

Bachelor of Computer Applications (BCA/BCA – LE) - Semester Pattern

Under Choice Based Credit System (CBCS)

Regulation and Syllabus



School of Computer Science

TAMIL NADU OPEN UNIVERSITY

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Chennai 600 015

Bachelor of Computer Applications (B.C.A.)

Regulations

1. Programme Learning Objectives (PLOs):

- PLO:1 Posses strong fundamentals to solve problems, think independently and to understand The role of Computer Science in Information technology
- PLO:2 Develop the students to understand the basics of Computer Science
- PLO:3 Realize the significance of software development.
- PLO:4 Acquire the skills to use appropriate theory, practices and tools to design, implement, test and evaluate systems to solve problems in Computer Science and other fields
- PLO:5 Enhance the Employment Opportunity to the youths.

3. Programme Specific Objectives (PSO):

- PSO:1 Apply the knowledge of mathematics and science fundamentals to solve the complex problems.
- PSO:2 Identify and resolve right issues at right time.
- PSO:3 Develop variety of real time applications using latest technologies.
- PSO:4 Combine analytical, logical and managerial skills with the technical aspects to resolve real world issues.
- PSO:5 Possess strong foundation of computer knowledge for their higher studies.
- PSO:6 Apply the suitable techniques to effectively manage business challenges.

Bachelor of Computer Applications and Lateral Entry

Distance Mode – Semester Pattern

(From Academic Year 2021-22 onwards)

Part	Name of the Course	Title of the Course	Course Code	Credit	Examination		
					Marks Distribution		Maximum Marks
					CIA*	TEE#	
1st YEAR							
Semester - I							
I	Language	Tamil or other language – I	BFTMS-11	3	30	70	100
II	Language	Foundation in English – I	BFEGS-11	3	30	70	100
III	Core - I	Problem Solving Techniques	BCAS-11	4	30	70	100
	Core-II	Information Technology Essentials	BCAS-12	4	30	70	100
	Ancillary - I	Allied Mathematics – I	BMSSA-11	3	30	70	100
IV	Core- Practical 1	Office Automation Laboratory	BCAS -P1	2	30	70	100

Semester - II							
I	Language	Tamil or other language – II	BFTMS-21	3	30	70	100
II	Language	Foundation in English – II	BFEFS-21	3	30	70	100
III	Core - III	Programming in C	BCAS-21	4	30	70	100
	Core-IV	Open Source Technology	BCAS-22	4	30	70	100
	Core-V	Digital Logic	BCAS-23	4	30	70	100
	Core Practical-II	C Programming Laboratory	BCAS-P2	2	30	70	100
2 nd YEAR							
Semester - III							
III	Core-VI	Programming Using C++	BCAS-31	4	30	70	100
	Ancillary- II	Allied Mathematics-II	BMSSA-22	3	30	70	100
	Core -VII	Data Structures	BCAS-32	4	30	70	100
	Core Practical III	C++ Laboratory	BCAS-P3	2	30	70	100
	Core Practical IV	Data Structures Laboratory	BCAS-P4	2	30	70	100
IV	Elective	Environmental Studies	CCE	2	30	70	100
Semester - IV							
III	Core-VIII	Operating Systems	BCAS-41	4	30	70	100
	Core-IX	Data Base Management Systems	BCAS-42	4	30	70	100
	Core - X	Web Designing	BCAS-43	4	30	70	100
	Core -XI	Software Engineering	BCAS-44	4	30	70	100
	Core Practical V	Web Designing Laboratory(HTML/DHTML/CSS)	BCAS-P5	2	30	70	100
	Core Practical - VI	Data Base Management System Laboratory	BCAS-P6	2	30	70	100
3 rd YEAR							
Semester - V							
III	Core -XII	Data Communication & Networking	BCAS-51	4	30	70	100
	Core-XIII	Programming in Java	BCAS-52	4	30	70	100
	Core-XIV	Programming in Python	BCAS-53	4	30	70	100
	Core Practical- VII	Programming in Java – Laboratory	BCAS-P7	2	30	70	100
	Core Practical - VIII	Programming in Python – Laboratory	BCAS-P8	2	30	70	100
IV	Elective	Generic Elective-1	GE-1	2	30	70	100
Semester – VI							
III	Core-XV	Visual Programming	BCAS-61	4	30	70	100
	Core Practical -IX	Visual Programming Laboratory	BCAS-P9	2	30	70	100
	Project Work	Mini Project	BCAS-P10	2	30	70	100
IV	Elective	Elective- I**	CBCS (Student Choice)	3	30	70	100
	Elective	Elective –II**	CBCS (Student Choice)	3	30	70	100
	Elective	Generic Elective-2	GE-2	2	30	70	100

Total Credits for BCA = 110 & BCA - LE - 71 Total Marks = 3600

* Generic Elective papers list given by the university

* *Continuous Internal Assessment (CIA)*

* *Term End Examination (TEE)*

***Any one from the list of respective electives*

Non-Major Elective Courses for other Discipline Students

1. *Information Technology Essentials-BCAS-12*
2. *Office Automation – BCAS-13*

Core and Elective Courses:

1. Core Courses – Core theory papers – I, II, III, IV, V, VI, VIII, XI, XIV
Core Practicals – I, II, IV, VI, VIII
2. Ability Enhancement Compulsory Courses (AECC) – (i) Foundation in English - I
(ii) Foundation in English - II
3. Skill Enhancement Courses (SEC) – Core Practicals- III, V, VII, IX
4. Non-Major Elective (NME) – Candidates may choose one paper from the list given by the University
5. Discipline Specific Elective (DSE) – Core theory papers –VII, IX, X, XII, XIII, XV.

LIST OF ELECTIVES

Course Code	Course Name
ELECTIVE – I	
BCASE-01	Principles of Management
BCASE-02	Management Information Systems
BCASE-03	Professional Ethics
BCASE-04	Constitution of India
ELECTIVE – II	
BCASE-05	E- Learning
BCASE-06	Big Data Analytics
BCASE-07	Financial Accounting
BCASE-08	Data Mining

Detailed Syllabus



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

பாடப் பெயர் : தமிழ் (Tamil)
(Course Title)

பாடக் குறியீடு : BFTMS-11
(Course Code)

பாட கற்றல் அளவெண் : 3
(Course Credits)

பாட நோக்கங்கள்

1. தமிழ் இலக்கியங்களை அறிமுக நோக்கில் எடுத்துரைத்தல்
2. மொழித்திறன், மொழியறிவு, இலக்கியப் பொது அறிவு பெறும் வகையில் விவரித்தல்

பாடத்தினைப் படிப்பதால் விளையும் பயன்கள்

1. தமிழிலுள்ள சமய இலக்கியங்கள், சிற்றிலக்கியங்கள், மரபுக் கவிதை, புதுக் கவிதை, உரைநடை இலக்கியங்கள், மு.வ.வின் உரைநடைச் சிறப்புகள், பாரதிதாசனின் அமைதி நாடகச் சிறப்புகள் பற்றி மாணவர்கள் விரிவாக எடுத்துரைப்பார்கள்.

பிரிவு - 1 பன்னிரு திருமுறைகள்

தமிழில் சமய இலக்கியங்கள் - சமய இலக்கியத் தோற்றம், சமணமும் பௌத்தமும், சைவ சமய வளர்ச்சி, பன்னிரு திருமுறை பட்டியல் - திருஞானசம்பந்தர் தேவாரம் பாடல் சிறப்புகள். - (திருநாவுக்கரசரின் மாசில் வீணையும், நம்கடம்பனைப் பெற்றவள், சுந்தரர் - பித்தா பிறைசூடி, பொன்னார் மேனியனே, மாணிக்கவாசகர் - வானாகி மண்ணாகி, பால்நினைந்து ஊட்டும், திருமூலரின் ஒன்றே குலமும் ஒருவனேதேவனும், அன்பும் சிவமும் இரண்டென்பர், காரைக்காலம்மையார் - இன்று நமக்கெளிதே மாலுக்கும், அறிவானும் தானே அறிவிப்பான் .

பிரிவு - 2 நாலாயிரத் திவ்யப் பிரபந்தம்

முதல் மூன்று ஆழ்வார்கள் - பொய்கையாழ்வார் பாடல் - வையம் தகளியா வார்கடலே, பூத்ததாழ்வார் பாடல் - அன்பே தகளியா ஆர்வமே - பேயாழ்வார் - திருக்கண்டேன் பொன்மேனி கெண்டேன்,

திருமழிசை ஆழ்வார் பாடல் - அன்பாய் ஆரமுதம் ஆவாய், நம்மாழ்வார் - இவையும் அவையும் உவையும், மதுரகவியாழ்வார் - நன்மையால் மிக்க நான்மறை, குலசேகராழ்வார் - செல்வத்து அரம்பையர்கள், பெரியாழ்வார் - மாணிக்கம் கட்டி வயிரம் இடைகட்டி - ஆண்டாள் - மத்தளம் கொட்ட வரிசங்கம், தொண்டரடிப் பொடியாழ்வார் - பச்சைமா மலைபோல் மேனி, திருப்பாணாழ்வார் - கொண்டல் வண்ணனைக் கோவலனாய், திருமங்கையாழ்வார் - குலம்தரும், செல்வம் தந்திடும், அடியார்.

