விழுமியங்களையும் பண்பாட்டையும் எடுத்துரைப்பதாக இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.
- தமிழ் இலக்கியம் உள்ளடக்கத்திலும், வடிவத்திலும் பெற்ற மாற்றங்கள், அதன் சிந்தனைகள், அடையாளங்கள் ஆகியவற்றை காலந்தோறும் எழுதப்பட்ட இலக்கியங்களின் வழியாகக் கூறுவதற்கு இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.
- மொழியின் கட்டமைப்பைப் புரிந்துகொள்வதற்கு ஏதுவாக பாடத்திட்டம் வடிவமைக்கப்பட்டுள்ளது.
- வாழ்வியல் சிந்தனைகள், ஒழுக்கவியல் கோட்பாடுகள், சமத்துவம், சூழலியல் எனப் பல சிறுகளை மாணவர்களுக்கு எடுத்துரைக்கும் விதத்தில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது.
- சிந்தனை ஆற்றலைப் பெருக்குவதற்குத் தாய்மொழியின் பங்களிப்பினை உணர்த்த இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.

பாடத்திட்டத்தின் வெளிப்பாடுகள்

- CO1 - இலக்கியங்கள் காட்டும் வாழ்வியல் நெறிமுறைகளைப் பேணிநடத்தல்.
CO2 - நமது எண்ணத்தை வெளிப்படுத்தும் கருவியாகத் தாய்மொழியைப் பயன்படுத்துதல்.
CO3 - தகவல் தொடர்புக்குத் தாய்மொழியின் முக்கியத்துவத்தை உணர்தல்.
CO4 - தாய்மொழியின் சிறப்பை அறிதல்.
CO5 - இலக்கிய இன்பங்களை நுகரும் திறன்களை வளர்த்தல்.

அலகு-1

(9 Hrs)

1. எட்டுத்தொகை: 1. குறுந்தொகை (படல்-130) 2. நற்றிணை (படல்-27) 3. அகநானூறு (படல்-86).
2. பத்துப்பாட்டு: சிறுபாணாற்றுப்படை (அடிகள்-126-143).
3. பதினெண் கீழ்க்கணக்கு: திருக்குறள்- வெகுளாமை (அதிகாரம்-31), காதல் சிறப்புரைத்தல் (அதிகாரம்-113).

அலகு-2

(9 Hrs)

1. எட்டுத்தொகை: 1. ஐங்குறுநூறு (படல்-203), 2. கலித்தொகை- பாலைத்திணை (படல்-9), 3. புறநானூறு (படல்-235).
2. பத்துப்பாட்டு- முல்லைப்பாட்டு (6-21).
3. பதினெண் கீழ்க்கணக்கு :
 1. நாலடியார் - நல்லார் எனத்தான் (221) .
 2. திரிகடுகம்- கோலஞ்சி வாழும் குடியும் (33).
 3. இனியவை நாற்பது- குழவி தளர்நடை (14).
 4. கார் நாற்பது- நலமிகு கார்த்திகை (26).
 5. களவழி நாற்பது-கவளங்கொள் யானை (14).

அலகு-3

(9 Hrs)

சைவம்- பன்னிரு திருமுறைகள்

- | | | |
|---------------------|---|---|
| 1. திருஞானசம்பந்தர் | - | வேபுறு தோளியங்கன் (இரண்டாம் திருமுறை). |
| 2. திருநாவுக்கரசர் | - | மனமெனும் தோணி (நான்காம் திருமுறை). |
| 3. சுந்தரர் | - | ஏழிசையாய் இசைப்பயனாய் (எழாம் திருமுறை). |
| 4. மாணிக்கவாசகர் | - | ஆதியும் அந்தமும் இல்லா (திருவெம்பாவை). |
| 5. திருமலர் | - | அன்பு சிவம் இரண்டு (திருமந்திரம்). |

வைணவம் - நாலாயிரத் திவ்வியப் பிரபந்தம்

- | | | |
|---------------------------|---|--------------------------------|
| 1. பேயாழ்வார் | - | திருக்கண்டேன் பொன்மேனி.... |
| 2. பெரியாழ்வார் | - | கருங்கண் தோகை மயிற் பீலி.... |
| 3. தொண்டரடிப்பொடி ஆழ்வார் | - | பச்சைமாமலை போல்.... |
| 4. ஆண்டவர் | - | கருப்பூரம் நாறுமோ? கமலப்பு.... |
| 5. திருமங்கையாழ்வார் | - | வாடினேன் வாடி வருந்தினேன்.... |

இஸ்லாமியம்

சீறாப்நராணம்- பாடல் நின்ற பிணை மானுக்குப்...5 பாடல்கள் (பாடல் எண்கள் 61-65).

கிருத்துவம்

இரட்சணய யாதீகம்- கடைதிறப்புப் படலம் -5 பாடல்கள் (பாடல் எண்கள்: 3,9,10,15,16).

அலகு - 4

(9 Hrs)

தமிழ் இலக்கிய வரலாறு

1. சங்க இலக்கியங்கள் 2. நீதி இலக்கியங்கள் 3. பக்தி இலக்கியங்கள் 4. காப்பியங்கள்.

அலகு-5

(9 Hrs)

சிறுகதைகள்

1. புதுமைபித்தன்	-	அகலிகை
2. நா. பிச்சமூர்த்தி	-	வேப்பமரம்
3. அகிலன்	-	ஒரு வேளைச்சோறு
4. ஜி.நாகராஜன்	-	பச்சக் குதிரை
5. கி.ராஜநாராயணன்	-	கதவு
6. சா. கந்தசாமி	-	தக்கையின் மீது நான்கு கண்கள்
7. ஆண்டாள் பிரியதர்ஷினி	-	மாத்திரை
8. வண்ணதாசன்	-	ஒரு உல்லாசப் பயணம்
9. சு. தமிழ்ச்செல்வன்	-	வெயிலோடு போய்
10. பாரததேவி	-	மாப்பிள்ளை விருந்து

பார்வை நூல்கள் :

1. அரசு, வீ., இருபதாம் நூற்றாண்டு சிறுகதைகள் நூறு, அடையாளம் பதிப்பகம், திருச்சி, 2013.
2. அருணாச்சலம், பா., பக்தி இலக்கியங்கள், பாரி நிலையம், சென்னை, 2010.
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2000.
4. பாக்கியமேரி, வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, என்.சி.பி.எச். பதிப்பகம், சென்னை, 2011.
5. பசுபதி, மா. வே., செம்மொழித் தமிழ் இலக்கண இலக்கியங்கள், தமிழ்ப் பல்கலைக்கழகம், 2010 .

உரைநடை நூல்கள் :

1. அன்பு, பா., மா.வா.சி யின் ஒரு இலக்கிய நூல்கள் ஒரு மதிப்பீடு, உலக தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை, 1983.
2. பிள்ளை, கே.கே., தமிழக வரலாறும் மக்களும் பண்பாடும், உலக தமிழ் ஆராய்ச்சி நிறுவனம், சென்னை, 2000.
3. ஜெயமோகன், நவீன இலக்கிய அறிமுகம், உயிரிமெய் பதிப்பகம், சென்னை, 1995.

இணையத்தளங்கள் :

<http://www.tamilkodal.com>
<http://www.languageelab.com>
<http://www.tamilweb.com>

A20FRT202

FRENCH – II
(Common to B.A., B.Sc., B.Com., B.B.A. & B.C.A)

L	T	P	C	Hrs
3	0	0	3	45

OBJECTIVES

- To enable the students read, understand, and write simple sentences.
- To grasp relevant grammar for communication
- To learn about the land, people and culture of France.

UNITÉ - 1

Qu'est -ce qu'on leur offre ?
On solde !
Découvrir Paris en bus avec l'open Tour

UNITÉ - 2

Si vous gagne vous ferez quoi
Parasol ou parapluie ?

UNITÉ - 3

Quand il est midi à Paris
Vous allez Vivre
L'avenir du Français

UNITÉ - 4

Souvenirs d'enfance
j'ai fait mes études à Lyon 2

UNITÉ – 5

Retour des Antilles
Au voleur ! Au voleur

TextBooks

Prescribed Textbook : *FESTIVAL 1* - Méthode de Français
Authors : Sylvie POISSON-QUINTON
Michèle MAHEO-LE COADIC
Anne VERGNE-SIRIEYS
Edition : CLE International, Nouvelle Édition révisée : 2009.

Reference Book Festival 1




A20GET202	GENERAL ENGLISH- II (Common to B.A, B.Sc. and BCA)	L 3	T 0	P 0	C 3	Hrs 45
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Course Objectives

- To recognize poetry from a variety of cultures, languages and historic periods
- To develop the intensive study of language by critical reading
- To identify the various genres and analyze the works of writers in English
- To expand the basic understanding of targeted grammatical structures
- To understand the conventions of writing in English

Course Outcomes

After the completion of this course, the students will be able to

CO1 – Understand and appreciate poetry as a literary art form.

CO2 – Comprehend and recognize relationship between ideas, events and facts.

CO3 – Learn to explore characters and their conflicts, dilemmas and extend their response to stories.

CO4 – Apply grammatical structures meaningfully and appropriately in oral and written form.

CO5 – Write effectively and coherently.

UNIT I POETRY**(9 Hrs)**

1. Lord Byron: She Walks in Beauty
2. Robert Frost: Stopping by Woods on a Snowy Evening
3. Nissim Ezekiel: Night of the Scorpion
4. Rabindranath Tagore: Where the Mind is Without Fear

UNIT II PROSE**(9 Hrs)**

1. Ernest Hemingway-A Day's Wait
2. Anton Chekhov: The Lottery Ticket

UNIT III FICTION**(9 Hrs)**

1. Jane Austen - Pride and Prejudice

UNIT IV GRAMMAR**(9 Hrs)**

1. Voice – Conditionals - Coherence

UNIT V COMPOSITION**(9 Hrs)**

1. Letter Writing
2. Report Writing



Text Books

1. Wisdom and Experience: An Anthology for Degree Classes. Board of Editors”, Orient Longman Limited, 2007
2. “The Approach to Life: A Selection of English Prose”, Orient Longman Limited, 2009.
3. “Brookside Musings: A Selection of Poems and Short Stories: Board of Editors”, Orient, Longman Limited,2009.

Reference Books

1. Lalitha Natarajan and Sasikala Natesan, “English for Excellence: Poetry”, Anuradha Publications Literary Pursuits: Board of Editors, Orient Longman Limited, 2015.
2. S.C. Gupta, “English Grammar & Composition”, Arihant, 2014
3. Rabindranath Tagore, Where the mind is without fear “,London : The India Society,1912.
4. Raymond Murphy and Surai Pongtongcharoen, “English Grammar in Use”, Cambridge University, 1985.

Web References

1. <https://poets.org/poem/she-walks-beauty>
2. <https://www.poetryfoundation.org/poems/46467/the-flea>
3. <https://www.classicshorts.com/stories/lottery.html>
4. <http://short-storylovers.blogspot.com/2012/07/thief-by-ruskin-bond.html>
5. <http://www.gutenberg.org/files/1342/1342-h/1342-h.htm>



A20CAT203**JAVA PROGRAMMING**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To explore the knowledge of fundamental concepts of java programming
- To Gain Knowledge about the basic java language syntax and semantics
- To know the principles of inheritances, packages, interfaces
- To get familiarized to generic programming, multithreading concepts.
- To Gain and explore the advanced concepts in Java

Course Outcomes

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

- CO1** – Write a maintainable Java Program for a given algorithm and implement the same.
CO2 – Demonstrate the use of inheritance, interface and package in relevant applications.
CO3 – Create java applications using exception handling, thread and generic programming.
CO4 – Build java distributed applications using Collections and IO streams.
CO5 – Develop simple graphical user interfaces using GUI components.

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING (12 Hrs)

Introduction to classes and objects: Basic Concepts of OOPs – Platform Independence – The History and Evolution of Java - byte code – data types – variables – arrays – operators – control statements – type conversion and casting - garbage collection – String class.

UNIT II INHERITANCE, PACKAGES AND INTERFACES (12 Hrs)

Inheritance: Basic concepts and its types - access control - constructors- static keyword- final - this and super keyword – method overriding, abstract classes- Packages - Interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING (12 Hrs)

Concepts of Exception handling, types of exceptions, creating own exception - Concepts of Multithreading - creating multiple threads.

UNIT IV COLLECTIONS, I/O STREAMS (12 Hrs)

Collections: List - Vector - Stack - Queue. Input /Output Basics - Streams - Byte streams and Character streams - Reading and Writing Console - Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC (12 Hrs)

Events - Delegation event model - Event handling - Adapter classes. AWT: Concepts of components SWING- SwingComponents. Java Database Connectivity - Programming Example.

Text Books

1. Java: The Complete Reference 11th Edition, 2018, Herbert Schildt, TMH Publishing Company Ltd, New Delhi, ISBN: 9781260440249.
2. E. Balaguruswamy, "Programming with Java" , 5th Edition, McGraw- Hill Education, 2014.