பிரிவு - 3 சீறாப்புராணம் (கதீசா கனவு கண்ட படலம்)

சீறாப்புராணம் - காப்பிய அமைப்பு, கதீசா கனவு கண்ட படலம், காப்பிய முன்கதைச் சுருக்கம், படலக் கதைச் சுருக்கம் - கதீசா கனவு கண்டு எழுதல் - கதீசா கண்ட கனவு, கதீசாவின் ஏமாற்றம் - கதீசாவின் இயல்பு நிலையில் மாற்றம் - ஒப்பனை துறந்த விரக்தி, பஞ்சணை பொருந்தா நிலை - கதீசாவின் புலம்பல் - விதவசம் பொருந்துமோ எனல், மாதுலன் வசனம் சிதையுமோ எனல், கதீசா தேம்புதல். - மெசறாவின் மடல் வருதல் - மெசறா எழுதிய பத்திரம், சித்திர வரிதொறும் முத்தமிடுதல், கடலில் தவிப்பார்க்குக் கிடைத்த மரக்கலம்.

பிரிவு - 4 தேம்பாவணி (காட்சிப் படலம்)

தேம்பாவணி - காப்பிய அமைப்பு, காட்சி படலம், காப்பிய முன்கதைச் சுருக்கம், படலக் கதைச் சுருக்கம், - கோவர் கூட்டம் வந்து காணுதல் - குழந்தை இயேசுவைத் தொழுதல், முல்லையார் தந்த முல்லை மாலை, பேரின்பத்தால் உயிர் ஊஞ்சலாடல் - கோவலர் போற்றி வாழ்த்துதல் - நீவிப் போன ஆட்டை மீட்கவோ உதித்தனை எனல், பிணிக் குலத்தக்கது உதித்த பெற்றி போற்றல், அன்னையையும் ஆண்டவரையும் வாழ்த்துதல் - கோவலர் செலுத்திய காணிக்கை - இடைச்சியர் மாலை சாத்தல், இடையர் தந்த பால் காணிக்கை, குழந்தை இயேசுவின் அருள்நோக்கு - ஓகனோடு ஓங்குதாயும் வாழ்த்தினாள் - அன்பால் பீறிட்ட ஆனந்தக் கண்ணீர் மழை, வேந்தரை நீக்கி ஆயரைத் தெரிந்ததென் எனல்.

பிரிவு - 5 முத்தொள்ளாயிரம் (யானை மறம் - மருப்பு ஊசி யாக, கொடிமதில் பாய்ந்துஇற்ற, அயிற்கதவம் பாய்ந்துழக்கி, கைக்கிளைப் பாடல்கள் - உழுத உழுத்தஞ்சேய், நாண் ஒருபால் வாங்க நலன் ஒருபால், ஆய்மணிப் பைம்பூண் எனத் தொடங்கும் பாடல்கள்)

நந்திக்கலம்பகம் (ஊசல், மறம் உறுப்பில் அமைந்த பாடல்கள்) தமிழில் சிற்றிலக்கியங்கள் - சிற்றிலக்கியத் தோற்றம், சிற்றிலக்கிய வகைகள், கலம்பகம், பிள்ளைத்தமிழ் -

முத்தொள்ளாயிரம் - நூல்பெயர் விளக்கம், அமைப்பு, யானை மறம் விளக்கம், கைக்கிளை விளக்கம், - முத்தொள்ளாயிரம் - யானை மறம் பாடல்கள் - பாண்டியன் யானை மறம் - ஒரு பாடல், சோழன் யானை மறம் - ஒருபாடல், சேரன் யானை மறம் - ஒரு பாடல் - முத்தொள்ளாயிரம் - கைக்கிளைப் பாடல்கள் - பாண்டியன் கைக்கிளை - ஒருபாடல், சோழன் கைக்கிளை ஒருபாடல், சேரன் கைக்கிளை ஒரு பாடல், - நந்திக்கலம்பகம் - ஊசல், மறம் - கலம்பக ஊறுப்புகள் 18 விளக்கம், ஊசல் உறுப்பில் அமைந்த பாடல், மறம் உறுப்பில் அமைந்த பாடல் - நந்திக்கலம்பகம், தலைவன் தலைவி கூற்று - தலைவன் கூற்றுப் பாடல், தலைவி கூற்றுப் பாடல்.

பிரிவு - 6 மீனாட்சியம்மை பிள்ளைத்தமிழ் (அம்புலி பருவம்)

பிள்ளைத் தமிழ் விளக்கம் - பிள்ளைத் தமிழின் பத்துப் பருவங்கள், பிள்ளைத் தமிழுக்கு அம்புலி - விளக்கம், - சாமம் என்னும் வழிமுறை - சாமம் விளக்கம், சாமம் வழிமுறைப்பாடல் - தானம் என்னும் வழிமுறை - தானம் விளக்கம், தானம் வழிமுறைப் பாடல் - பேதம் என்னும் வழிமுறை - பேதம் விளக்கம், பேதம் வழிமுறைப் பாடல் - தண்டம் என்னும் வழிமுறை - தண்டம் விளக்கம், தண்டம் வழிமுறைப் பாடல்.

பிரிவு - 7 இக்கால மரபுக்கவிதைகளும் பாட்டு இலக்கியமும்

மரபுக் கவிதைகளும் பாட்டு இலக்கியமும் - மரபுக் கவிதைகள் விளக்கம், பாட்டுக்கள் - வள்ளலார், பாரதியார், பாரதிதாசன் - வள்ளலார் இராமலிங்க அடிகள் பாடல் - ஒருமையுடன் நினது திருமலரடி... - பாரதியார் - யாமறிந்த மொழிகளிலே - பாரதிதாசன் - காலைஇளம் பரிதியிலே... நாமக்கல் கவிஞர், கவிமணி - நாமக்கல் கவிஞர் இராமலிங்கம்பிள்ளை பாடல் - தமிழனென்று சொல்லடா... - கவிமணி தேசிகவிநாயகம் பிள்ளை - புலர்ந்து விடியும் பொழுதினிலே...சுரதா, முடியரசன் - சுரதா - சுவரின்மேல் ஒட்டிக் கொண்டிருக்கும் - முடியரசன் - சாதியைத்தான் முன்வைத்துச் சான்றுகின்றார். கண்ணதாசன் - கேள்வி பிறந்தது அன்று, மருதகாசி - சமரசம் உலாவும் இடமே, பட்டுக்கோட்டையார் - சின்னப்பயலே சின்னப்பயலே...

பிரிவு - 8 புதுக் கவிதைகளும் ஐக்கூக் கவிதைகளும்

புதுக்கவிதைகளும் ஐக்கூக் கவிதைகளும் - புதுக் கவிதைகள் விளக்கம், - நா. காமராசன் - பாற்கடல் அமுதத்தை..., அப்துல் ரகுமான்- நாற்காலியாய் இருந்தவன் ..., மீரா - மூட்டை மூட்டையாய்..., சிற்பி - அகன்ற உலகு நான்..., இன்குலாப் - பதவியூர் போகும்..., மு. மேத்தா - என்னுடைய சம்பளநாளில்..., அபி

– பகல்வெளியில் எங்கோ..., ஈரோடு தமிழன்பன் – நீலச் சேற்றில்..., சேசாலம் – மண்ணின் வெடிப்பை..., வைரமுத்து – அவிழ்ந்த கூந்தலை அள்ளிமுடிக்க..., ஐக்கூக் கவிதைகள் – அப்துல் ரகுமான் – இரவெல்லாம் ..., அமுதபாரதி – எரியும் பிணங்கள், மித்ரா – பசித்த குழந்தைகள், அறிவுமதி – மரம் வெட்டிய..., கழனிசூரன் – அன்புடைமை...