Reference Books

1. Cay S. Horstmann, Gary cornell, —Core Java Volume –I FundamentalsII, 9th Edition, Prentice Hall, 2013.
2. Java How to Program, 6th Edition, H. M. Dietel and P.J.Dietel, Pearson Education/PHI
3. Herbert Schildt, "Java – A Beginner's Guide", McGraw- Hill Education, 6th Edition, 2018.

Web References

1. <http://www.ibm.com/developerworks/java/>
2. <http://docs.oracle.com/javase/tutorial/rmi/>.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. <https://www.edureka.co/blog>
5. <https://www.geeksforgeeks.org>



A20CAT204	DATA STRUCTURES AND ALGORITHMS (Common to B.Sc. CS and B.C.A.)	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To introduce the primary data structures and algorithms for their associated operations.
- To understand the applications of data structures.
- To learn the implementation issues of the data structures introduced.
- To understand the concepts of searching and sorting Techniques.
- To understand the basic concepts of stack, queue, List, Trees and Graphs

Course Outcomes

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

CO1 – Analyze algorithms based on time and space complexity.

CO2 – Implement and Apply linear data structures to solve simple problems.

CO3 – Represent and Apply Non-linear data structures to solve complex problems.

CO4 – Use Divide and conquer method to solve various problems.

CO5 – Use Greedy techniques to solve real time problem.

UNIT I INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS (12 Hrs)

Types of data structures - Abstract Data Type (ADT) - Analysis of algorithm - Time and space complexity - Recurrence relation - Asymptotic notation. Sorting - Searching.

UNIT II LIST ADT (12 Hrs)

Static and dynamic Representation – Types -Single Linked List-Doubly Linked List – Circular Linked List – Operations and Applications.

UNIT III STACK AND QUEUE ADT (12 Hrs)

Static and Dynamic Representation – Operations - Applications- Balancing Parenthesis- Evaluation of Arithmetic Expression- Infix to Postfix conversion. Queue ADT: Static and dynamic Representation – Linear queue – circular queue.

UNIT IV TREE ADT AND GRAPH ADT (12 Hrs)

Representation – Types - Binary Tree - Threaded Binary Tree - Binary Search Tree - Operation and Application. Graph: Representation – Types -Graph Traversal – Depth First Search - Breadth First Search –Application - Minimum cost spanning tree - Topological Sorting.

UNIT V ALGORITHM DESIGN TECHNIQUES (12 Hrs)

Divide and Conquer - General method – Finding Minimum Maximum – Merge Sorting - Greedy Method: General Method – knapsack problem – Single source shortest path – Dijkstras: Job sequencing.

Text Books

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 4th Edition, Pearson Education, 2013.
2. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, The Orient Blackswan,2019.
3. A Puntambekar, “Data Structures”, 3rd Revised Edition, Technical Publications Pune, 2008.

Reference Books

1. ReemaThareja, “Data Structures Using C”, Edition, Oxford University Press, 2017.
2. Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education, 2015.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education,Reprint, 2006.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2rd Edition,University Press, 2008.



Web References

1. <https://www.geeksforgeeks.org/>
2. <http://opendatastructures.org/>
3. <https://nptel.ac.in/courses/106/106/106106127>



Bachelor of Computer Applications



A20CAD202	NUMERICAL METHODS AND STATISTICS	L	T	P	C	Hrs
		3	1	0	4	60

COURSE OBJECTIVES

- Learn the techniques of solving algebraic and transcendental equations.
- To introduce the numerical techniques of differentiation and integration.
- To know the basic concepts of statistical parameters like mean, median, mode etc.
- To understand the concept of testing of hypothesis using statistical analysis
- Identify the direction and strength of a linear correlation between two factors.

COURSE OUTCOMES

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

CO1 – Solve algebraic and transcendental equations.

CO2 – Analyze and apply the knowledge of interpolation by using the numerical methods.

CO3 – Understand the basic concepts of Statistics.

CO4 – Apply the concept of testing of hypothesis for small and large samples.

CO5 – Know the applications of linear regression and correlation.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS (12 Hrs)

Solution of algebraic and transcendental equations - Newton Raphson method - Gauss elimination method - GaussJordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION (12 Hrs)

Interpolation: Interpolation by Newton's forward and backward difference formulae for equal intervals-Solution of Ordinary Differential Equations- Single step methods: Taylor series method - Euler methods - Integration by Trapezoidal and Simpson's rules-Lagrange's method for unequal intervals.

UNIT III MEASURES OF DISPERSION (12 Hrs)

Standard Deviation - Mean Deviation - Quartile Deviation - Range. Measures of skewness and Pearson's coefficient of Skewness - Moments about the arbitrary origin and moments based on measures of skewness and kurtosis.

UNIT IV TESTING OF HYPOTHESIS (12 Hrs)

Sampling distributions - Small and large samples -Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions - Contingency table (test for independent) Goodness of fit.

UNIT V CORRELATION AND REGRESSION (12 Hrs)

Curve fitting - Method of least squares - Correlation-Rank correlation- Regression -Multiple and partial correlation – Plane of regression - Coefficient of multiple correlation – Coefficient of partial correlation.

Text Books

1. Grewal. B.S. "Numerical Methods in Engineering and Science ", Mercury learning & Information, kindle Edition, 2018.
2. Richard A.Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
3. Bali N.P. and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015

Reference Books

1. Gupta .C.B, Shree Ram Singh, M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2015
2. Ramesh Kumar Guptat, "Numerical Methods, Fundamental and its Applications", Cambridge University, 2019
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition. 2019
4. Dass .H.K & Dr. Rama Verma, "Introduction to Engineering Mathematics", S. Chand & co, New Delhi, 2019.
5. Timothy Sauer, "Numerical Analysis", 3rd Edition, Pearson Education, 2017.
6. Arvind Pragati Gautam, "Numerical Methods", Alpha Science International Limited 2019.

Web References

1. <http://nptel.ac.in/courses/111107063/>
2. <https://nptel.ac.in/courses/111107119/>
3. <https://nptel.ac.in/courses/110/105/110105087/>
4. <https://nptel.ac.in/courses/111/105/111105077/>
5. <https://www.coursera.org/learn/basic-statistics>



A20AET202	PUBLIC ADMINISTRATION	L	T	P	C	Hrs
		2	0	0	2	30

(Compulsory Course designed as per the directions issued by Government of India, MHRD, Department of Higher Education (Central University Bureau)
F.No.19-6.2014-Desk U Dated 19-05-2014)

Course Objectives

- To introduce the elements of public administration
- To help the students obtain a suitable conceptual perspective of public administration
- To introduce them the growth of institution devices to meet the need of changing times
- To instill and emphasize the need of ethical seriousness in contemporary Indian Public Administration

Course Outcomes

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

- CO1** – Understand the concepts and evolution of Public Administration.
CO2 – Be aware of what is happening in the Public Administration in the country
CO3 – Explain the Territory Administration in the State and the Centre
CO4 – Appreciate emerging issues in Indian Public Administration

UNIT I INTRODUCTION TO PUBLIC ADMINISTRATION (7 Hrs)

Meaning, nature and Scope of Public Administration and its relationship with other disciplines- Evolution of Public Administration as a discipline — Woodrow Wilson, Henry Fayol, Max Weber and others - Evolution of Public Administration in India — Arthashastra — Colonial Administration upto 1947

UNIT II PUBLIC ADMINISTRATION IN INDIA (8 Hrs)

Enactment of Indian Constitution - Union Government – The Cabinet – Central Secretariat -- All India Services – Training of Civil Servants – UPSC – NitiAyog – Statutory Bodies: The Central Vigilance Commission – CBI - National Human Rights Commission – National Women’s Commission –CAG

UNIT III STATE AND UNION TERRITORY ADMINISTRATION (8 Hrs)

Differential Administrative systems in Union Territories compared to States Organization of Secretariat: -Position of Chief Secretary, Functions and Structure of Departments, Directorates – Ministry of Home Affairs supervision of Union Territory Administration – Position of Lt.Governor in UT – Government of Union Territories Act 1963 – Changing trend in UT Administration in Puducherry and Andaman and Nicobar Island

UNIT IV EMERGING ISSUES IN INDIAN PUBLIC ADMINISTRATION (7 Hrs)

Changing Role of District Collector – Civil Servants – Politicians relationship – Citizens Charter - Public Grievance Redressal mechanisms — The RTI Act 2005 – Social Auditing and Decentralization – Public Private Partnership.

Text Books

1. Avasthi and Maheswari, “Public Administration”, Lakshmi Narain Agarwal, 1st Edition, 2016.
2. Ramesh K.Arora, “Indian Public Administration: Institutions and Issues”, New Age International Publishers, 3rd Edition, 2012.
3. RumkiBasu, “Public Administration: Concept and Theories”, Sterling, 1st Edition, 2013.




Reference Books

1. Siuli Sarkar, "Public Administration in India", Prentice Hall of India, 2nd Edition, 2018.
2. M. Laxmikanth, "Public Administration", McGraw Hill Education, 1st Edition, 2011.
3. R.B.Jain, "Public Administration in India, 21st Century Challenges for Good Governance", Deep and DeepPublications, 2002.

Web References

1. <http://cic.gov.in/>
2. <http://www.mha.nic.in/>
3. <http://rti.gov.in/>
4. <http://www.cvc.nic.in/>



A20CAL203**JAVA PROGRAMMING LAB**

L	T	P	C	Hrs
0	0	4	2	30

Course Objectives

- To acquire programming skill in core java.
- To learn how to design java program and applications.
- To acquire object oriented skills in java.
- To develop the skill of designing applications.
- To know the use of java in a variety of technologies and on different platforms

Course Outcomes

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

CO1 – Apply and practice logical formulations to solve simple problems leading to specific applications.

CO2 – Demonstrate the use of inheritance, interface and package in relevant applications.

CO3 – Create java applications using exception handling, multithread.

CO4 – Build java distributed applications using Collections and IO streams

CO5 – Develop simple graphical user interfaces using GUI components.

List of Exercises

1. Develop simple programs using java syntax and semantics.
2. Develop a java program that implements the interface.
3. Develop a java program that implements the Packages.
4. Write a java program to demonstrate inheritance.
5. Develop a program to illustrate the use of Multi Threads.
6. Create java applications using Exception Handling.
7. Write programs in Java to demonstrate the use of following components Text fields, buttons, Scrollbar, Choice, List and Check box
8. Write Java programs to demonstrate the use of various Layouts like Flow Layout, Border Layout, Grid layout, Gridbag layout and card layout
9. Design an application using event-driven programming and JDBC to connect a back-end database using Java.

Text Books

1. Herbert Schildt , “Java: The Complete Reference “ , TMH Publishing Company Ltd, New Delhi, ISBN: 9781260440249, 11th Edition, 2018
2. Cay S. Horstmann, Gary Cornell, “Core Java Volume –I Fundamentals II”, 9th Edition, Prentice Hall, 2013.
3. H. M. Dietel and P. J. Dietel ,”Java How to Program”, 6th Edition, , Pearson Education/PHI
4. Cay. S. Horstmann and Gary Cornell , “Core Java 2”, Volume 2, Advanced Features, 7th Edition, Pearson Education.

Web References

1. <http://www.ibm.com/developerworks/java/>
2. <http://docs.oracle.com/javase/tutorial/rmi/>.
3. IBM’s tutorials on Swings, AWT controls and JDBC.
4. <https://www.edureka.co/blog>
5. <https://www.geeksforgeeks.org>

A20CAL204**DATA STRUCTURES LAB**
(Common to B.Sc. CS and B.C.A)

L	T	P	C	Hrs
0	0	4	2	30

Course Objectives

- To learn the basic concepts of Data Structures.
- To learn about the concepts of Searching and Sorting.
- To design and implement various Data Structures algorithms.
- To study about the linear and non-linear Data Structures.
- To learn about the concepts of ADT including List, stack and Queues.

Course Outcomes

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

CO1 – Analyze the algorithm's / program's efficiency in terms of time and space complexity.

CO2 – Solve the given problem by identifying the appropriate Data Structure.

CO3 – Solve problems in linear and non-linear Data Structures.

CO4 – Develop programs using various searching methods.

CO5 – Solve the problems using Linked List

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations.
 - a) Insert an element into a list.
 - b) Delete an element from list
 - c) Search for a key element in list
 - d) Count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
 - a) Insert an element into a binary search tree.
 - b) Delete an element from a binary search tree.
 - c) Search for a key element in a binary search tree.
8. Write a C program that use recursive functions to traverse the given binary tree in
 - a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Rohit Khurana, "Data structures using C", 1st Edition, Vikas Publishing, 2014.
3. S.K.Srivastava, Deepali Srivastava, "Data Structures Through C in Depth" ,BPB Publications in the year 2011.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. <https://www.w3schools.in/data-structures-tutorial/intro/>
3. <https://nptel.ac.in/courses/106103069/>
4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. Data Structures Laboratory Manual, Department of Computer Science and Engineering, Sri Manakula VinayagarEngineering College.



A20CAS202	QUANTITATIVE APTITUDE AND LOGICAL REASONING	L T P C Hrs
		0 0 4 2 30

Course Objectives

- To understand the concepts of basic aptitude.
- To learn about average and profits
- To learn about series.
- To learn the concept of logical reasoning.
- To know about mathematical reactions

Course Outcomes

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

CO 1 - understand the concepts of basic aptitude.