பிரிவு – 9 மு. வரதராசனாரின் “தமிழுக்கு முதல் இடம்”

தமிழில் உரைநடை வளர்ச்சி – உரைநடையின் தோற்றம், தமிழில் கட்டுரைகள், தமிழில் மணிப்பிரவாள நடை, தமிழில் தனித்தமிழ்நடை, - மு. வரதராசனார் உரைநடை,- மொழிப்பற்று நூல் அறிமுகம், தமிழுக்கு முதல் இடம் – கட்டுரை உட்பொருள் – தமிழுக்கு முதல் இடம் – தமிழ்நாட்டுக் கோயில்களில் வடமொழி, தமிழ் இசை கருநாடக இசையாக மாறிப்போனது, தமிழ் இசைக்கு முதல் இடம், ஆட்சித் துறையில் தமிழுக்கு முதல் இடம், ஆட்சிமொழி எவ்வழி பிறதுறைகள் அவ்வழி, இதழியல் துறையில் தமிழுக்கு முதல் இடம், ஆங்கிலப் பத்திரிகைகளும் அமாவாசைச் சாமியார்களும்.

பிரிவு – 10 பாரதிதாசனின் “அமைதி” நாடகம்

தமிழில் உரைநடை நாடக வளர்ச்சி, - தமிழில் நாடகங்களின் தோற்றம், 20 ஆம் நூற்றாண்டில் தமிழ் நாடகங்களின் நிலை, முத்தமிழில் நாடகத்தமிழ் விளக்கம், மௌன மொழி உலகப் பொதுமொழி. – பாரதிதாசன் என்னும் நாடக ஆசிரியர் – புரட்சிக்கவிஞரின் நாடகப் புரட்சி, பிரெஞ்சு நாடகத் தாக்கம், அமைதியின் சிறப்பு – அமைதி நாடகக் கதைச் சுருக்கம் – அமைதி – களம் ஒன்று, களம் – இரண்டு , களம் மூன்று, களம் நான்கு, களம் ஐந்து, களம் ஆறு, களம் ஏழு, அமைதி நாடகத் திறனாய்வு.

பார்வை நூல்கள்:

1. மு. வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்ய அக்காதெமி, புதுடெல்லி.
2. மது. ச. விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE	:	Foundation in English-I (Literature and Grammar)
COURSE CODE	:	BFEGS-11
COURSE CREDIT	:	3

Course Objectives

While studying the Foundation in English –I course, the student can able to:

- CO1: Make the learners aware of the history of England
- CO2: Cultivate the creativity among the learners
- CO3: Improve the reading skills of the learners
- CO4: Enhance the vocabulary of the learners
- CO5: Make the learners read and write in English

Block-1 Brief History of England

Tudor England- Stuart England -Restoration England -Revolutions -Eighteenth Century-19th Century Education- 20th Century

Block 2 Literary Texts

R.K. Narayan- *An Astrologer's Day* and Sarojini Naidu - *Bangle Sellers*

Block-3 Reading Comprehension

Definition of Comprehension- Types of Comprehension- Reading Materials-Vocabulary- Critical Reading- Effective Reading- Exercises

Block -4 Functional Grammars and Vocabulary

Parts of Speech- Tenses-Articles -Prepositions and Linkers –Punctuation-Common Mistakes - Polite Expression-Affixes

Block-5 Language Skills

Reading Skills: SQ3R Technique -Writing Skills -Dictionary Use.

References:

1. Narayan R.K. *Short Story Collections*.
2. Sarojini Naidu. *Bangle Sellers*
3. Sinha C.A. Reading Comprehension. Prabhat Prakashan.
4. Xavier A.G. *An Introduction to the Social History of England*. Viswanathan S. Printers, Chennai. 2009.

Web Resources:

1. <https://www.digimat.in/nptel/courses/video/109106124/L01.html>
2. <https://www.digimat.in/nptel/courses/video/109106138/L46.html>
3. <https://www.coursera.org/lecture/multimodal-literacies/9-2-learning-to-read-reading-for-meaning-HdG3O>
4. <https://nptel.ac.in/courses/109/107/109107172/>

Course Learning Outcomes

After completion of the Foundation in English –I Course, the learners will be able to:

CLO1: Describe the history of England

CLO2: Critically analyze the literary texts

CLO3: Use the words correctly

CLO4: Write in flawless English



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE : Problem Solving Techniques

COURSE CODE : BCAS-11

COURSE CREDIT : 4

COURSE OBJECTIVES

While studying the Problem Solving techniques, the student shall be able to:

CO1: Demonstrate the different types of problems

CO2: Develop different games and predict the winning strategies.

CO3: Acquire Knowledge about Algorithms that Involve a Simple Repetitive Process

CO4: Describe the need for problem Formulation and Solution

CO5: Construct the bridge problem.

BLOCK I: INVARIANTS

Invariants – Chocolate-bar Problem – Empty-box Problem – Tumbler Problem – Tetrominoes – Goat-cabbage-wolf Problem - Brute-force Search – State-space Explosion – Abstraction –

Nervous-couples Problem - Denoting States and Transitions – Rule of Sequential Composition – Bridge Problem – Conditional Statements.

BLOCK II: GAMES

Games – Matchstick Game – Winning Strategies – Subtraction-set Games - Sums of Games – Knights and Knaves – Logic Puzzles - Calculational Logic – Equivalence and Continued Equalities – Negation.

BLOCK III: INDUCTION

Induction – Black and White Colouring – Cutting the Plane – Triomino Problem - Looking for Patterns – The Need for Proof – From Verification to Construction.

BLOCK IV: PROBLEM FORMULATION AND SOLUTION

Fake-Coin Detection – Problem Formulation – Problem Solution – Tower of Hanoi Problem - Specification and Solution –Inductive Solution – Iterative Solution - Principles of Algorithm Design – Iteration. Invariants and Making Progress – Sam Loyd's Chicken-Chasing Problem.

BLOCK V: BRIDGE PROBLEM

Bridge Problem – Lower and Upper Bounds – Outline Strategy - Regular Sequences – Sequencing Forward Trips – Choosing Settlers and Nomads- Knight’s Circuit – Straight-Move Circuits – Super Squares – Partitioning the Board.

Reference book:

1. Roland Backhouse, “Algorithmic Problem Solving”, 2011 John Wiley & Sons Ltd.

COURSE LEARNING OUTCOMES

After completion of the Problem solving techniques, the student can able to:

CLO1: Reveal the different types of problems.

CLO2: Construct different games and predict the winning strategies.

CLO3: Acquire Knowledge about Algorithms that Involve a Simple Repetitive Process

CLO4: Describe the need for problem Formulation and Solution

CLO5: Identify the bridge problem.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE : **Information Technology Essentials**
COURSE CODE : **BCAS-12**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Information technology essentials course, the student shall be able to:

- CO1: Memorize the basics of computers
- CO2: Demonstrate the classification of software
- CO3: Enumerate the various types of software and operating systems
- CO4: Observe the concepts of Networking and various types of LAN
- CO5: Recognize the concepts of Internet and WWW.

BLOCK I: INTRODUCTION TO COMPUTER CONCEPTS

Definition – Importance – History – Classification – Benefits & Limitations - Software - Application Software – System Software - Computer Architecture – I/O Unit – CPU – Memory unit – Memory System – Memory hierarchy.

BLOCK II: SOFTWARE CONCEPTS

Classification of Software – System Software – application Software - Operating System: Types of Operating System – Functions of Operating System

BLOCK III: SOFTWARE TOOLS

Software Tools – Application Generator – Software Engineering & CASE Tools – System Software Utilities – Windows - General Purpose Application Software – Special Purpose Application Software.

BLOCK IV: NETWORKING

Communication – Networking – Types of Networks – Components of Networks –Standard Topologies - Network Operating System: Concepts – Client Software – Server Software - LAN Expansion – Repeaters – Routers – Bridges – Gateways.

BLOCK V: INTERNET & WWW

Internet – functions – internet capabilities – Information retrieval on the internet - WWW – WebPages and HTML - Web browsers - Internet Benefits to Organization – Problem on the Internet.

Reference Books:

1. Fundamentals of Information Technology, S.K. Bansal, A P H Publishing Corporation, 2002
2. Introduction of Information Systems, Alexis Leon, Mathews Leon, Vijay Nicole, imprints, Pvt. Ltd, 2004.

Web Links

1. <https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1003&context=schmuldissoft>
2. <https://homepage.cs.uri.edu/faculty/wolfe/book/Readings/Reading05.htm>.
3. [http://engineering.futureuniversity.com/BOOKS%20FOR%20IT/William%20Stallings%20-%20Operating%20Systems%20\(1\).pdf](http://engineering.futureuniversity.com/BOOKS%20FOR%20IT/William%20Stallings%20-%20Operating%20Systems%20(1).pdf)
4. [https://www.guru99.com/operating-system-tutorial.html#:~:text=An%20Operating%20System%20\(OS\)%20is,run%20and%20perform%20its%20tasks.](https://www.guru99.com/operating-system-tutorial.html#:~:text=An%20Operating%20System%20(OS)%20is,run%20and%20perform%20its%20tasks.)

COURSE LEARNING OUTCOMES

After completion of the Information technology essentials course, the student can be able to:

CLO1: Acquire the basic of knowledge of computer concepts

CLO2: Identify the classification of software

CLO3: Demonstrate the various types of software and operating systems

CLO4: Illustrate the concepts of Internet and WWW.

CLO5: Observe the concepts of Networking and various types of LAN.



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE : Allied Mathematics – 1

COURSE CODE : BMSSA-11

COURSE CREDIT : 3

COURSE OBJECTIVES

While studying the Allied Mathematics – 1, the Learner shall be able to:

CO1: Provide basic Mathematical concepts of Matrices.

CO2: Enumerate the differential calculus.

CO3: Evaluate the Differential Equations.

CO4: Identify the Fourier Series

CO5: Construct the Linear Programming Problem

BLOCK – I: Properties of Matrices

- 1.1 Eigenvalues and Eigenvectors
- 1.2 Cayley Hamilton Theorem
- 1.3 Similar Matrices
- 1.4 Diagonalization of Matrices possessing Distinct Eigenvalues
- 1.5 Eigenvalues for symmetric matrices

BLOCK -II:Differential Calculus

- 2.1 Higher Derivatives – nth derivative – Standard Results
- 2.2 Trigonometric Transformations
- 2.3 Formation of Equations Involving Derivatives
- 2.4 Leibnitz's formula for nth derivative – Problems involving Leibnitz's formula
- 2.5 Methods of Integration of functions of the Following Types:

$$\frac{1}{(x+p)\sqrt{ax^2+bx+c}}; \sqrt{(x-a)(b-x)}; \frac{1}{\sqrt{(x-a)(b-x)}}; \sqrt{\frac{(x-a)}{(b-x)}}.$$

BLOCK-III: Differential Equations

- 3.1 Partial Differential Equation
- 3.2 Formation of Equations by Elimination of Constants and an Arbitrary Function
- 3.3 Definition of General, Particular, Complete and Singular Integral
- 3.4 Solutions of First Order Equations in their Standard Forms
- 3.5 Lagrange's Method of Solving of Linear Equations $Pp \square Qq \square R$

BLOCK-IV: Fourier Series

- 4.1 Definition of Fourier Series
- 4.2 Finding Fourier Coefficients for a given Periodic Function with Period $2 \square$
- 4.3 Odd and Even Functions
- 4.4 Half - Range Series
- 4.5 Development in sine and cosine series

BLOCK-V: Linear Programming Problem

- 5.1 Formulation of LPP
- 5.2 Graphical Method

5.3 Simplex Method

BOOKS FOR STUDY

1. Narayanan, S., Hanumantha Rao and T.K. Manicavachagam Pillai, *Ancillary Mathematics – Volume - I*. Madras.:Viswanathan, S, 2012.

Chapter 3: Sections 3.4, 3.5

Chapter 6: Sections 6.1

2 Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy.

3 *Ancillary Mathematics – Volume – II*. Madras.: Viswanathan, S, 1995 Reprint 2011.

Chapter 1: Sections 8 (cases 5-9)

Chapter 2: Sections 1 - 5

Chapter 6: Sections 1-3, 5, 6.

4. Kalavathy S, *Operations Research*, Vikas Publishing House, Noida, Fourth Edition 2013

Chapter 2: Sections 2.1, 2.2

Chapter 3: Sections 3.1 – 3.3

Chapter 4: Sections 4.1, 4.2

BOOKS FOR REFERENCE

1. Joseph, Edwards, *An Elementary Treatise on the Differential Calculus*, London: Macmillan, 1948.
2. Manicavachagam Pillai T.K., Natarajan T. and Ganapathy K. S, *Algebra Volume I*. Madras.: Viswanathan, S., 2006.
3. Madras.: Viswanathan, S., 2006.
4. Manicavachagam Pillai T.K., Natarajan T. and Ganapathy K. S, *Algebra Volume II*. Madras.: Viswanathan, S., 2004.
5. Singaravelu A., *Allied Mathematics, Chennai*: Meenakshi, 2010
6. Sundaresan V., K.S. Ganapathy Subramanian, K. Ganesan. *Resource Management Techniques*, 4th ed. Arapakkam: A.R. Publications, 2007.

Web Links

1. <https://www.youtube.com/watch?v=jqU0q21PHEQ>
2. <https://www.youtube.com/watch?v=6o7b9yyhH7k>

3. https://www.youtube.com/watch?v=LGxE_yZYigI
4. https://www.anlyzemath.com/linear_programming/linear_prog_applications.html

COURSE LEARNING OUTCOMES

After completion of the Allied Mathematics – 1, the Learner will be able to:

CLO1: Recognize the basic Mathematical concepts of Matrices.

CLO2: Identify the differential calculus.

CLO3: Develop the Differential Equations.

CLO4: Create the Fourier Series

CLO5: Construct the Linear Programming Problem.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE : **Office Automation Laboratory**
COURSE CODE : **BCAS-P1**
COURSE CREDIT : **2**

COURSE OBJECTIVES

While studying the Office Automation Laboratory course, the student shall be able to:

CO1: Describe the professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools

CO2: Enumerate the students in preparation of documents and presentations with office automation tools.

I. MS-WORD

1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text
2. Bio data: Prepare a Bio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer and Headers.
4. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a mark sheet.

II. MS-EXCEL

1. Data sorting-Ascending and Descending (both numbers and alphabets)
2. Mark list preparation for a student
3. Individual Pay Bill preparation.
4. Invoice Report preparation.

III. MS-POWERPOINT

1. Create a slide show presentation for a seminar.
2. Preparation of Organization Charts
3. Create a slide show presentation to display percentage of marks in each semester for all students
 - a. Use bar chart (X-axis: Semester, Y-axis: % marks).
 - b. Use different presentation template different transition effect for each slide.

Web Links

1. <https://www.youtube.com/watch?v=zRBXIBYQ0z8>
2. <https://www.youtube.com/watch?v=bUIeN-hk-3s>
3. https://onlinecourses.nptel.ac.in/noc22_mg35/preview

COURSE LEARNING OUTCOMES

After completion of the Office Automation Laboratory course, the student can be able to:

- CLO1: Perform documentation
- CLO2: Perform accounting operations
- CLO3: Perform presentation skills



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

பாடப் பெயர் : தமிழ் (Tamil)

(Course Title)

பாடக் குறியீடு : BFTMS-21

(Course Code)

பாட கற்றல் அளவெண் : 3

(Course Credits)

பாட நோக்கங்கள்

-
1. தமிழ் இலக்கியங்களை அறிமுக நோக்கில் எடுத்துரைத்தல்
 2. மொழித்திறன், மொழியறிவு, இலக்கியப் பொது அறிவு பெறும் வகையில் விவரித்தல்
-

பாடத்தினைப் படிப்பதால் விளையும் பயன்கள்

-
1. தமிழ் உரைநடை பற்றியும், ஜெயகாந்தனின் சிறுகதைகள் பற்றியும் எடுத்துரைப்பர்.
 2. தமிழ் பற்றியும் அலுவலகத் தொடர்பு மடல்கள் எழுதுவது எப்படி என்பது பற்றியும், மொழியை திறம்பட எவ்வாறு பயன்டுத்துவது என்பது பற்றியும் எடுத்துரைப்பர்.
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பிரிவு - 1 ஜெயகாந்தனின் “நான் இருக்கிறேன்” - சிறுகதை
தமிழ் உரைநடையில் சிறுகதை வளர்ச்சி - தமிழில் கதை இலக்கியத் தோற்றம், தமிழ்ச் சிறுகதைகளின் தோற்றமும் வளர்ச்சியும், சிறுகதை இலக்கணம் - தமிழ்ச் சிறுகதைகளில் ஜெயகாந்தன் - ஜெயகாந்தன் சிறுகுறிப்பு - கதை அரங்கம் அறிமும், நான் இருக்கிறேன் கதைச் சுருக்கம் - நான் இருக்கிறேன் சிறுகதை - வியாதிக்காரன் அனுபவங்கள், சாகக் கற்றுக்கொடுத்த நொண்டி, வாழக் கற்றுக்கொடுத்த வியாதிக்காரன், நான் இருக்கிறேன் அம்மா, - நான் இருக்கிறேன் - சிறுகதைத் திறனாய்வு.

பிரிவு - 2 வா.செ.குழந்தைசாமியின் அறிவியல் தமிழ் ஆக்கம் இற்றை நிலை

அறிவியல் தமிழ் - இயற்றுதல் அறிந்தோம் புனைதல் இல்லை - தமிழில் அறிவியல் இலக்கியம் படைப்போம் - வா.செ. குழந்தைசாமி - அறிமுகம் - அறிவியல் தமிழ் - எந்தத் துறைகளைக் குறிக்கும் - அறிவியல் தமிழை உள்ளடக்கியது - தோற்றம் - கலைச்சொல்லாக்கப் பணி - விடுதலைக்குமுன் - விடுதலைக்குப்பின் - பாடநூல் நிறுவனத்தின் பங்கு - பதிப்பகங்களின் பங்கு - பல்கலைக்கழகங்களின் பங்கு - இதழ்களின் பங்கு - இலங்கைத் தமிழரின் பங்கு - கருத வேண்டியவை.