CO 2 - Understand the basic concepts of average and profits

CO 3 - Usage of series.

CO 4 - Basics of logical reasoning.

CO 5 - Basic concepts of mathematical reactions.

UNIT I APTITUDE BASICS**(6 Hrs)**

HCF - LCM - permutations and Combinations - Permutations and combinations - probability ,

UNIT II PROGRESSION AND SEQUENCE**(6 Hrs)**

Ratio and proportion - Percentage - Average - Problem based on ages - Profit and loss Square roots - Cube roots - Series - Progression and sequence

UNIT III RELATIONS**(6 Hrs)**

Fractions - simple interest - compound interest - time and work - Analogy - Classifications - Series Completion - Coding and Decoding - Blood relations

UNIT IV LOGICAL SEQUENCES**(6 Hrs)**

Puzzle test - Direction sense test - logical venn diagram -number ranking and time sequence test - Situation reaction test -

UNIT V STATEMENTS AND ARGUMENTS**(6 Hrs)**

Mathematical reaction - logical sequences of words - Statements and arguments

Text Books

1. Quantitative aptitude by Dr RS Aggarwal

Reference Books

1. SURA`S Quantitative Aptitude and Arithmetic Competitive Exam Book by Prof Abhilasha Khanna MA CTE BED Arvind Sharma MSc MEd
2. Quantitative Aptitude for Competitive Examination by Abhijit Guha
3. Quantitative Aptitude and Reasoning by by Shyam Saraf/Abhilasha Swarup

Web References

1. <https://www.indiabix.com/>
2. <https://www.careerbless.com/aptitude/qa/home.php>
3. <https://www.fresherslive.com/online-test/aptitude-test/questions-and-answers>
4. <https://testbook.com/aptitude>
5. <https://www.greatlearning.in/academy/learn-for-free/courses/quantitative-aptitude-basics>



A20EAL201	NATIONAL SERVICE SCHEME	L	T	P	C	Hrs
	(Common to all B.A., B.Sc., B.Com., B.B.A., B.C.A.)	0	0	2	1	30

Course Objectives

- To introduce about various activities carried out by national service scheme.
- To gain life skills through community service.
- To gain awareness about various service activities performed in higher educational institutions.
- To give exposure about the use of technology to uplift the living standards of rural community.
- To induce the feeling of oneness through harmony of self and society.

Course Outcomes

After the end of the course, the students will able to

CO1 – Recognize the importance of national service in community development.

CO2 – Convert existing skills into socially relevant life skills.

CO3 – Differentiate various schemes provided by the government for the social development

CO4 – Identify the relevant technology to solve the problems of rural community.

CO5 – Associate the importance harmony of nation with long term development

UNIT I INTRODUCTION TO NATIONAL SERVICE SCHEME**(6 Hrs)**

History and objectives, NSS symbol, Regular activities, Special camping activities, Village adaptation programme, Days of National and International Importance, Hierarchy of NSS unit in college. Social survey method and Data Analysis. NSS awards and recognition. Importance of Awareness about Environment, Health, Safety, Gender issues, Government schemes for social development and inclusion policy etc.,

UNIT II LIFE SKILLS AND SERVICE LEARNING OF VOLUNTEER**(6 Hrs)**

Communication and rapport building, problem solving, critical thinking, effective communication skills, decision making, creative thinking, interpersonal relationship skills, self- awareness building skills, empathy, coping with stress and coping with emotions. Understanding the concept and application of core skills in social work practice, Team work, Leadership, Event organizing, resource planning and management, time management, gender equality, understanding rural community and channelizing the power of youth.

UNIT III EXTENSION ACTIVITIES FOR HIGHER EDUCATIONAL INSTITUTIONS**(6 Hrs)**

Objective and functions of Red Ribbon Club, Swatchh Bharath Abhiyan, Unnat Bharat Abhiyan, Jal Shakthi Abhiyan, Road Safety Club, Environmental club and Electoral literacy club.

UNIT IV USE OF TECHNOLOGY IN SOLVING ISSUES OF RURAL INDIA**(6 Hrs)**

Understanding community issues, economic development through technological development. Selection of appropriate technology, Understanding issues in agriculture, fishing, artisans, domestic animals, health and environment.

UNIT V NATIONAL INTEGRATION AND COMMUNAL HARMONY**(6 Hrs)**

The role of Youth organizations in national integration, NGOs, Diversity of Indian Nation, Importance of National integration communal harmony for the development of nation, Indian Constitution, Building Ethical human Relationships, Universal Human Values, Harmony of self and Harmony of nation.




Reference Books

1. Joseph, Siby K and Mahodaya Bharat (Ed.), "Essays on Conflict Resolution", Institute of Gandhian Studies, Wardha, 2007.
2. Barman Prateeti and Goswami Triveni (Ed.), "Document on Peace Education", Akansha Publishing House, New Delhi, 2009
3. Sharma Anand and G. Davi, "Gandhian Way, Academic Foundation", New Delhi Myers Social Psychology. New Delhi: Tata Mc.Graw Hill, 2007.
4. Taylor E. Shelly et.al, "Social Psychology", 12th Edition New Delhi, Pearson Prentice Hall Singh, 2006.
5. Madhu, "Understanding Life Skills, background paper prepared for education for all: The leap to equality, Government of India report", New Delhi, 2003.
6. Sandhan "Life Skills Education, Training Module, Society for education and development", 2005.
7. Jaipur. Radakrishnan Nair and Sunitha Rajan, "Life Skill Education: Evidences form the field", RGNIYD publication, Sriperumbudur, 2012.
8. National Service Scheme Manual (Revised), Government of India, Ministry of Youth Affairs and Sports, New Delhi.
9. M. B. Dishad, "National Service Scheme in India: A Case study of Karnataka", Trust Publications, 2001.

Web References

1. <http://www.thebetterindia.com/140/national-service-scheme-nss/>
2. <http://en.wikipedia.org/wiki/national-service-scheme> 19=<http://nss.nic.in/adminstruct>
3. <http://nss.nic.in/propexpan>
4. <http://nss.nic.in>
5. <http://socialworknss.org/about.html>



A20CAT305**PYTHON PROGRAMMING**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To acquire programming skill in core python.
- To learn the basic looping and functions.
- To learn how to design python program and applications.
- To acquire the basic packages.
- To develop the object oriented programming.

Course Outcomes

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

CO1 – Define the structure and components of a python program.

CO2 – Illustrate the concepts of Python decision statements.

CO3 – Use list, tuple, Set and dictionary in python program.

CO4 – Read / write data from/to files and structure a program using Exceptions and Modules.

CO5 – Knowing the basic oops concepts.

UNIT I INTRODUCTION TO PYTHON PROGRAMMING LANGUAGE**(10 Hrs)**

Introduction to Python Language – Strengths and Weaknesses – IDLE – Operators – Data Types – Introduction List, Tuple, Set, Dictionary. String : Slicing, Basic operations on strings- Built in methods -

UNIT II DECISION MAKING , LOOPING & FUNCTIONS**(16 Hrs)**

Control Flow: Introduction – Control Flow and Syntax – Indenting – Relational Expressions – Logical Expressions – If Statement – If else – elif – Nested if. Loop: The while Loop– Nested while Loop – For Loop – Nested for Loop – Break and continue Functions: parameters – Return values – Local and global scope – Function composition – Recursion and lambda functions.

UNIT III LIST, TUPLE, SET, DICTIONARY AND ARRAYS**(12 Hrs)**

Lists: List operations – List slices – List methods – List loop – Mutability – Aliasing – Cloning lists – List parameters – Tuples: Tuple assignment – Tuple as return value – Advanced list processing – List comprehension – Sets – Dictionaries: Operations and methods – Arrays.

UNIT IV FILES, EXCEPTIONS, MODULES AND PACKAGES**(12 Hrs)**

Built In Functions. Files and Exception: Text Files – Reading and writing files – Format operator – Command line arguments – Errors and exceptions – Handling exceptions – Modules – Standard modules – Packages.

UNIT IV OBJECT ORIENTED PROGRAMMING IN PYTHON**(10 Hrs)**

Classes and Objects – Constructors – Inheritance – Abstraction

Text Books

1. Martin C Brown, "Python The Complete Reference", McGraw-Hill Education, 4th Edition, 2018
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Shroff/O'Reilly Publishers, 2nd edition, 2016(<http://greenteapress.com/wp/thinkpython/>).
3. ReemaThareja, "Python Programming Using Problem Solving Approach", ISBN:9780199480173, Oxford University Press, First edition, 2017.

Reference Books

1. Robert Sedgewick, "Kevin Wayne, Robert Dondero – Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. 2016.
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. Ben Stephenson, "The Python Workbook A Brief Introduction with Exercises and Solutions", Springer International Publishing, Switzerland 2014.



Web References

1. <https://www.learnpython.org/>
2. <https://pythonprogramming.net/introduction-learn-python-3-tutorials/>
3. <https://www.codecademy.com/learn/learn-python>
4. <https://nptel.ac.in/courses/106/106/106106182/>



Bachelor of Computer Applications



A20CAT306**COMPUTER NETWORKS**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To understand the basic concepts of Data Communications.
- To understand the functionalities and components involved in the physical layer.
- To learn the basic concepts of data link layer services and network layer communication protocols
- To understand various load characteristics and network traffic conditions, decide the transport protocols to be used.
- To analyze and compare the different protocols available in the application layer.

Course Outcomes

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

CO1 - Analyze the network components and network standards.

CO2 - Determine the Physical layer functionalities, Transmission modes and media.

CO3 - Analyze the Error correction and detection techniques and determine the proper usage of IP address, subnet mask and default gateway in a routed network.

CO4 - Describe, analyze and compare different protocols in transport layer.

CO5 - Analyze the functional working of different protocols of application layer.

UNIT I DATA COMMUNICATIONS**(12Hrs)**

Overview of Data Communications – Networks and its types – Network topologies. Transmission technologies: Signal Transmission – Digital signaling – Analog Signaling. Networks Models: Protocol Layering – OSI reference model – TCP/IP Protocol suite.

UNIT II PHYSICAL LAYER**(12Hrs)**

Physical layer functionalities – Analog to digital conversion using PCM, Transmission Modes: Parallel– Serial. Transmission Media: Guided and unguided media. Switching: Introduction. Circuit Switching and Packet switching Networks.

UNIT III DATA LINK LAYER AND NETWORK LAYER**(12Hrs)**

Data link layer services – Error Detection and Correction – Sliding window protocols – Network devices. Network layer functionality. Routing Algorithms: Shortest path algorithm, Distance vector routing – Sub netting – Network layer protocols: IPV4, IPV6.

UNIT IV TRANSPORT & SESSION LAYER**(12Hrs)**

The Transport Services - Connection management – Transport layer Congestion Control – Transport Layer Protocols: User Datagram Protocol (UDP) – Transmission Control Protocol (TCP). – Establishment of Session Layer

UNIT V PRESENTATION & APPLICATION LAYER**(12Hrs)**

Data representation and Comparison of presentation layer - Application Layer Protocols – HTTP – FTP – Telnet – Email (SMTP, POP3, IMAP, MIME) – DNS – Need for Cryptography and Network Security – Firewalls.

Text Books

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
2. Tanenbaum, A.S. and David J. Wetherall “Computer Networks”, 5th ed., Prentice Hall, 2011
3. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach: International Edition”, Pearson Education, Sixth edition, 2013.



Bachelor of Computer Applications



Reference Books

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A system approach", 5th edition, Elsevier, 2012.
2. Stallings, W., "Data and Computer Communications", 10th Ed., Prentice Hall Int. Ed., 2013.
3. DayanandAmbawade, Deven Shah, "Advanced Computer Networks", Dreamtech Press, 1st edition, 2011.
4. PallapamanviV , "Data Communications and Computer Networks", PHI, 4th edition, 2014.
5. Andre S.Tanenbaum, "Computer Networks", Pearson Publication, 4th Edition, 2018.

Web References

1. <https://www.geeksforgeeks.org/last-minute-notes-computer-network/>
2. <https://lecturenotes.in>
3. <https://www.cse.iitk.ac.in/users/dheeraj/cs425/>
4. <https://nptel.ac.in/courses/106/105/106105183/>
5. <https://nptel.ac.in/courses/106/105/106105081/>



A20CAD303	FINANCIAL AND MANAGEMENT ACCOUNTING-I (Common to B.C.A. & B.Sc. Mathematics)	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To develop a deeper understanding of the Fundamentals of Accounting
- To appreciate the role and significance of subsidiary books in accounting system
- To learn the preparation of basic financial statements of small business entities.
- To gain knowledge about the preparation of cash flow statements.
- To develop the knowledge of accounting in computerized environment.

Course Outcomes

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

CO1 – Explain the concepts of accounting and solve simple problems on fundamentals of accounting

CO2 – Prepare various subsidiary books including different types of cash books.

CO3 – Prepare the basic financial statements of various business entities

CO4 – Handle the preparation and understanding of cash flow statements

CO5 – Explain the role of computers in Accounting and Automation.

UNIT I THEORETICAL FRAMEWORK OF ACCOUNTING**(10 Hrs)**

Meaning and Scope of Accounting – Nature and Objectives of Accounting – Distinction between Book-Keeping and Accountancy – Accounting Transactions – Principle of Double Entry – Branches of Accounting: Financial, Cost and Management Accounting – Accounting Equation – Significant Accounting Concepts and Conventions: Business Entity, Money Measurement, Going Concern, Materiality, and Conservatism.

UNIT II ACCOUNTING PROCESS**(16 Hrs)**

Business Transactions – Recording of Business Transactions in Accounting – Book of Prime Record: Journal, Steps in Journalising – Book of Main Record: Ledger – Posting to Ledger. Extracting Trial Balance from Ledger Accounts. Simple Problems in Journal, Ledger and Trial Balance. Subsidiary Books – Meaning and Importance – Types of Subsidiary Books – Types of Cash Book – Simple Problems in Sales Book, Purchases Book, and Simple Cash Book.

UNIT III BASIC FINANCIAL STATEMENTS**(16 Hrs)**

Profit and Loss Account or Income Statement – Meaning, Contents, and Preparation – Balance Sheet or Position Statement – Meaning, Contents and Preparation – Adjustments in Final Accounts (Closing Stock, Expenses and Income Outstanding, Expenses paid and Income received in advance, Depreciation, Provision for Bad and Doubtful Debts, Provision for Discount on Creditors, Interest on Capital and Interest on Drawings). Practical Problems on Financial Statements with basic adjustments. Vertical Form of Financial Statements – Income Statement and Balance Sheet.

UNIT IV CASH FLOW STATEMENT**(12 Hrs)**

Concept of Funds and Cash in Accounting – Importance of Cash Flow in Business – Meaning and Need of Cash Flow Statement – Use of Accounting Standard 3 in the preparation of Cash Flow Statement – Classification of Cash Flow based on activities: Operating, Investing and Financing. Preparation of Cash Flow Statements. Simple Problems.

UNIT V ACCOUNTING IN COMPUTERISED ENVIRONMENT**(6 Hrs)**

Role of Computer in Accounting and Automation – Accounting as an Information System – Accounting Process under Manual and Computerised Accounting – Software for Accounting. Framework of Accounting Software – Grouping of Accounts – Data Entry in Accounting Software – Generation of Reports – Use of Spreadsheets in Accounting Analysis.




Text Books

1. K.L. Nagarajan, N. Vinayagam & P.L. Mani, "Principles of Accountancy", S. Chand & Sons, 4th Edition, 2016.
2. T.S. Reddy & Y. Hari Prasad Reddy, "Financial and Management Accounting", Margham Publications, 4th Edition, 2018.
3. S.N. Maheswari, Suneel K. Maheswari & Sharad K. Maheswari, "An Introduction to Accountancy", Vikas Publishing House, 12th Edition, 2019.

Reference Books

1. N. Ramachandran & Ram Kumar Kakani, "Financial Accounting for Management", McGraw Hill, 5th Edition, 2020.
2. Hanif & Mukherjee, "Financial Accounting", Tata McGraw Hill, 2nd Edition, 2019.
3. S.P. Jain & K.L. Narang, "Financial Accounting", Kalyani Publishers, 12th Edition, 2014.
4. P.C. Tulsian & Bharat Tulsian, "Financial Accounting", S.Chand, 2nd Edition, 2016.
5. R.L. Gupta & M. Radhasamy, "Advanced Accountancy – Vol.1", Sultan Chand & Sons, 13th Edition, 2020.

Web References

1. <https://www.civilserviceindia.com/subject/Management/notes/financialaccounting.html>
2. <https://www.taxmann.com/blogpost/2000001622/accounting-principles-andconcepts.aspx>
3. <https://courses.lumenlearning.com/sac-finaccounting/chapter/ledgers-journals-andaccounts/>
4. <http://www.accountingnotes.net/management-accounting/management-accountingmeaning-limitations-and-scope/5859>
5. <https://efinancemanagement.com/financial-accounting/financial-statement-notes>



A20CAL305	PYTHON AND NETWORK PROGRAMMING LAB	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To practice the fundamental programming methodologies in the Python programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design basic networking styles and provides recursive solution to problems.
- To understand the miscellaneous aspects of networking.

Course Outcomes

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

CO1 – Apply and practice logical formulations to solve simple problems leading to specific applications.

CO2 – Develop python programs for simple applications making use of basic constructs, arrays and strings.

CO3 – Develop the networking programs using IP.

CO4 – Design the module for Client and Server.

CO5 – Construct the network specializations.

List of Exercises

1. Finding Area of a Triangle, Rectangle and Square.
2. Checking whether a given number is Prime or not.
3. Implementation of User defined functions.
4. Various operations on List and Tuples.
5. Various operations on string and dictionary.
6. Various types of inheritance using python..
7. Detect Network Changes Automatically.
8. Log Management with Python and Network Monitoring with Cacti.
9. NetFlow and sFlow Based Monitoring.
10. Alerting and Email Notification.
11. Testing DHCP Server and Client.
12. Test Network Speed with Python.

Reference Books

1. Stallings, W., "Data and Computer Communications", 10th Ed., Prentice Hall Int. Ed., 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", MIT Press, Revised and expanded Edition, 2013.

Web References

1. <https://pythonprogramming.net/introduction-learn-python-3-tutorials/>
2. <https://www2.mvcc.edu/users/faculty/jfiore/CP/labs/LaboratoryManualForComputerProgramming.pdf>
3. <https://www.codecademy.com/learn/learn-python>
4. <https://www.geeksforgeeks.org/last-minute-notes-computer-network/>
5. <https://lecturenotes.in>



A20CAD304**ACCOUNTING SOFTWARE LAB**
(Common to B.C.A. & B.Sc. Mathematics)

L	T	P	C	Hrs
0	0	4	2	60

Course Objectives

- To develop a deeper knowledge in fundamentals of accounting software.
- To understand the working of business transactions.
- To learn the importance of MIS.
- To gain knowledge about GST and TDS.

Course Outcomes

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

CO1 – Work with chart of accounts in accounting software.

CO2 – Prepare various business transactions in software.

CO3 – Generate various reports including customized reports

CO4 – Handle the preparation and understanding of GST and TDS

UNIT I CHART OF ACCOUNTS**(15 Hrs)**

An Overview of Accounting Fundamentals – Double Entry Book keeping – Types of Accounts – Golden Rules of Accounts – Source Documents for Accounting – Accounting Equation – Recording Business Transactions – Journal – Ledger – Trial Balance – Subsidiary Books – Financial Statements: Profit and Loss Account – Balance Sheet.

Getting Started with Accounting Software – Company Creation and Management – Company Features and Configuration – Chart of Accounts – Ledger – Grouping – Creation, Display and Deletion.

Inventory Masters – Creating Inventory Masters: Stock Group, Units of Measure, Stock Items, Godown/Warehouse – Stock Category Reports.

UNIT II RECORDING DAY-TO-DAY TRANSACTIONS**(20 Hrs)**

Business Transactions – Source Document for Voucher – Recording Transactions in Accounting Software – Accounting Vouchers: Receipt Voucher, Contra Voucher, Payment Voucher, Purchase Voucher, Sales Voucher, Debit Note Voucher, Credit Note Voucher, Journal Voucher.

Accounts Payables and Receivables – Maintaining Bill-wise details – Stock Category Report – Changing Financial Year.

UNIT III MIS REPORTS**(5 Hrs)**

Management Information System (MIS) – MIS Reports in Accounting Software – Trial Balance – Balance Sheet – Profit and Loss Account – Cash Flow Statement – Accounting Ratios. Books and Reports: Day Book – Receipts and Payments – Purchase Register – Sales Register – Bills Receivable and Bills Payable.

UNIT IV HANDLING GST AND TDS**(20 Hrs)**

Goods and Services Tax (GST) – Recording GST in Accounting Software – Generating GST Reports.

Tax Deducted at Source (TDS) – TDS in Accounting Software – TDS Activation – Statutory Masters – Configuring TDS – Booking of Expenses in Purchase Voucher – TDS Reports.

Text Books

1. Tally Education, Tally Essential Level 1, Sahaj Enterprises, 1st Edition, 2021.
2. Tally Education, Tally Essential Level 2, Sahaj Enterprises, 1st Edition, 2021.
3. Tally Education, Tally Essential Level 3, Sahaj Enterprises, 1st Edition, 2021.



Reference Books

1. DT Editorial Services, "Tally ERP 9 with GST", DreamTech Press, 1st Edition, 2020.
2. Tally Education, "Tally ERP 9 with GST", BPB Publishers, 1st Edition, 2018.
3. Vikas Gupta, "Comdex Tally ERP 9 with GST and MS Excel", DreamTech Press, 1st Edition, 2018.
4. Shraddha Singh, "Tally ERP 9", V & S Publishers, 1st Edition, 2014.
5. Soumya Ranjan Behera, "Learn Tally ERP 9 with GST", B.K. Publications, 2th Edition, 2014.

Web References

1. https://www.youtube.com/watch?v=rG_eHA3vN1I
2. <https://www.youtube.com/watch?v=Sw2H56aMe-g>
3. <https://www.youtube.com/watch?v=eA8oK3wn1p4>
4. <https://www.youtube.com/watch?v=Vi7TzAPjXu0>
5. <https://www.youtube.com/watch?v=lpz1VVQGXEc>



A20CAS303	ANDROID APP DEVELOPMENT	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To facilitate students to understand android SDK
- To help students to gain a basic understanding of Android application development
- To inculcate working knowledge of Android Studio development tool
- To know about the testing.
- To describe the Android applications

Course Outcomes

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

CO 1 - Identify various concepts of mobile programming.

CO 2 – Know about essentials of android application.

CO 3 - Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces

CO 4 – Manipulate the testing in all the android application.

CO 5 - Deploy applications to the Android marketplace for distribution.

UNIT I INTRODUCTION TO ANDROID

(6 Hrs)

The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT II ANDROID APPLICATION DESIGN ESSENTIALS

(6 Hrs)

Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT III ANDROID USER INTERFACE DESIGN ESSENTIALS

(6 Hrs)

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT IV TESTING

(6 Hrs)

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT V USING COMMON ANDROID APIS

(6 Hrs)

Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Text Books

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

Reference Books

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd 2.
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd 3.
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Web References

1. <https://www.udemy.com/course/learn-android-application-development-y/>
2. <https://www.coursera.org/specializations/android-app-development>
3. <https://developer.android.com/>
4. <https://www.androidauthority.com/android-app-development-1128595/>



A20CAT407**OPERATING SYSTEMS**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To grasp a fundamental understanding of operating systems and processes
- To learn the concepts of CPU scheduling and deadlock
- To understand synchronization and memory management concepts in OS
- Understand the concepts of file systems and secondary storage structure
- To learn the features of commercial operating systems

Course Outcomes

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

CO1 – Define the concepts of operating systems operations, processes and threads.

CO2 – Apply the concepts of CPU scheduling and deadlock techniques.

CO3 – Simulate the principles of memory management.

CO4 – Identify appropriate file system and disk organizations for a variety of computing scenario.

CO5 – Examine the features of various open source operating systems.

UNIT I INTRODUCTION AND PROCESS MANAGEMENT**(12Hrs)**

Operating system structure – Operating system operations – Process management – Memory management – Storage management – Protection and Security – System structures: Operating system services – System calls – Types of system calls – System programs. Process scheduling – Operations on processes – Inter-process communication.

UNIT II CPU SCHEDULING AND DEADLOCK**(12Hrs)**

Overview of threads – Multithreading models – Threading issues – Basic concepts of process scheduling – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling, Dead Lock: Characterization – Prevention Detection – Avoidance and Recovery.

UNIT III CONCURRENT PROCESSES AND MEMORY MANAGEMENT**(12Hrs)**

Process synchronization: The Critical Section Problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors. Memory Management: Swapping – Contiguous memory allocation – Paging – Structure of the Page Table – Segmentation, Demand Paging – Page Replacement – Allocation of Frames – Thrashing.

UNIT IV FILE SYSTEMS AND SECONDARY STORAGE STRUCTURE**(12Hrs)**

File Concept – Access Methods – Directory structure – File system mounting – File sharing – Protection – File system structure – File system implementation – Directory Implementation – Allocation methods – Free-space management. Disk structure – Disk Scheduling – Disk Management – Swap-Space management.

UNIT V I/O BASED LINUX**(12Hrs)**

LINUX System: Basic Concepts – Components of Linux System – Architecture - System administration – Requirements for Linux System Administrator – Setting up a LINUX multifunction server – Domain Name System – Setting up local network services.

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons Ninth Edition, 2017.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, 3rd Edition, 2015.
3. Gary Nutt, "Operating Systems - A Modern Perspective", Pearson Education, Second Edition, 2013.



Reference Books

1. William Stallings, "Operating System", Prentice Hall of India, 6th Edition, 2015.
2. Thomas Anderson and Michael Dahlin, "Operating Systems principles and practice", Wiley, 2nd Edition, 2014.
3. Harvey M. Deitel, "Operating Systems", Pearson Education, Third Edition, 2013.
4. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.
5. William Stallings, "Operating System: Internals and design Principles", New Edition (7), Pearson Education India.