பிரிவு - 3 சமய இலக்கியக் காலம் (கி.பி.700 - கி.பி 1100)
தமிழில் சமய இலக்கியங்கள் - சமண இலக்கியத் தோற்றம் - பௌத்த இலக்கியத் தோற்றம் - தமிழில் பௌத்த இலக்கியங்கள் - வைணவ இலக்கியங்கள் - சைவ இலக்கியத் தோற்றம் - தமிழில் சைவ இலக்கியங்கள் - வைணவ இலக்கியத் தோற்றம் - தமிழில் வைணவ இலக்கியங்கள் - தமிழில் இசுலாமிய இலக்கியங்கள் - தமிழில் கிறிஸ்தவ இலக்கியங்கள்.

பிரிவு - 4 சிற்றிலக்கியக் காலம் (கி.பி. 700 - கி.பி. 1400)

சிற்றிலக்கியத் தோற்றம் - சிற்றிலக்கிய வகைகள் - இலக்கண நூல்கள் - உலா - கலம்பகம் - பரணி - பிள்ளைத்தமிழ் - கோவை - தூது.

பிரிவு - 5 உரையாசிரியர்கள் காலம் (கி.பி. 1200 கி.பி. 1800)

உரைநூல்களின் தோற்றம் - பயன்கள் - உரை வகைகள் - நக்கீரர் - இளம்பூரணர் - பேராசிரியர் - சேனாவரையர் - நச்சினார்க்கினியர் - கல்லாடர் - தெய்வச்சிலையார் போன்றோர் - அடியார்க்கு நல்லார் - பரிமேலழகர் - பிரபந்த உரையாசிரியர்கள் - நன்னூல் உரையாசிரியர்கள் .

பிரிவு - 6 புத்திலக்கியக் காலம் (கி.பி. 1800 - கி.பி 2000)

தமிழில் புதினம் - தமிழில் சிறுகதை - தமிழில் புதுக்கவிதைகள் - தமிழில் உரைநடை நாடகங்கள் - புதினங்கள் - சிறுகதைகள் - இலக்கியங்கள் - மரபுக் கவிதை இலக்கியங்கள் - புதுக்கவிதை இலக்கியங்கள் - தமிழில் ஐக்கூக் கவிதைகள்.

பிரிவு - 7 கருத்துப் பரிமாற்ற மொழித்திறன்

கருத்து விளக்கக் கட்டுரைகள் - செய்திக் கட்டுரைகள் - சொற்பொழிவு - குழு விவாதங்கள் - நண்பர்களுடன் உரையாடும் திறன் - கணினித் தமிழ் - கட்டுரை - பெண்ணியம் - தலைப்பு - தேர்ந்தெடுக்கும் முறை - தகவல்கள் சேகரிக்கும் முறை - தகவல் திரட்டல் - நகைச்சுவைத் திறன் - அவை அறிதல் - உச்சரிப்புக் கவனம் - குழு விவாத அமைப்பும் குறிக்கோளும் - உரையாடலில் - சுயபுராணம் தவிர்த்தல் - உடன்பட வைக்கும் நாகரிக உத்தி .

பிரிவு - 8 அலுவலகத் தொடர்பு மடல்கள்

நட்புறவு மடல்கள் - வேண்டுகூல் மடல்கள் - குறை தெரிவிக்கும் / புகார் மடல்கள் - கருத்து மடல்கள் - விண்ணப்ப மடல்கள் - அலுவலகத் தொடர்பு மடல்கள் - விண்ணப்ப மடலின் படிநிலைகள் - தன்குறிப்பு விவரங்கள் - விண்ணப்ப மடலின் வடிவமைப்பு - விண்ணப்ப மடல் எழுதும் முறை - குறிப்பு - வரைவு - கடிதம் - குறிப்பு மடல் - அலுவலக ஆணை - நேர்முகக் கடிதம்.

பிரிவு - 9 எழுத்து - சொல் பிழைகளும் திருத்தமும்

ஒலி மயக்கம் தரும் எழுத்துக்கள் - ர, ற ஒலி மயக்கம் - ந, ன, ண ஒலி மயக்கம் - ல, ள, ழ, ஒலி மயக்கம் - சொல் முதலில் வரும் எழுத்து மரபுகள் - சொல் இடையில் வரும் எழுத்து மரபுகள் - சொற்களின் சந்திப்பு மரபுகள் - வேற்றுமைப் புணர்ச்சியும் அல்வழிப் புணர்ச்சியும் - உயிர்முன் உயிர் புணர்தல் - குற்றியலுகரப் புணர்ச்சி - வல்லின ஒற்று மிகும் இடங்களும் மிகா இடங்களும்.

பிரிவு - 10 இலக்கிய அறிவு வினா விடை

பாடப்பகுதி தொடர்பானவை - பொதுவான தமிழ் இலக்கியம்
தொடர்பானவை.

பார்வை நூல்கள்:

1. மு. வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்ய அக்காதெமி, புதுடெல்லி.
2. மது. ச. விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
4. தமிழண்ணல், இனிய தமிழ்மொழியின் இயல்புகள் -1,2,3 பகுதிகள், மீனாட்சி புத்தக நிலையம், மதுரை.
5. முத்து - கண்ணப்பன்,தி.. தமிழில் தவறுகளைத் தவிப்போம், பாரிநிலையம், 184, பிராட்வே, சென்னை.
6. கீ. இராமலிங்கனார், தமிழில் எழுதுவோம், கழக வெளியீடு, சென்னை.
7. செ. முத்துவீராசாமி நாயுடு, ஆவணங்களும் பதிவுமுறைகளும், கழக வெளியீடு, சென்னை.
8. டாக்டர் ச. பாலசுப்பிரமணியன், தகவல் தொடர்புக் கல்வி, மாநிலப் பள்ளிசாராக் கல்விக் குருவூலம், சென்னை.
9. எஸ். கலைவாணி, இதழியல் உத்திகள், பராசக்தி வெளியீடு, குற்றாலம்.
10. டாக்டர் அ. சாந்தா, டாக்டர் வீ. மோகன், மக்கள் ஊடகத் தொடர்பியல் புதிய பரிமாணங்கள், மீடியா பப்ளிகேஷன்ஸ், மதுரை.
11. பி.எஸ். ஆச்சார்யா, உயர்வுதரும் உரையாடல்கலை, நர்மதா பதிப்பகம், சென்னை.
12. மு. முத்துக்காளத்தி, பேசுவது எப்படி, கண்ணம்மாள் பதிப்பகம், பாரி நிலையம், சென்னை.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (I SEMESTER)

COURSE TITLE : Foundation in English-II (Literature and Use of English)

COURSE CODE : BFEGS-21

COURSE CREDIT : 3

Course Objectives

While studying the Foundation in English-II course, the student shall be able to:

CO1: Cultivate the creativity among the learners

CO2: Improve the reading skills of the learners

CO3: Enhance the vocabulary of the learners

CO4: Develop pronunciation skills

CO5: Imbibe the use of internet for developing language skills

Block-1 Literary Texts

Rabindranath Tagore's *Sacrifice* and John Donne's *The Sun Rising*

Block- 2 Reading Comprehension

Reading passages-Preparing a glossary from passage- reading the meaning- respond to questions

Block- 3 Vocabulary and Grammar

Synonyms and Antonyms- Homophones-Making of Nouns-Making of Adjectives-Compound Words-Phrases and Idioms-Words often confused-Spelling- Tenses

Block-4 Pronunciation and Spoken English

Importance of English-Pronunciation: An Exposition-Speech Sounds-Sounds and Spelling: The Relationship-Attributes of Good Speech-Dialogue Situations/ Situational Dialogues

Block-5 The Internet English

Email-Chat Groups-Virtual Words-The Web-Commentary

References:

1. *Balasubramanian T. English Phonetics for Indian Students - A Workbook.* 2016.
2. Daniel Jones. *Cambridge English Pronouncing Dictionary.* Cambridge University Press, 2011.
3. Tagore, Rabindranath. *Sacrifice and Other Plays.* Niyogi Books, 2012.