Web References

1. <https://nptel.ac.in/courses/106108101/>
2. <http://www.tcyonline.com/tests/operating-system-concepts>
3. <http://www.galvin.info/history-of-operating-system-concepts-textbook>
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
5. <https://www.cse.iitk.ac.in/pages/CS330.html>



A20CAT408**DATABASE MANAGEMENT SYSTEMS**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To learn about Database Structure and Data Models.
- To study SQL Commands for storing and retrieving data into the database.
- To study the Relational database system design
- To understand the concept of Transactions
- To understand the concept of Concurrency Control and Recovery System

Course Outcomes

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

CO1 – Design conceptual data model using Entity Relationship Diagram.

CO2 – Design conceptual and logical database models for an application.

CO3 – Normalize relational database design of an application.

CO4 – Explain the need for Indexing, Hashing in database.

CO5 – Understand the strategies for Transactions and Management.

UNIT I INTRODUCTION**(12Hrs)**

Database System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Database – Database Design – System Structure – Database Architecture. Database Design and E-R Model: Overview of the Design Process – The E-R Model – Constraints – E-R Diagrams- E-R Design Issues – Extended E-R features – Reduction to Relational Schemas – Other aspects of Database Design.

UNIT II RELATIONAL MODEL**(12Hrs)**

Structure of Relational Database – Fundamental Relational Algebra Operations – Extended Relational Algebra Operations – Modification of the Database. Structured Query Language: Introduction – Basic Structure of SQL Queries – Set Operations – Additional Basic Operations – Aggregate Functions – Null Values – Nested Sub queries – Views – Join Expression.

UNIT III RELATIONAL DATABASE DESIGN**(12Hrs)**

Features of Good Relational Designs – 1NF – 2NF – 3NF and 4NF with Examples. Atomic Domains and first Normal form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithm for Decomposition – Decomposition using Multivalued Dependencies.

UNIT IV INDEXING , HASHING & PL/SQL**(12Hrs)**

Basic Concepts – Ordered Indices – B+ Tree Index Files – B-Tree Files – Multiples – Key Access – Static Hashing – Dynamic Hashing - PL/SQL - Basic programs – Functions Cursor- Trigger

UNIT V TRANSACTION MANAGEMENT**(12Hrs)**

Transaction Management: Transaction concept – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation and Atomicity – Serializability – Recoverability – Transaction Isolation Levels – Implementation of Isolation Levels.



Text Books

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", McGraw-Hill, 7th Edition, 2019.
2. RamezElmasri and ShamkantNavathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2018.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems The Complete Book" Prentice Hall, 2nd Edition, 2014.

Reference Books

1. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.
2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
4. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.
5. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. <http://dev.mysql.com/doc/>
3. <http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf>
4. <https://nptel.ac.in/courses/106/106/106106095/>
5. <https://www.tutorialspoint.com/dbms/index.htm>



A20CAD404	FINANCIAL AND MANAGEMENT ACCOUNTING II (Common to B.C.A. & B.Sc. Mathematics)	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To develop a deeper understanding on financial statement analysis.
- To make them understand the accounting ratios.
- To learn the preparation of cost sheet.
- To be familiar with marginal costing and break-even analysis.
- To develop the knowledge of budgeting

Course Outcomes

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

- CO1** – Work with the tools of financial analysis
CO2 – Compute Accounting Ratios from financial statements
CO3 – Prepare the cost sheet with unit cost details
CO4 – Work with marginal costing and break-even analysis
CO5 – Prepare the Sales, Production, Cash and Flexible Budgets.

UNIT I FINANCIAL STATEMENTS ANALYSIS (10 Hrs)

Financial Statements – Significance – Users of Financial Statements – Analysis of Financial Statements – Tools of Financial Analysis: Horizontal Analysis, Vertical Analysis, Trend Analysis, and Ratio Analysis. Preparation of Comparative Financial Statements and Common-size Financial Statements. Simple Problems.

UNIT II ACCOUNTING RATIOS (12 Hrs)

Accounting Ratios – Classification of Ratios – Basis of Origin and Functional Classification. Ratios to test Solvency, Profitability, Liquidity, Efficiency and Performance of the business – Computation of Accounting Ratios and Interpretation. Problems on Computation of Ratios from given Financial Statements and other information.

UNIT III COST CONCEPTS AND COST SHEET (12 Hrs)

Cost – Concept and Meaning – Classification of Costs – Elements of Cost – Statement of Cost – Unit Costing – Problems on Cost Sheet.

UNIT IV MARGINAL COSTING AND BREAK-EVEN ANALYSIS (14 Hrs)

Marginal Cost and Marginal Costing – Concept of Contribution – Profit-Volume Ratio – Margin of Safety – Break-Even Analysis: Preparation of Break-Even Chart – Problems on Break-Even Analysis.

Uses of Marginal Costing in decision-making – Pricing Decisions – Make or Buy Decisions – Accepting a Foreign Offer – Sales Mix Decisions.

UNIT V BUDGETING (12 Hrs)

Budget and Budgeting – Types of Budgets – Functional Budgets: Sales Budget, Production Budget, Materials Purchase Budget, Cash Budget. Concept of Flexible Budgeting – Concept of Zero Base Budgeting. Problems on preparation of Sales, Production, Cash and Flexible Budgets.

Text Books

1. P. Periyasamy, "Financial, Cost and Management Accounting", Himalaya Publishing House, 1st Edition, 2011.
2. T.S. Reddy & Y. Hari Prasad Reddy, "Financial and Management Accounting", Margham Publications, 4th Edition, 2018.
3. R.S.N. Pillai & B.N. Bagavathi, "Management Accounting", S. Chand & Sons, 5th Edition, 2010.

Reference Books

1. N. Ramachandran & Ram Kumar Kakani, "Financial Accounting for Management", McGraw Hill, 5th Edition, 2020.
2. M.N. Arora, "Cost and Management Accounting", Vikas Publishing House, 10th Edition, 2019.
3. I.C. Jain, "Management Accounting", Vikas Publishers House, 6th Edition, 2018.
4. N.P. Srinivasan & M. Sakthivel Murugan, "Accounting for Management", S. Chand & Sons, 6th Edition, 2018.
5. M.Y Khan & P K Jain, "Management Accounting", McGraw Hill, 9th Edition, 2018.



Web References

1. <https://www.civilserviceindia.com/subject/Management/notes/financialaccounting.html>
2. <https://www.taxmann.com/blogpost/2000001622/accounting-principles-andconcepts.aspx>
3. <https://www.dynamictutorialsandservices.org/2018/10/management-accounting-notes.html>
4. <https://books.google.co.in/books?id=LZpdDwAAQBAJ&printsec=frontcoverv=onepage&q&f=false>
5. <http://www.accountingnotes.net/management-accounting/management-accountingmeaning-limitations-and-scope/5859>



Bachelor of Computer Applications



A20CAL407**OPERATING SYSTEMS LAB**

L	T	P	C	Hrs
0	0	4	2	30

Course Objectives

- To learn basic UNIX / LINUX commands
- To develop programs in Linux environment using system calls.
- To implement the CPU scheduling algorithms.
- To implement Deadlock handling algorithm.
- To develop solutions for synchronization problems using semaphores

Course Outcomes

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

- CO1** – Understand the basic commands for UNIX / Linux.
CO2 – Develop simple shell programs.
CO3 – Implement different Scheduling Algorithms.
CO4 – Apply the basic concepts of Deadlock Handling procedures.
CO5 – Simulate Critical Section problem using Semaphore.

List of Exercises

1. Study of basic UNIX / Linux commands
2. Shell Programming - I
 - (a) To Write a Shell program to count the number of words in a file.
 - (b) To Write a Shell program to calculate the factorial of a given number.
 - (c) To write a Shell program to generate Fibonacci series.
 - (d) Write a Shell Program to wish the user based on the login time.
3. Shell Programming - II
 - (a) Loops
 - (b) Patterns
 - (c) Expansions
 - (d) Substitutions
4. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, open dir, read dir.
5. To write a program to simulate cat command.
6. To write a program to simulate head and tail commands.
7. Simulate UNIX commands like ls, grep.
8. Process Scheduling- FCFS, SJF, Priority and Round robin.
9. Implementation of Banker's algorithm.
10. Producer and Consumer problem using semaphores.

Reference Books

1. William Stallings, "Operating System", Pearson Education, Sixth edition, 2015.
2. Andrew S. Tanenbaum, Modern Operating Systems, 3rd edition Prentice Hall of India Pvt. Ltd, 2015.
3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt, Third Edition, 2013
4. William Stallings, "Operating System: Internals and design Principles", Old Edition(7), Pearson Education, 2013.
5. Silberschatz, Galvin, "Operating System Concepts", Wiley, Student Edition, 2006.

Web References

1. <https://www.geeksforgeeks.org>
2. <http://avanthioslab.blogspot.com/2016/08/file-organization-techniques.html>
3. <https://www.programming9.com/programs/c-programs/285-page-replacement-programs-in-c>



A20CAL408	DBMS LAB	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To learn and understand DDL & DML.
- To learn and understand DCL.
- To implement Basic SQL commands.
- To execute PL/SQL programs.
- To develop GUI applications in any platform.

Course Outcomes

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

- CO1** – Implement DDL and DML commands.
CO2 – Implement DCL commands.
CO3 – Analyze PL/SQL programs.
CO4 – Understand PL/SQL programs.
CO5 – Develop GUI applications in their known platform.

List of Exercises

1. Create Table using Data Definition Language (DDL).
2. Modify Table using Data Manipulation Language (DML).
3. Store and Retrieve data through Data Control Language (DCL).
4. Implement Constraints and Built-in functions in various tables.
5. Perform Joins and Group-by functions.
6. Implement Simple Programs in PL/SQL.
7. Create PL/SQL programs using functions.
8. Create PL/SQL programs using Cursor.
9. Create PL/SQL programs using triggers.

Developing GUI applications.

- Student Information System.
- Inventory Management.
- Payroll Processing.

Reference Books

1. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2016.
2. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, McGraw Hill, 3rd Edition, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts”, McGraw-Hill Indian Edition, 7th Edition, 2013.
4. Kuhn, "RMAN Recipes for Oracle Database", Apress, 2nd Edition, 2013.
5. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, Pearson Education, 8th Edition, 2006.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. <http://dev.mysql.com/doc/>
3. <http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf>



	L	T	P	C	Hrs
A20CAS404	0	0	4	2	30

OFFICE AUTOMATION TOOLS**Course Objectives**

- To practice the MS Word application.
- To practice the MS Excel application.
- To practice the MS Power point application.
- To practice the MS Access application.
- To practice the MS Picture Manager application.

Course Outcomes

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

- CO 1** - Creating a document in MS Word.
CO 2 - Creating a spread sheet in MS Excel.
CO 3 - Creating a presentations in MS Power Point.
CO 4 - Creating a database in MS Access
CO 5 - Editing a picture in MS Picture Manager.

UNIT I MS WORD**(6 Hrs)**

Introduction – Working with MS Word- Creating a New Document-Different Page Views and layouts - Working with Styles - Text Attributes - Paragraph and Page Formatting - Text editing using various features –Header and Footer – Inserting – Page Numbers, Pictures, Files, Auto texts, Symbols - Working with Columns, Tabs & Indents - Creation & Working with Tables - Margins & Space management in document - Mail Merge.

UNIT II MS EXCEL**(6 Hrs)**

Introduction –Working with MS Excel - Concepts of Workbook & Worksheets - Working with Data & Ranges - Different Views of Worksheets - Column Freezing, Labels, Hiding, Splitting -Using different features with Data and Text - Use of Formulas, Calculations & Functions-Cell Formatting including Borders & Shading - Working with Different Chart Types -Printing of Workbook & Worksheets with various options.

UNIT III MS POWERPOINT**(6 Hrs)**

Introduction – Creating and Viewing Presentations – Editing a Presentation – Inserting styles – Working with Presentation- Animations - Slide transitions and Special Effects -

UNIT IV MS ACCESS**(6 Hrs)**

Introduction – Creating database, table, fields & its properties - Data types - Adding primary key into table – Relationship - Adding/Editing data – Sorting – Indexing - Designing queries - Using forms - Report generation.

UNIT V ADOBE PHOTOSHOP**(6 Hrs)**

Introduction – Creating custom work spaces – Opening images – Image magnification – Moving the image – Bitmap images – Vector images – Color modes and models – Painting tools – Brush settings.

Text Books

1. Archana Kumar, “Computer Basics with Office Automation”, Dream tech Press, Wiley Publisher, 2019.
2. Dr. P. Rizwan Ahmed, “Office Automation”, Margham Publications, 2016.
3. Omani Kellogg , “Adobe Photoshop For Beginners: 2021”

Reference Books

1. Dinesh Maidasani , Straight to the Point – MS Office 2010, Laxmi Publications, 2010.
2. Sherry Kinkoph Gunter, Master Visually Microsoft Office 2010, WILEY, 2010.
3. hector grant , “adobe photoshop for beginners 2021: learn the amazing features of photoshop”



Web References

1. <https://www.tutorialspoint.com/word/index.htm>
2. https://en.wikipedia.org/wiki/Office_automation
3. <https://www.tutorialspoint.com/excel/index.htm>
4. <https://www.tutorialspoint.com/powerpoint/index.htm>
5. https://www.tutorialspoint.com/ms_access/index.htm
6. <https://www.groovypost.com/howto/stop-yahoo-scanning-your-email-to-sell-data/>
7. <https://www.guru99.com/photoshop-tutorials.html>



DISCIPLINE SPECIFIC ELECTIVES
Discipline Specific Electives – I (DSE - I) – offered in Third Semester

A20CAE301	DATA MINING AND WARE HOUSING (Common to B.Sc CS and BCA)	L 3	T 0	P 0	C 3	Hrs 45
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Course Objectives

- To understand the concepts of Data Mining.
- To learn about Data types.
- To learn about Preprocessing.
- To learn the basics of classification.
- To know about Cluster analysis.

Course Outcomes

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

CO 1 - Understand the basic concepts of Data Mining.

CO 2- Understand the basic data types and visualization.

CO 3- Usage of preprocessing techniques.

CO 4 - Basics of classification.

CO 5 - Basic concepts of cluster analysis.

UNIT I INTRODUCTION TO DATA MINING**(9 Hrs)**

Introduction to Data Mining: Definition of data mining - Stages of the Data Mining Process –Basic data types – Major building blocks –Scope of Data Mining – Data Mining working –Data Mining Architecture – Data Mining implementation process – Data Mining Techniques– Advantages & Disadvantages.

UNITII DATA PREPROCESSING**(9 Hrs)**

Data preprocessing: Data preprocessing introduction, Data cleaning - Data integration – Data reduction – Data transformation and data Discretization.

UNIT III CLUSTERING**(9 Hrs)**

Introduction - Hierarchical algorithms – Partitional algorithms –Minimum spanning tree – K-Means Clustering - Nearest Neighbour algorithm. Association Rules: What is an association rule? – Methods to discover an association rule–APRIORI algorithm – Partitioning algorithm

UNITIV CLASSIFICATION – DATA WAREHOUSING**(9 Hrs)**

An introduction – characteristics of a data warehouse – Data marts – other aspects of data mart Online analytical processing: OLTP & OLAP systems.

UNITV DEVELOPING A DATA WAREHOUSE**(9 Hrs)**

Why and how to build a data warehouse – Data warehouse architectural strategies and organizational issues – Design consideration – Data content – meta data – distribution of data – tools for data warehousing – Performance considerations

Text Books

1. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Elsevier, 2010.
2. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar,2005.
3. Data Mining: Practical Machine Learning Tools and Techniques, Fourth Edition, by Ian H. Witten , Eibe Frank , Mark A. Hall , Christopher Pal
- 4.C.S.R.Prabhu, “Data Warehousing concepts, techniques, products & applications”, PHI, Second Edition.) (UNIT IV & V)

Reference Books

1. Data Mining by Charu C Aggarwal, Springer.
2. Introduction to Data Mining by Pang-Nang Tan , Michael Steinbach , Vipin Kumar , Pearson.
3. Principles of Data Mining , by David Hand , HeikkiMannila , Padhraic Smyth , The MIT press , Cambridge
4. Data Mining: The Textbook 2015th Edition by Charu C. Aggarwal Data Mining and Predictive Analytics (Wiley Series on Methods and Applications in Data Mining) 2nd Editionby Daniel T. Larose
5. Pieter Adriaans, Dolf Zantinge, "Data Mining" Pearson Education, 1998.
6. Arun K Pujari, "Data Mining Techniques",Universities Press(India) Pvt, 2003.
7. S.Rajashekharan, G A Vijaylakshmi Bhai,"Neural Networks,Fuzzy Logic ,and Genetic Algorithms synthesis and Application", PHI
- 8.Margaret H.Dunham," Data Mining Introductory and Advanced topics",Pearson Eductaionn 2003.

Web References

1. <https://www.sciencedirect.com/book/9780123814791/data-mining-concepts-and-techniques>
2. https://www.tutorialspoint.com/data_mining/index.htm#:~:text=Data%20Mining%20is%20defined%20as,is%20mining%20knowledge%20from%20data.
3. https://www.tutorialspoint.com/dm/dm_quick_guide.htm
4. <https://www.javatpoint.com/data-mining>



A20CAE302	INTRODUCTION TO DATA SCIENCE USING HADOOP	L	T	P	C	Hrs
	(Common to B.Sc CS and BCA)	3	0	0	3	45

Course Objectives

- To understand the concepts of Data Science.
- To learn about Hadoop Technology.
- To learn about Hadoop Architecture .
- To learn the concept of Eco System in Hadoop.
- To know about Hive.

Course Outcomes

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

CO 1 - Understand the basic concepts of Data Science.

CO 2 - Understand the basic concepts of Hadoop.

CO 3 - Usage of Hadoop Techniques.

CO 4 - Basics of Eco System.

CO 5 - Basic concepts of Hive.

UNIT I INTRODUCTION TO DATA SCIENCE**(9 Hrs)**

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues. Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization

UNIT II INTRODUCTION TO HADOOP**(9 Hrs)**

Introduction to Hadoop - Hadoop Distributed File System – Map Reduce Paradigm – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce – Data Serialization.

UNIT III HADOOP TECHNIQUES**(9 Hrs)**

Hadoop Architecture - Common Hadoop Shell Commands – Name Node, Secondary Name Node and Data Node – Job Tracker and Task Tracker – Cluster Setup – SSH and Hadoop Configuration.

UNITIV ECO SYSTEM**(9 Hrs)**

Hadoop Ecosystem - Hadoop Ecosystem Concepts – Schedulers – New Features of Hadoop 2.0 – Name Node High Availability – HDFS Federation – Map Reduce Version 2 – YARN – Use Cases.

UNIT V HIVE**(9 Hrs)**

Hive, HiveQL and HBase Hive Architecture and Installation – Comparison with Traditional Data Bases – Hive SQL – Querying Data – Sorting and Merging – Joins and Subqueries – HBase Concepts – Schema Design – Advanced Indexing – Use cases.

Text Books

1. Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2011

Reference Books

1. Prajapati, V. Big data analytics with R and Hadoop. Packt Publishing Ltd, 2013
2. Gates, A. Programming Pig. " O'Reilly Media, Inc.", 2011.
3. Capriolo, E., Wampler, D., & Rutherglen, J., Programming hive. " O'Reilly Media, Inc.", 2012.
4. Zikopoulos, P., Parasuraman, K., Deutsch, T., Giles, J., & Corrigan, D.v Harness thePower of Big Data The IBM Big Data Platform. McGraw Hill Professional, 2012.



Web References

1. <https://www.mastersindatascience.org/data-scientist-skills/hadoop/>
2. <https://towardsdatascience.com/big-data-analysis-spark-and-hadoop-a11ba591c057>
3. <https://www.discoverdatascience.org/training/hadoop/>
4. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm
5. <https://www.javatpoint.com/hadoop-tutorial>
6. <https://www.guru99.com/bigdata-tutorials.html>



A20CAE303	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C	Hrs
	(Common to B.Sc CS and BCA)	3	0	0	3	45

Course Objectives

- To grasp the fundamental Computer Graphics concepts.
- To learn the concepts of Output Primitives.
- To understand the 2D and 3D transformation methods.
- Understand the concepts of Basic Multimedia.
- To learn different productions of Multimedia.

Course Outcomes

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

CO1–Definethe concepts of Computer Graphics.

CO2– Applythe concepts of Output Primitives.

CO3 –Simulatethe 2D and 3D transformation methods.

CO4– Identify the Basic Multimedia concepts.

CO5– Examine the different productions of Multimedia.

UNIT I INTRODUCTION TO COMPUTER GRAPHICS**(9 Hrs)**

Introduction to computer graphics: Brief Survey of ComputerGraphics – Graphics Systems: Video Display Devices – Types –Raster-Scan Systems and Random-Scan Systems – Input Devices – Hard-Copy Devices – Graphics Software.

UNIT II OUTPUT PRIMITIVES AND THEIR ATTRIBUTES**(9****Hrs)**

Line-Drawing (DDA and Bresenham's) Algorithms – Circle-Generating (Midpoint) Algorithm – Ellipse-Generating (Midpoint) Algorithms- Area-Filling (Boundary-Fill and Flood-Fill) Algorithms - Line Attributes - Color and Grayscale Levels – Character Attributes.

UNIT III 2D AND 3D TRANSFORMATIONS**(9 Hrs)**

Basic Transformations - Matrix Representations and Homogeneous Coordinates – Composite Transformations - Other Transformations. Three-Dimensional Display Methods: Parallel and Perspective Projections – Depth Cueing – Three-Dimensional Transformations: Translation – Rotation - Scaling - Other Transformations.

UNIT IVINTRODUCTION TO MULTIMEDIA**(9 Hrs)**

Key elements of multimedia: text, audio, video, graphics, animation - Hardware and software requirements for multimedia - Applications of multimedia. Basic design concepts - User interface design - Hypermedia authoring concepts.

UNIT VMULTIMEDIA PRODUCTIONS**(9 Hrs)**

Introduction to animation - Basic audio and video integration techniques - Animation effects - Production process of animation - Process of multimedia production - Various file formats of text, audio, video, graphics and animation - File compression techniques - Creating web based multimedia.

Text Books

- 1.D. Hearn and M.P. Baker, "Computer Graphics", Pearson Education, Prentice Hall, 2ndEdition, 19th Reprint, 2005.
- 2.Andreas Holzinger, "Multimedia Basics -Volume 1", Firewall Media, 2018.




Reference Books

- 1.W.M. Newman and R.F. Sproull , "Principles of Interactive Computer Graphics", Tata McGraw-Hill, 2nd Edition,1997.
- 2.D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia" , Prentice-Hall of India Pvt. Ltd.,1st Edition, 1997.
- 3.Ze-Nian Li, Mark S. Drew, "Fundamentals of Multimedia", Pearson Prentice Hall, 2004.

Web References

1. <https://nptel.ac.in/courses/106108101/>
2. <http://www.tcyonline.com/tests/operating-system-concepts>
3. <http://www.galvin.info/history-of-operating-system-concepts-textbook>
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html
5. <https://www.cse.iitk.ac.in/pages/CS330.html>



A20CAE304**INFORMATION SECURITY**
(Common to B.Sc CS and BCA)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To provide an understanding of principals.
- To understand the technologies.
- To explore the basic ethics.
- To navigate the risk management.
- To observe the control strategies.

Course Outcomes

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

- CO1** – Understand the history of information security.
CO2 - Acquire knowledge about legal and ethical aspects.
CO3 - Providing basic approaches in information security.
CO4 – Observing the major issues in risk management
CO5 – Description of control strategies.

UNIT I INTRODUCTION**(9 Hrs)**

Introduction – History of Information Security – defining security – CNSS Security Model –Components of an Information Security – Approaches to Information SecurityImplementation – System Development Life Cycle.

UNIT II NEED FOR SECURITY**(9 Hrs)**

The Need for Security – Introduction - Business Needs First – Threats – Attacks – Secure Software Development

UNIT III ETHICS**(9 Hrs)**

Legal, Ethical, and Professional Issues in Information Security - Law and Ethics inInformation Security - Relevant U.S. Laws - International Laws and Legal Bodies.

UNIT IV RISK MANAGEMENT**(9 Hrs)**

Ethics and Information Security - Codes of Ethics and Professional Organizations – Risk Management - Introduction - An Overview of Risk Management – Risk Identification – Risk Assessment.

UNIT V CONTROL STRATEGIES**(9 Hrs)**

Risk Control Strategies - Selecting a Risk Control Strategy - Quantitative Versus Qualitative Risk Control Practices - Risk Management Discussion Points

Text Books

1. Michael E. Whitman & Herbert J. Mattord, "Principles of Information Security", CourseTechnology, Cengage Learning, 4thedition, 2011. (Chapters 1,2,3,4,5)
2. James M. Stewart, Ed Tittel, Mike Chapple 'CISSP: Certified Information Systems Security Professional Study Guide', Wiley 2008.
3. Network Security Strategies by Aditya Mukherjee

Reference Books

1. Software-Defined Networking and Securityby Dijiang Huang, Ankur Chowdhary, Sandeep Pisharody
2. Security Engineering A Guide to Building Dependable Distributed Systemsby Ross Anderson
3. Jan Killmeyer Tudor, " Information Security Architecture: An Integrated Approach to Security in the Organization," CRC Press, September 2000
4. Thomas R. Peltier, " Information Security Risk Analysis," Auerbach Publications, January 2001
5. Arnaud de Borchgrave, Frank J. Cilluffo, Sharon L. Cardash, " Cyber Threats and Information Security : Meeting the 21st Century Challenge," Center for Strategic & Int'l Studies, May 2001



Web References

1. <https://www.sitesbay.com/cyber-security/index>
2. <https://www.baynetworks.com/security/>
3. <https://bayshorenetworks.com/>
4. <https://www.baycollege.edu/academics/programs/computer-network-systems-security.php>



Bachelor of Computer Applications



DISCIPLINE SPECIFIC ELECTIVES**Discipline Specific Electives – II (DSE - II) – offered in Fourth Semester**

A20CAE405	MANET	L	T	P	C	Hrs
	(Common to B.Sc CS and BCA)	3	0	0	3	45

Course Objectives

- To provide an understanding of principals.
- To understand the technologies and protocols
- To explore the basic ethics of adhoc network
- To navigate the security
- To observe the integration of adhoc

Course Outcomes

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

CO1 – Understand the history of adhoc

CO2 - Acquire knowledge about wireless network

CO3 - Providing basic approaches in multicast routing

CO4 – Observing the security with manet

CO5 – Description of integration of adhoc

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to adhoc networks – definition, characteristics features, applications. characteristics of Wireless channel, Adhoc Mobility Models:-Indoor and outdoor models. Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet.