Web Resources:

1. <https://www.poetryfoundation.org/podcasts/75363/the-sun-rising>
2. <https://nptel.ac.in/courses/109/103/109103135/>
3. <https://nptel.ac.in/content/storage2/courses/109106085/downloads/03-%20Phonetics%20and%20Phonology-%20week%203.pdf>
4. <https://nptel.ac.in/courses/109/106/109106085/>
5. <https://nptel.ac.in/courses/109/107/109107172/>

Course Learning Outcomes

After successful completion of the Foundation in English-II Course, the learners will be able to:

CLO1: Critically evaluate the literary texts

CLO2: Read the passages effectively

CLO3: Speak with good accent

CLO4: Communicate through online



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - I YEAR (II SEMESTER)

COURSE TITLE : Programming in C

COURSE CODE : BCAS-21

COURSE CREDIT : 4

COURSE OBJECTIVES

While studying the Programming in C course, the student shall be able to:

CO1: Describe the fundamentals and basics of C

CO2: Create the control statements in C

CO3: Demonstrate the storage classes

CO4: Develop array structure and union

CO5: Recognize Pointers and files.

BLOCK I: FUNDAMENTALS OF C

C fundamentals Character set - Identifier and keywords - data types – constants - Variables - Declarations - Expressions – Statements - Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators - Library functions.

BLOCK II: DATA INPUT, OUTPUT AND CONTROL STATEMENTS

Data input output functions - Simple C programs - Flow of control - if, if-else, while, do-while, for loop - Nested control structures - Switch, break and continue, go to statements - Comma operator.

BLOCK III: FUNCTIONS AND STORAGE CLASSES

Functions -Definition - prototypes - Passing arguments - Recursions. - Storage Classes - Automatic, External, Static, Register Variables - Multi-file programs.

BLOCK IV: ARRAYS, STRUCTURES AND UNIONS

Arrays - Defining and Processing - Passing arrays to functions - Multi-dimension arrays - Arrays and String - Structures - User defined data types - Passing structures to functions - Self-referential structures - Unions - Bit wise operations.

BLOCK V: POINTERS AND FILES

Pointers - Declarations - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers - Files: Creating Processing, Opening and Closing a data file.

Text Book

1. E.Balagurusamy, "Programming in ANSI C", Eighth Edition, Tata McGraw Hill, 2019.

Reference Books

1. W.Kernighan and D M.Ritchie, "The C Programming Language", 2nd Editon, PHI,.. 1988
2. H. Schildt, "C: The Complete Reference", 4th Edition. TMH Edition, 2000.
3. Gottfried B.S, "Programming with C", Second Edition, TMH Pub. Co. Ltd., New Delhi 1996.
4. Kanetkar Y., "Let us C", BPB Pub., New Delhi, 1999.

Web Links

1. <https://youtu.be/05nhvJnTkeU>
2. <https://alvinser.com/fundamentals-of-c-programming.html>
3. <https://www.ibm.com/docs/en/itcam-app-mgr/7.2.0?topic=tesl-operators-expressions-1>
4. <https://www.programtopia.net/c-programming/docs/operators-expressions>
5. <https://byjus.com/gate/input-and-output-functions-in-c/>
6. <https://www.studytonight.com/c/c-input-output-function.php>

COURSE LEARNING OUTCOMES

After completion of the Programming in C course, the student can be able to:

- CLO1: Memorize the fundamentals and basics of C
- CLO2: Write the control statements in C
- CLO3: Identify the storage classes
- CLO4: Indicate array structure and union
- CLO5: Separate Pointers and files.



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - I YEAR (II SEMESTER)

COURSE TITLE : Open Source Technology

COURSE CODE : BCAS-22

COURSE CREDIT : 4

COURSE OBJECTIVES

While studying the Open Source Technology course, the student shall be able to:

CO1: Describe about the open source software's.

CO2: Manipulate about the history, philosophy and license

CO3: Predict about community building, opening and starting the open source projects

CO4: Discover knowledge on the servers.

CO5: Observe about the ethical, social and financial impacts of open source software.

BLOCK I: INTRODUCTION

Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. - History: BSD, The Free Software Foundation and the GNU Project.

BLOCK II: HISTORY, PHILOSOPHY AND LICENSE

Open Source History, Initiatives, Principle and methodologies. - Philosophy: Software Freedom, Open Source Development Model - Licenses and Patents: What Is A License, Important FOSS Licenses (Apache,BSD,GPL, LGPL), copyrights and copy-lefts - Patents Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization.

BLOCK III: COMMUNITY BUILDING

Community Building: Importance of Communities in Open Source Movement, JBoss Community - Starting and Maintaining an Open Source Project , Open Source Hardwar.

BLOCK IV: SERVERS

Apache HTTP Server and its flavors - WAMP server (Windows, Apache, MySQL, PHP)- Apache - MySQL, PHP, JAVA as development platform.

BLOCK V: ETHICS, SOCIAL AND FINANCIAL

Open source vs. closed source Open source government, Open source ethics - Social and Financial impacts of open source technology - Shared software, Shared source.

TEXT BOOKS

1. Sumitabha Das “Unix Concepts and Applications, Tata McGraw Hill Education 006
2. The Official Ubuntu Book, 8th Edition
3. Kailash Vadera, Bhavyesh Gandhi, “Open Source Technology”, University Science press.

REFERENCE BOOKS

1. Paul Kavanagh, “Open Source Software: Implementation and Management”, Elsevier Digital Press
2. The Linux Documentation Project : <http://www.tldp.org>
3. Docker Project Home : <http://www.docker.com>.

Web Links

1. https://en.wikipedia.org/wiki/Free_Software_Foundation
2. https://en.wikipedia.org/wiki/GNU_Free_Documentation_Lices
3. https://en.wikipedia.org/wiki/GNU_Project
4. https://en.wikibooks.org/wiki/FOSS_Open_Standards/Standards_and_Internationalization/Localization_of_Software
5. <https://opensource.guide/starting-a-project/>
6. <https://www.oshwa.org/>
7. https://en.wikipedia.org/wiki/Open-source_hardware

COURSE LEARNING OUTCOMES

After completion of the Open Source Technology course, the student can be able to:

CLO1: Illustrate the open source methodologies

CLO2: Classify the history, philosophy and license

CLO3: Formulate about the community building, opening and starting the open source projects

CLO4: Summarize knowledge on the servers

CLO5: Discover the ethical, social and financial impacts of open source software



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (II SEMESTER)

COURSE TITLE : **Digital Logic**
COURSE CODE : **BCAS-23**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Digital logic course, the student shall be able to:

- CO1: Describe about the basic concepts of Digital Computer Fundamentals
- CO2: Modify about the concepts of logic gates, Boolean Algebra
- CO3: Classify the combinational circuits and Multiplexers
- CO4: Identify knowledge about the sequential logic and Registers
- CO5: Able to construct the different types of counters and enumerate about the memory.

BLOCK I : INTRODUCTION TO NUMBER SYSTEM

Number Systems and Codes: Number System, Base Conversion, Binary Codes. Code Conversion - Digital Logic: Logic Gates, Truth Tables, Universal Gates.

BLOCK II : BOOLEAN ALGEBRA AND BINARY ARITHMETIC

Boolean Algebra: Laws and Theorems, SOP, POS Methods - Simplification of Boolean Functions - Using Theorems, K-Map, Prime, Implicant Method - Binary Arithmetic: Binary Addition, Subtraction - Various Representations of Binary Numbers, Arithmetic Building Blocks, Adder, Subtractor.

BLOCK III: COMBINATIONAL LOGIC

Combinational Logic: Multiplexers, Demultiplexers - Decoders, Encoders, Code Converters - Parity Generators and Checkers.

BLOCK IV: SEQUENTIAL LOGIC AND REGISTERS

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

BLOCK V: COUNTERS AND MEMORY

Counters: Asynchronous and Synchronous Counters, Ripple, Mod, Up, Down Counters, Ring Counters - Memory: Basic Terms and Ideas, Types of ROMs, Types of RAMs - Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA).

Text Books :

1. Digital Design – Third Edition , M.Morris Mano, Pearson Education/PHI.
2. Fundamentals Of Logic Design, Roth, 5th Edition, Thomson.

Reference Books

1. V.Rajaraman and T.Radhakrishnan, *Digital Computer Design*, Prentice Hall of India, 2001
2. D.P.Leach and A.P.Malvino, *Digital Principles and Applications* – TMH – Fifth Edition – 2002.
3. M. Moris Mano, *Digital Logic and Computer Design*, PHI, 2001.
4. T.C.Bartee, *Digital Computer Fundamentals*, 6th Edition, Tata McGraw Hill, 1991.