UNIT II AD HOC ROUTING PROTOCOLS**(9 Hrs)**

Introduction – Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source– Initiated On–Demand Approaches

UNIT III MULTICAST ROUTING IN ADHOC NETWORKS**(9 Hrs)**

Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols –Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols

UNIT IV END-END DELIVERY AND SECURITY**(9 Hrs)**

Transport layer : Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols

UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G**(9 Hrs)**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.



Text Books

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education. 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad hoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for AdHoc Network”
4. C. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR, 2001.
5. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000

Web References

1. <https://tutorialspoint.dev/computer-science/computer-network-tutorials/manet-mobile-ad-hoc-network>
2. <https://www.javatpoint.com/mobile-adhoc-network>
3. <https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/>
4. <https://minigranth.in/mobile-adhoc-networks-tutorial/introduction-manet>



A20CAE406	PYTHON FOR DATA SCIENCE (Common to B.Sc CS and BCA)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the concepts of programming.
- To learn about flow statements and loops.
- To learn about object oriented programming.
- To learn the concept of advance python.
- To know about data science.

Course Outcomes

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

- CO 1** - Understand the basic concepts of programming.
CO 2 - Understand the basic concepts of flow and loops.
CO 3 – implementations of object oriented programming.
CO 4 - Basics of advance python.
CO 5 - Basic concepts of data science.

UNIT I INTRODUCTION TO PROGRAMMING**(9 Hrs)**

History of computers – Understanding hardware – Writing first program – Variables and Data types – assigning variables – operators

UNIT II CONTROL FLOW & LOOPS**(9 Hrs)**

If, If-Else, Else if, Switch Statements - For, While, Do-While, For Each loops

UNIT III OBJECT ORIENTED PROGRAMMING**(9 Hrs)**

Introduction to O.O.P paradigm - Introduction to Objects, Classes, Instances - Inheritance, Abstraction, and Sets

UNIT IV ADVANCED PYTHON**(9 Hrs)**

File Input - User Input- List Comprehension - Packages

UNIT V DATA SCIENCE**(9 Hrs)**

Introduction to Data Science - Review Python Fundamentals - Understanding the data science discipline- Pandas - Data set reading - Filtering, Cleaning, Manipulating Data - Excel vs Python - Matplotlib Package- Understanding motivations between different graphs - Sci-Kit Learn package - Understand motivation and definition of machine learning

Text Books

1. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
2. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science",manning publications, 2016 (Chapter 1 to 3 for Module I &Module V)
3. Martin C Brown, "Python The Complete Reference", McGraw-Hill Education, 4th Edition,2018

Reference Books

1. Data Science and Big Data Analytics", EMC Education Service, Wiley. 2015 (Chapter1 & 2 for module II)
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.
3. Ben Stephenson, "The Python Workbook A Brief Introduction with Exercises and Solutions", Springer International Publishing, Switzerland2014.

Web References

1. <https://pythonprogramming.net/introduction-learn-python-3-tutorials/>
2. <https://www.mastersindatascience.org/data-scientist-skills/hadoop/>
3. <https://towardsdatascience.com/big-data-analysis-spark-and-hadoop-a11ba591c057>



A20CAE407	IMAGE PROCESSING	L	T	P	C	Hrs
	(Common to B.Sc CS and BCA)	3	0	0	3	45

Course Objectives

- To study the various concepts
- To Explore the methods and algorithms of image processing
- To represent the image transformation
- To enhance the image enhancement
- To describe the image restoration, image compression techniques

Course Outcomes

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

CO1 - Study the various concepts

CO2 - Explore the methods and algorithms of image processing

CO3 - Represent the image transformation

CO4 - Enhance the image enhancement

CO5 - Describe the image restoration, image compression techniques

UNIT I CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS (9 Hrs)

Light, Luminance, Brightness and Contrast, Eye, The Monochrome Vision Model, Image Processing Problems and Applications, Vision Camera, Digital Processing System, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd Max Quantizer, Dither, Color Images, Linear Systems And Shift Invariance, Fourier Transform, Z Transform, Matrix Theory Results, Block Matrices and Kronecker Products

UNIT II IMAGE TRANSFORMS (9 Hrs)

2-D orthogonal and Unitary transforms, 1-D and 2-DDFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-loeve, Singular value Decomposition transforms

UNIT III IMAGE ENHANCEMENT (9 Hrs)

Point operations - contrast stretching, clipping and thresholding density slicing, Histogram equalization, modification and specification, spatial operations – spatial averaging, low pass, high pass, bandpass filtering, direction smoothing, medium filtering, generalized cepstrum and homomorphic filtering, edge enhancement using 2-D IIR and FIR filters, color image enhancement.

UNIT IV IMAGE RESTORATION (9 Hrs)

Image observation models, sources of degradation, inverse and Wiener filtering, geometric mean filter, nonlinear filters, smoothingsplines and interpolation, constrained least squares restoration.

UNIT V IMAGE DATA COMPRESSION (9 Hrs)

Image data rates, pixel coding, predictive techniques transform coding and vector DPCM, Block truncation coding, wavelet transform coding of images, color image coding. Random transform, back projection operator, inverse random transform, back projection algorithm, fan beam and algebraic restoration techniques

Text Books

1. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 1995.
2. Sid Ahmed M.A., "Image Processing", McGraw Hill Inc, 1995.
3. Gonzalaz R. and Wintz P., "Digital Image Processing", Addison Wesley, 2nd Ed, 1987.

Web References

1. http://www.imageprocessingplace.com/root_files_V3/tutorials.htm
2. <https://www.geeksforgeeks.org/digital-image-processing-basics/>
3. <https://www.tutorialspoint.com/dip/index.htm>
4. <https://www.javatpoint.com/digital-image-processing-tutorial>
5. <https://www.mathworks.com/learn/tutorials/image-processing-onramp.html>



A20CAE408	ETHICAL HACKING (Common to B.Sc CS and BCA)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Investigate how to attack a computer system.
- Explore low tech hacking techniques Investigate web-based hacking.
- Explore wireless network hacking.
- Investigate Trojans and other attacks.
- Perform penetration testing.

Course Outcomes

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

CO1 - Identify and analyze the stages an ethical hacker requires to take in order to compromise a target system.

CO2 - Identify tools and techniques to carry out a penetration testing.

CO3 - Critically evaluates security techniques used to protect system and user data.

CO4 - Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.

CO5 - Develop a practical understanding of the current cyber security issues.

UNIT I INTRODUCTION**(9 Hrs)**

Ethical Hacking Introduction - Attack Scenarios - Emulating Cyber Attacks - Cyber Laws - Programming (C, Python, Assembly Language Basics, Computer Memory)

UNIT II SCOPE**(9 Hrs)**

Scope of Hacking - Red Team Operations - Purple Team Operation - Bug Bounty Programs

UNIT III EXPLOITATION**(9 Hrs)**

System Exploitation Basic System Exploits - Windows Exploits – Power shell Exploitation - Web Application Exploitation

UNIT IV MALWARE**(9 Hrs)**

Malware Analysis Study of Malware - Mobile Malware – Ransomware.

UNIT V ETHICAL HACKING MOTION**(9 Hrs)**

Putting Ethical Hacking in Motion: Social Engineering, Why Hackers Use Social Engineering, Understanding the Implications, Performing Social-Engineering Attacks: Fishing for information, Building trust, exploiting the relationship. Social-Engineering Countermeasures: Policies, awareness

Text Books

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, "Gray Hat Hacking The Ethical Hacker's Handbook", McGraw-Hill, 5th Edition, 2018.
2. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group– 2008.
3. Kimberly Graves, "Certified Ethical Hacker STUDY GUIDE", Wiley publication, 2010.

Reference Books

1. Sean-Philip Oriyano, "Hacker Techniques, Tools, and Incident Handling, Jones and Bartlett Learning LLC", 3rd Edition, 2018.
2. AnkitFadia, "The Unofficial Guide to Ethical Hacking", Premier Press, 2nd Edition 2006.
3. LakshayEshan, "Ethical Hacking A Beginners Guide to Learning the World of Ethical Hacking", Amazon Digital Services LLC - KDP Print US, 2018.
4. RafayBaloch, "Ethical Hacking and Penetration Testing Guide", CRC Press, 2017.
5. Adidas Wilson, "Hacking Essentials The Beginner's Guide To Ethical Hacking And Penetration Testing", Adidas Wilson, 2019.



Web References

1. <https://freedomhacker.net> › Internet Security.
2. <https://www.guru99.com/c-sharp-tutorial.html>.
3. <https://www.hackthissite.org/>
4. <https://www.eccouncil.org/programs/certified-ethical-hacker-ceh/>
5. <https://hackaday.com/>



OPEN ELECTIVES
Open Electives – I (OE - I) – offered in Third Semester

A20CPO310	DATA STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

(Permitted Department – Mathematics, Bio Technology , Nutrition and Dietetics)

Course Objectives

- To understand the concept of data structure and arrays.
- To learn about Stack and List.
- To learn about Queue and Tree.
- To learn the concept of Graph.
- To know about Sorting.

Course Outcomes

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

CO 1 - Descriptions about the concept of data structure and arrays.

CO 2- Understand the Stack and List.

CO 3 - Usage of Queue and Tree.

CO 4 - Usage of Graph.

CO 5 - Explain the types of Sorting.

UNIT I DATA STRUCTURE AND ARRAY**(9 Hrs)**

Introduction – Types of data structure – Arrays - Representation of arrays- Applications of arrays- Searching - Linear search and Binary Search .

UNIT II STACK AND LIST**(9 Hrs)**

Introduction – Representation- Operations on stack - Implementation of stack using array- Application – Evaluation of Expression – List – Representations - Implementing the list operations- Single Linked List - Doubly Linked List – Circular Linked List -Operations and Applications.

UNIT III QUEUE AND TREE**(9 Hrs)**

Introduction – Representation, Operations on Queues, Implementation of queues using array – Tree - Basic terminology - Binary tree - Representation – Traversal - Binary search tree .

UNIT IV GRAPH**(9 Hrs)**

Introduction – Definition and Terminology – Representation, Traversal – Depth First and Breadth First traversal - Applications

UNIT V SORTING**(9 Hrs)**

Introduction – Selection sort - Bubble Sort - Insertion Sort - Merge Sort - Quick Sort

Text Books

1. Ellis Horowitz, Sartaj Sahni and Anderson, “Fundamentals of Data Structure in C”, University Press, 2nd edition, 2008.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 4th Edition, Pearson Education, 2013.
3. A Puntambekar, “Data Structures”, Third Revised Edition, Technical Publications Pune, 2008.

Reference Books

1. A Puntambekar, “Data Structures”, Third Revised Edition, Technical Publications Pune, 2008.
2. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, 2nd Edition, The Orient Blackswan, 2019.
3. Reema Thareja, “Data Structures Using C”, 1st Edition, Oxford University Press, 2017.
4. Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education, 2015.
5. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint, 2006.



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1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. <https://www.javatpoint.com/data-structure-tutorial>
3. <https://www.coursera.org/specializations/data-structures-algorithms>
4. <https://www.geeksforgeeks.org/data-structures/>
5. <https://www.codechef.com/certification/data-structures-and-algorithms/prepare>



A20CPO311	PROGRAMMING IN C	L	T	P	C	Hrs
		3	0	0	3	45
(Permitted Departments - Commerce and Management, Mathematics, Media Studies, Bio Technology , Nutrition and Dietetics)						

Course Objectives

- To understand the Fundamentals of Computer and basic concepts of C programming.
- To learn about decision making and branching techniques.
- To learn about Arrays and Functions.
- To learn the concept of Structures and Unions.
- To know about Pointer and File management.

Course Outcomes

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

CO 1 - Understand the Fundamentals of Computer and basic concepts of C programming.

CO 2 - Understand the decision making and branching techniques.

CO 3 - Usage of Arrays and Functions.

CO 4 - Usage of Structures and Unions.

CO 5 - Usage of Pointer and File management.

UNIT I OVERVIEW OF C**(9 Hrs)**

Fundamentals of Computer: Computer Definition – Block Diagram of Computer – Types of Computer – Characteristics of Computer – Applications of Computer.

History of C –Importance of C – Programming style – Executing a c program – C tokens – Keywords and identifiers – Constants – variables – Data types – Operators and Expressions - Sample exercises .

UNIT II DECISION MAKING AND BRANCHING**(9 Hrs)**

Introduction – IF statement – The If..Else statement – Nesting of If.. Else statements – The Else if ladder – The switch statement – The goto statement – Looping statements – The while statement – Do – While statement – For loop statement – Sample exercises .

UNIT III ARRAYS AND FUNCTIONS**(9 Hrs)**

Introduction – One dimensional arrays – Declaration and Initialization – Two dimensional arrays - Declaration and Initialization – Multidimensional array – Dynamic array – Functions – Introduction – Types of functions – Built in functions – User defined functions – String functions – Mathematical functions – Recursion - Sample exercises.

UNIT IV STRUCTURES AND UNIONS**(9 Hrs)**

Introduction – Defining Structure – Declaring structure variable – Accessing structure members - Structure initialization – Arrays of structure – Unions – Size of structure - Sample exercises.

UNIT V POINTER AND FILE MANAGEMENT**(9 Hrs)**

Introduction – Understanding pointer – Accessing the address of a variable – Declaring pointer variables – Initialization of pointer variables – Pointers and array – Pointer to functions – Pointer to structure – File management in C – Introduction – Defining and opening a file – Closing a file – Input and output operations on file - Sample exercises.

Text Books

1. E. Balagurusamy, "Programming in ANSI C ", Fourth edition , Tata McGraw Hill Publishing company limited .
2. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language", Second Edition , Pearson.
3. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, 4th Edition, New Delhi, 2015.
4. Herbert Schildt, "C: The Complete Reference", McGraw Hill, 4th Edition, 2014.
5. Yashwant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.



Reference Books

1. Peter van der Linden, "Expert C Programming: Deep Secrets", **1st Edition, Kindle Edition.**
2. Herbert Schildt ,C: The Complete Reference , Tata McGraw Hill.
3. AshokNKamthane,"ComputerProgramming",Pearsoneducation,2rdImpression,2012.
4. VikasVerma,"AWorkbookonC",CengageLearning,2rdEdition,2012.
5. Dr.P.RizwanAhmed,"OfficeAutomation",MarghamPublications,2016.
6. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", 4th Edition, SriKrishnaPublications,2012.
7. PradipDev,ManasGhoush,"ProgramminginC",2rdEdition,OxfordUniversityPress,2011.

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1. <https://www.tutorialspoint.com/cprogramming/index.htm>
2. <https://www.cprogramming.com/>
3. <https://www.javatpoint.com/c-programming-language-tutorial>
4. <https://www.geeksforgeeks.org/c-programming-language/>
5. <https://www.w3schools.in/c-tutorial/>



A20CPO312**PROGRAMMING IN PYTHON**

L	T	P	C	Hrs
3	0	0	3	45

(Permitted Departments - Commerce and Management, Mathematics, Media Studies, Bio Technology , Nutrition and Dietetics)

Course Objectives

- To understand an introduction to python.
- To learn about control structures.
- To derivate a concept of List.
- To know about the concept of functions.
- To manage the string and file process.

Course Outcomes

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

CO 1 - Observing the introduction to python.

CO 2 - Develop the programs using control structures.

CO 3 - Presenting the concept of List.

CO 4 - Develop the programs in Functions.

CO 5 - Maintaining the files.

UNIT I INTRODUCTION TO PYTHON**(9 Hrs)**

Introduction - The Python Standard Library - Literals - Numeric Literals - String Literals - Control Characters - String Formatting - Variables and Identifiers - Variable Assignment and Keyboard Input- Identifier-Keywords and Other Predefined Identifiers in Python – Operators – Various Operators - Relational Operators-Membership Operators – Boolean Operators - Expression and Data Types.

UNIT II CONTROL STRUCTURE**(9 Hrs)**

Introduction - Control Structure -Selection Control- If Statement - Indentation in Python - Multi-Way Selection - Iterative Control - For Loops- While Loops- Definite vs. Indefinite Loops

UNIT III LIST**(9 Hrs)**

Introduction – List Structures - Common List Operations - List Traversal - Lists (Sequences) in Python- Python List Type - Tuples- Sequences- Nested Lists Iterating Over Lists (Sequences) in Python .

UNIT IV FUNCTIONS**(9 Hrs)**

Introduction – Defining Functions - Calling Value-Returning Functions - Calling Non-Value-Returning Functions - Keyword Arguments in Python - Default Arguments in Python - Variable Scope - Recursive functions - Exception Handling - Catching and Handling.

UNIT V STRING AND FILE PROCESS**(9 Hrs)**

Introduction – String Processing - String Traversal – String-Applicable Sequence Operations -String Methods - Using Text Files - Opening Text Files - Reading Text Files - Writing Text Files

Text Books

1. Charles Dierbach, Introduction to Computer Science using Python , Wiley First Edition (2015)
2. LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", John Wiley & Sons, 2012
3. Learning with python , by Allen Downey, Jeffrey Elkner

Reference Books

1. Zed A.Shaw, Learn Python the Hard Way Paperback, Pearson Education, Third Edition
2. Paul Barry, Head First Python, O' Reilly Publishers, First Edition, 2010
3. Python for Everybody: Exploring Data in Python 3 by Charles R. Severance
4. Think Python: How to Think Like a Computer Scientist by Allen B. Downey



Web References

1. <https://www.tutorialspoint.com/python/index.htm>
2. <https://www.javatpoint.com/python-tutorial>
3. <https://www.javatpoint.com/python-basic-programs>



OPEN ELECTIVES
Open Electives – II (OE - II) – offered in Fourth Semester

A20CPO410	DATABASE MANAGEMENT SYSTEMS	L	T	P	C	Hrs
	(Permitted Departments - Commerce and Management, Mathematics, Media Studies, Bio Technology , Nutrition and Dietetics)	3	0	0	3	45

Course Objectives

- To learn about Database Structure and Data Models.
- To study SQL Commands for storing and retrieving data into the database.
- To study the Relational database system design
- To understand the concept of Transactions
- To understand the concept of Concurrency Control and Recovery System

Course Outcomes

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

CO1– Design conceptual data model using Entity Relationship Diagram.

CO2– Design conceptual and logical database models for an application.

CO3– Normalize relational database design of an application.

CO4– Explain the need for Indexing, Hashing in database.

CO5 – Understand the strategies for Transactions and Management.

UNIT I INTRODUCTION**(9 Hrs)**

Database System Application – Purpose of Database Systems – View of Data – Database Languages – Relational Database – Database Design – System Structure – Database Architecture. Database Design and E-R Model: Overview of the Design Process – The E-R Model – Constraints – E-R Diagrams

UNIT II RELATIONAL MODEL**(9 Hrs)**

Structure of Relational Database – Fundamental Relational Algebra Operations – Extended Relational Algebra Operations – Modification of the Database - Structured Query Language: Introduction – Basic Structure of SQL Queries – Set Operations – Additional Basic Operations – Aggregate Functions

UNIT III RELATIONAL DATABASE DESIGN**(9 Hrs)**

Features of Good Relational Designs – 1NF – 2NF – 3NF and 4NF with Examples - Atomic Domains and first Normal form – Decomposition using Functional Dependencies – Functional Dependency Theory – Algorithm for Decomposition – Decomposition using Multi valued Dependencies.

UNIT IV SQL LANGUAGES**(9 Hrs)**

Structured Query Language - Introduction, History of SQL Standard, Commands in SQL, Data Types in SQL, Data Definition Language, Data Manipulation Language, Data Control Language - Table Modification Commands – primary & foreign keys

UNIT V PL/SQL**(9 Hrs)**

Introduction, Shortcoming in SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, steps to Create a PL/SQL, steps to create a Cursors, Procedure, Function, Triggers.

Text Books

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", McGraw-Hill, 7th Edition, 2019.
2. RamezElmasri and ShamkantNavathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2018.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems The Complete Book" Prentice Hall, 2nd Edition, 2014.

Reference Books

1. Raghu Ramakrishna, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition, 2014.
2. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
3. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database System", Pearson Education, 8th Edition, 2006.
4. Paul Beynon-Davies, "Database Systems", Palgrave Macmillan, 3rd Edition, 2003.
5. Mukesh Chandra Negi, "Fundamentals of Database Management Systems", BPB Publications, 2019.

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1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. <http://dev.mysql.com/doc/>
3. <http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf>
4. <https://nptel.ac.in/courses/106/106/106106095/>
5. <https://www.tutorialspoint.com/dbms/index.htm>



A20CPO411	INTRODUCTION TO DATA SCIENCE USING PYTHON	L	T	P	C	Hrs
	(Permitted Departments - Commerce and Management, Mathematics, Media Studies, Bio Technology , Nutrition and Dietetics)	3	0	0	3	45

Course Objectives

- To understand the concepts of programming.
- To learn about flow statements and loops.
- To learn about object oriented programming.
- To learn the concept of advance python.
- To know about data science.

Course Outcomes

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

- CO 1** - Understand the basic concepts of programming.
CO 2 - Understand the basic concepts of flow and loops.
CO 3 – implementations of object oriented programming.
CO 4 - Basics of advance python.
CO 5 - Basic concepts of data science.

UNIT I INTRODUCTION TO PROGRAMMING**(9 Hrs)**

History of computers – Understanding hardware – Writing first program – Variables and Data types – assigning variables – operators

UNIT II CONTROL FLOW & LOOPS**(9 Hrs)**

If, If-Else, Else if, Switch Statements - For, While, Do-While, For Each loops

UNIT III OBJECT ORIENTED PROGRAMMING**(9 Hrs)**

Introduction to O.O.P paradigm - Introduction to Objects, Classes, Instances - Inheritance, Abstraction, and Sets

UNIT IV ADVANCED PYTHON**(9 Hrs)**

File Input - User Input- List Comprehension - Packages

UNIT V DATA SCIENCE**(9 Hrs)**

Introduction to Data Science - Review Python Fundamentals - Understanding the data science discipline- Pandas - Data set reading - Filtering, Cleaning, Manipulating Data - Excel vs Python - Matplotlib Package- Understanding motivations between different graphs - Sci-Kit Learn package - Understand motivation and definition of machine learning

Text Books

1. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
2. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science",manning publications, 2016 (Chapter 1 to 3 for Module I &Module V)
- 3.Martin C Brown, "Python The Complete Reference", McGraw-Hill Education, 4th Edition,2018

Reference Books

1. Data Science and Big Data Analytics", EMC Education Service, Wiley. 2015 (Chapter1 & Chapter 2 for module II)
- 2.Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.
3. Ben Stephenson, "The Python Workbook A Brief Introduction with Exercises and Solutions", Springer International Publishing, Switzerland2014.

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1. <https://pythonprogramming.net/introduction-learn-python-3-tutorials/>
2. <https://www.mastersindatascience.org/data-scientist-skills/hadoop/>
3. <https://towardsdatascience.com/big-data-analysis-spark-and-hadoop-a11ba591c057>
4. <https://www.discoverdatascience.org/training/hadoop/>



		L	T	P	C	HRS
A20CPO412	WEB DEVELOPMENT					
	(Permitted Departments - Commerce and Management, Mathematics, Media Studies, Bio Technology , Nutrition and Dietetics)	3	0	0	3	45

Course Objectives

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

- CO1** - Develop basic web applications.
CO2 - Design the web applications using CSS.
CO3 - Validate the web pages using java scripts functions.
CO4 - Demonstrate the web 2.0 application to advance scripts.
CO5 - Update the knowledge of XML Data.

UNIT I INTRODUCTION TO WWW & HTML

(9 Hrs)

Protocols– Secure Connections– Application and development tools– Web browser– Server definition – Dynamic IP.Web Design: Web site design principles–Planning the site and navigation. HTML: Development process– Html tags and simple HTML forms– Web site structure.

UNIT II STYLE SHEETS

(9 Hrs)

Introduction to CSS: Need for CSS– Basic syntax and structure using CSS–Background images– Colors and properties–Manipulating texts using fonts, borders and boxes–Margins, padding lists, positioning using CSS

UNIT III JAVASCRIPTS

(9 Hrs)

Client side scripting :Basic JavaScript – Variables–Functions–Conditions– Loops. Application : Page Validation – Reporting.

UNIT IV ADVANCE SCRIPT

(9 Hrs)

JavaScript and objects– DOM and Web browser environments–Forms and Validations–DHTML. AJAX: Introduction– Web applications –Alternatives of AJAX.

UNIT V XML

(9 Hrs)

Introduction to XML– Uses of XML–Simple XML– XML key components– DTD and Schemas– Well-formed XML document – Applications of XML– XSL and XSLT.

Text Books

1. Keith Wald, Jason Lengstorf, " Pro PHP and jQuery", Paperback, 2016.
2. SemmyPurewal, "Learning Web App Development", O'Reilly Media, 2014.
3. P.J. Deitel AND H.M. Deitel, " Internet and World Wide Web - How to Program", Pearson Education, 2009.

Reference Books

1. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development ", O'Reilly Media, 2014.
2. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript& HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
3. UttamK.Roy, "Web Technologies", Oxford University Press, 2010.
4. Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.

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2. <https://www.geeksforgeeks.org/web-technology/>
3. <https://www.guru99.com/cakephp-tutorial.html>
4. <https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business>
5. <http://Oriel.ly/learning-web-app>