Web Links

1. https://www.tutorialspoint.com/computer_logical_organization/binary_codes.htm
2. <https://www.tutorialandexample.com/codes-in-digital-electronics/>
3. <http://www.ee.surrey.ac.uk/Projects/CAL/digital-logic/gatesfunc/index.html>
4. <http://www.uop.edu.pk/ocontents/Lec-10-universal%20gates.pdf>
5. <https://www.electronicshub.org/multiplexer-and-demultiplexer/>
6. <https://www.geeksforgeeks.org/encoders-and-decoders-in-digital-logic/>

COURSE LEARNING OUTCOMES

After completion of the Digital logic course, the student can be able to:

- CLO1: Memorize about the basic concepts of Number System.
- CLO2: Demonstrate about the concepts of Binary Numbers and Boolean Algebra
- CLO3: Construct the combinational circuits and Multiplexers
- CLO4: Summarize knowledge about the sequential logic and Registers
- CLO5: Collaborate the different types of counters and enumerate about the memory.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - I YEAR (II SEMESTER)

COURSE TITLE : **C Programming Lab**
COURSE CODE : **BCAS-P2**
COURSE CREDIT : **2**

COURSE OBJECTIVES

While studying the C programming Lab course, the student shall be able to:

- CO1: Make the student learn a programming language.
- CO2: Discriminate problem solving techniques.
- CO3: Explain programs in C and to solve the problems.
- CO4: Demonstrate the string manipulation in C
- CO5: Describe Sorting and Searching techniques.

List of Programs

I Summation of Series

1. Sin(x), 2. Cos(x), 3. Exp(x) (Comparison with built in functions)

II String Manipulation

1. Counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.
2. Reverse a string and check for palindrome.
3. Sub string detection, count and removal.
4. Finding and replacing substrings

III Recursion

1. ${}^n P_r$, ${}^n C_r$
2. GCD of two numbers
3. Fibonacci sequence
4. Maximum & Minimum

IV Matrix Manipulation

1. Addition and Subtraction
2. Multiplication
3. Transpose, and trace of a matrix
4. Determinant of a Matrix

V Sorting and Searching

1. Insertion Sort
2. Bubble Sort
3. Linear Search
4. Binary Search

Web Links

1. https://www.youtube.com/playlist?list=PLdE8ESr9Th_t8RpyS4rlhNSjNNeVUAdwB
2. https://www.youtube.com/watch?v=Az1XQ1hq_Ww
3. <https://archive.nptel.ac.in/courses/106/104/106104128/>

COURSE LEARNING OUTCOMES

After completion of the C Programming Lab course, the student can be able to:

CLO1: Define, understand and trace the execution of programs written in C language.

CLO2: Locate the C code for a given algorithm.

CLO3: Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

CLO4: Demonstrate programs that perform operations using derived data types.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (III SEMESTER)

COURSE TITLE : **Programming Using C++**
COURSE CODE : **BCAS-31**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Programming using C++ course, the student shall be able to:

- CO1: Paraphrase the basic concepts of the Object-Oriented Programming Paradigm.
- CO2: Examine the Functions in C++ and the different types of Constructors in C++.
- CO3: Indicate Operator Overloading.
- CO4: Identify the different types of Inheritance.
- CO5: Collaborate Stream Classes and Files.

BLOCK I: BASIC CONCEPTS OF OOP

Object-Oriented Programming (OOP) Paradigm – Basic Concepts of OOP – Benefits of OOP – Tokens – Keywords – Identifiers and Constants - Basic Data Types – User-Defined Data Types – Storage Classes – Derived Data Types – Symbolic Constants – Type Compatibility – Declaration of Variables – Dynamic Initialization of Variables – Reference Variables- Operators in C++ – Scope Resolution Operator – Member Dereferencing Operators – Memory Management Operators – Manipulators – Type Cast Operator - Expressions and Their Types – Special Assignment Expressions – Implicit Conversions – Operator Overloading – Operator Precedence – Control Structures.

BLOCK II: FUNCTIONS IN C++

Functions in C++ – The Main Function – Function Prototyping – Call By Reference – Return by Reference – Inline Functions – Default Arguments – ‘const’ Arguments – Recursion – Function Overloading – Friend and Virtual functions – Math Library Functions - Classes and Objects – Specifying a Class – Defining Member Functions – Making an Outside Function Inline – Nesting of Member Functions – Private Member Functions – Arrays within a Class - Memory Allocation

for Objects – Static Data Members – Static Member Functions – Array of Objects – Objects as Function Arguments – Friendly Functions – Returning Objects – ‘const’ Member Functions – Pointers to Members – Local Classes.

BLOCK III: CONSTRUCTORS AND DESTRUCTORS

Constructors – Parameterized Constructors – Multiple Constructors in a Class – Constructors with Default Arguments – Dynamic Initialization of Objects – Copy Constructors – Dynamic Constructors – Constructing Two-Dimensional Arrays – ‘const’ Objects – Destructors – Operator Overloading – Rules for Overloading Operators – Overloading Unary Operators – Overloading Binary Operators – Overloading Binary Operators Using Friends – Manipulation of Strings Using Operators – Type Conversions.

BLOCK IV: INHERITANCE

Inheritance – Single Inheritance – Making a Private Member Inheritable – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance - Virtual Base Classes – Abstract Classes – Constructors in Derived Class – Nesting of Classes – Pointers – Pointers to Objects – ‘this’ Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions – Virtual Constructors and Destructors.

BLOCK V: C++ STREAMS

C++ Streams – C++ Stream Classes – Unformatted I/O Operations – Formatted Console I/O operations – Managing Output with Manipulators - Files – Classes for File Stream Operations – Opening and Closing a File – Detecting End-of-File – Open () File Modes – File Pointers and their Manipulators - Sequential Files – Random Access Files – Error Handling during File Operations – Command-Line Arguments.

Text Book:

1. E Balagurusamy, “Object Oriented Programming with C++”, Sixth Edition, McGraw Hill Education (India) Private Limited, 2013.

References:

1. Herbert Schildt, “C++: The Complete Reference”, Fifth Edition, McGraw-Hill Education, 2012.

Web Links

1. <https://www.ibm.com/docs/en/itcam-app-mgr/7.2.0?topic=tesl-operators-expressions-1>
2. <https://www.programtopia.net/cpp-programming/docs/operators-expressions>
3. https://www.simplilearn.com/tutorials/cpp-tutorial/cpp-interview-questions?source=sl_frs_nav_playlist_video_clicked

4. <https://askaboutcpp.blogspot.com/2010/07/specifying-class.html>
5. <https://www.kindsonthegenius.com/cplusplus/c-string-manipulation/>

COURSE LEARNING OUTCOMES

After completion of the Programming using C++ course, the student can be able to:

- CLO1: Classify the basic concepts of the Object-Oriented Programming Paradigm.
- CLO2: Experiment the Functions in C++ and the different types of Constructors in C++.
- CLO3: Analyze Operator Overloading.
- CLO4: Recognize the different types of Inheritance.
- CLO5: Summarize Stream Classes and Files.



B. C. A. SYLLABUS - II YEAR (III SEMESTER)

COURSE TITLE	:	Allied Mathematics-II
COURSE CODE	:	BMSSA-22
COURSE CREDIT	:	3

COURSE OBJECTIVES

While studying the Allied Mathematics – II, the Learner shall be able to:

- CO1: Define the basic Mathematical concepts like Beta, Gamma, Integrals
- CO2: State finite differences-forward and backward
- CO3: Discuss about Multiple Integrals.
- CO4: Evaluate Laplace Transform
- CO5: Classify merits and demerits of a rank correlation.

BLOCK- I: Beta, Gamma Integrals

- 1.1 Definitions of Beta and Gamma Integrals
- 1.2 Recurrence Formula for Gamma Functions
- 1.3 Properties of Beta Functions
- 1.4 Relation between Beta and Gamma Functions

BLOCK -II: Numerical Differentiation and Integration

- 2.1 Finite Differences- Forward and Backward
- 2.2 Derivatives using Newton's Forward Difference Formula
- 2.3 Derivatives using Newton's Backward Difference Formula
- 2.4 Numerical Integration using Trapezoidal Rule
- 2.5 Numerical Integration using Simpsons rule

BLOCK -III: Multiple Integrals

- 3.1 Definitions of Double and Triple Integrals
- 3.2 Change of Order of Integration for Two Variables
- 3.3 Double Integrals and Triple Integrals in Cartesian Coordinates

BLOCK- IV: Laplace Transform

- 4.1 Definition and Transform of $f'(t)$ & $f''(t)$
- 4.2 Laplace Transform of Functions e^{-at} , $\cos at$, $\sin at$, and tn where 'n' is a Positive Integer
- 4.3 First Shifting Theorem - Laplace Transform of $e^{-at} \cos bt$, $e^{-at} \sin bt$ and $e^{-at} tn$
- 4.4 Inverse Laplace Transform
- 4.5 Solving Second Order Differential Equations with Constant Coefficients using Laplace Transform

BLOCK -V: Statistics

- 5.1 Correlation
- 5.2 Scatter diagram and its uses
- 5.3 Karl Pearson's Coefficient of Correlation
- 5.4 Correlation coefficient for a Bivariate Frequency Distribution
- 5.5 Probable error of correlation coefficient
- 5.6 Spearman's rank correlation coefficient
- 5.7 Merits and demerits of rank correlation coefficient

BOOKS FOR STUDY

1. Narayanan S. and Manicavachagam Pillay T.K., Calculus-Vol II. Chennai: S.Viswanathan, 2012. Chapter 7 Sec. 2.1, 2.3, 3 - 5
2. Narayanan S., R. Hanumantha Rao,T.K. Manicavachgam Pillay, and P. Kandaswamy., Ancillary Mathematics – Volume – II. Madras.: Viswanathan, S, 1995 Reprint 2011.
Chapter 3 Sec 1 - 3
Chapter 7 Sec 1 – 6
3. R. S. N. Pillai and V. Bagavathi, Statistics, S. Chand & company Ltd, New Delhi, 2007. Chapter 12: Page No: 363 – 395.
4. Sastry S.S., Introductory Methods of Numerical Analysi., Prentice – Hall of India Private Limited :New Delhi(2000).

Chapter 3 : Sections 3.3, 3.3.1, 3.3.2

Chapter 5 : Sections 5.1, 5.2(Numerical differentiation only), 5.4, 5.4.1, 5.4.2, 5.4.3

BOOKS FOR REFERENCE

1. Gupta B.D., Numerical Analysis. Delhi.:Konark Publishers pvt. Ltd. , 1999
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2007 Reprint 2014

3. Jeffrey Alan, Handbook of Mathematical formulas and Integrals, United States: Academic, 2004.
4. Narayanan S. & T.K. Manicavachagam Pillay, Calculus-Vol I, Madras: S. Viswanathan, 1997.
5. Vedamurthy, V.N., N. Ch. S. N. Iyengar. Numerical Methods. Delhi : Vikas Publishing House, 1998.

Web Links

1. <https://www.youtube.com/watch?v=0rtaUUonwkU>
2. <https://www.youtube.com/watch?v=VMbJ1XyWWnU>
3. https://www.youtube.com/watch?v=KqokoYr_h1A

COURSE LEARNING OUTCOMES

After completion of the Allied Mathematics – II, the Learner will be able to:

CLO1: Explain the basic Mathematical concepts like Beta, Gamma, Integrals

CLO2: Convert finite differences-forward and backward

CLO3: Discuss about Multiple Integrals.

CLO4: Correlate Laplace Transform

CLO5: Formulate merits and demerits of a rank correlation.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (III SEMESTER)

COURSE TITLE : **Data Structures**
COURSE CODE : **BCAS-32**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Data Structures course, the student shall be able to:

- CO1: Demonstrate how to perform Matrix Operations using Two-Dimensional Arrays.
- CO2: Recognize Linked Lists and Linear Data Structures namely Stacks and Queues.
- CO3: Construct Non Linear Data Structures namely Binary Trees.
- CO4: Illustrate Search Operations using Linear Search, Binary Search and Hashing.
- CO5: Familiarize Sorting techniques namely Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort and Bucket Sort

BLOCK I: INTRODUCTION TO DATA STRUCTURES

Introduction to Data Structures – Linear and Non Linear Data Structures – Arrays – Types of Arrays – Representation of One-Dimensional Array in Memory - Array Traversal – Insertion and Deletion – Realizing Matrices using Two-Dimensional Arrays – Matrix Operations – Addition – Subtraction – Multiplication – Transpose - Linked Lists – Representation of Linked Lists – Advantages and Disadvantages of Linked List – Linked List Node Declaration – Linked List Operations – Linked List Implementation - Circular Linked List Operations – Circular Linked List Implementation – Doubly Linked List Node Declaration – Doubly Linked List Operations – Doubly Linked List Implementation.

BLOCK II: STACKS AND QUEUES

Stacks – Stack Representation in Memory – Arrays vs. Stacks – Stack Operations – Array Implementation of Stacks –Linked Implementation of Stacks - Queues – Logical Representation of Queues – Queue Operations – Array Implementation of Queues – Linked Implementation of Queues - Circular Queues – Priority Queues – Double-Ended Queues.

BLOCK III: TREES

Trees – Tree Terminology – Binary Tree – Array representation of Binary Tree – Linked Representation of Binary Tree - Binary Tree Traversal – Binary Search Tree – Insert, Delete, and Search Operations on a Binary Tree and Binary Search Tree – Expression Trees.

BLOCK IV: GRAPHS

Graphs – Graph Terminology – Implementing Graphs Using Adjacency Matrix, Path Matrix and Adjacency List - Shortest Path Algorithm – Breadth First Search and Depth First Search Traversal of a Graph - Searching – Linear Search – Binary Search – Hashing.

BLOCK V: SORTING

Sorting – Selection Sort – Insertion Sort – Bubble Sort - Quick Sort – Merge Sort – Bucket Sort.

Text Book:

1. E Balagurusamy, “Data Structures”, McGraw Hill Education (India) Private Limited, 2019.

References:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Pearson Education, 2007.
2. Reema Thareja, —Data Structures Using C++, Second Edition , Oxford University Press, 2011.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C++, Second Edition, University Press, 2008.

Web Links

1. <https://www.youtube.com/watch?v=hk5rQs7TQ7E>
2. <https://tildesites.bowdoin.edu/~ltoma/teaching/cs210/fall10/Slides/StacksAndQueues.pdf>
3. <https://www.youtube.com/watch?v=LbcJw-iMIoI>

COURSE LEARNING OUTCOMES

After completion of the Data Structures course, the student can be able to:

CLO1: Describe the Matrix Operations using Two-Dimensional Arrays.

CLO2: Illustrate Linked Lists and Linear Data Structures namely Stacks and Queues.

CLO3: Convert Non Linear Data Structures namely Binary Trees.

CLO4: Paraphrase Search Operations using Linear Search, Binary Search and Hashing.

CLO5: Point out Sorting techniques namely Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort and Bucket Sort.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (DISTANCE MODE)

COURSE TITLE : C++ Laboratory

COURSE CODE : BCAS-P3

COURSE CREDIT : 2

COURSE OBJECTIVES

While studying the C++ Laboratory course, the student shall be able to:

CO1: Explain about how to write basic C++ programming

CO2: Describe how to use control statements

CO3: Enumerate the usage of arrays and functions

CO4: Show how to create classes

List of Programmes

1. Write a C++ program to calculate average marks scored by a student for 3 subjects.
2. Write a C++ program to find the area and perimeter of a circle and rectangle.
3. Write a C++ program to swap two numbers.
4. Write a C++ program to find largest of three numbers.
5. Write a C++ program to find the maximum number among three numbers.
6. Write a C++ program to generate Fibonacci series.
7. Write a C++ program to perform string manipulation.
8. Find the length of a string. Compare two strings, Concatenate two strings, Reverse a string, Copy a string to another location.
9. Write a C++ program to find quotient and remainder of 2 numbers.
10. Write a C++ program to manipulate the class account using classes and function. A user should be able to perform the following functions.
 - a) Deposit money.
 - b) Withdraw money,
 - c) Calculate the interest

- d) Check the total balance in his account.
11. Write a C++ program to generate Prime numbers between 1 and 50.
 12. Write a C++ program to perform matrix addition and multiplication.
 13. Write a C++ program to check whether the given matrix is a sparse matrix or not.
 14. Write a C++ program to overload unary minus operator.
 15. Write a C++ program to calculate total sales and average sales made by a salesman.

Web Links

1. <https://www.youtube.com/watch?v=Ko-Q0Y5-b3k>
2. <https://www.youtube.com/watch?v=xLRMPeEezEk>
3. <https://www.youtube.com/watch?v=ViqyfSIp5g>

COURSE LEARNING OUTCOMES

After completion of the C++ Laboratory course, the student can be able to:

- CLO1: Explain how to write programs in C++
- CLO2: Experiment how to use control statements
- CLO3: Learn about arrays and functions
- CLO4: Demonstrate how to create classes



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (III SEMESTER)

COURSE TITLE	:	Data Structures Laboratory
COURSE CODE	:	BCAS-P4
COURSE CREDIT	:	2

COURSE OBJECTIVES

While studying the Data Structures Laboratory course, the student shall be able to:

- CO1: Know about the working of linked list
- CO2: Understand the working of matrix manipulation
- CO3: Gather knowledge about how Stack Tree, and Queue is working
- CO4: Know about the working of quick sort algorithm

List of Programs

1. Implement PUSH, POP operations of stack using Arrays.
2. Implement PUSH, POP operations of stack using Pointers.
3. Implement add, delete operations of a queue using Arrays.
4. Implement add, delete operations of a queue using Pointers.
5. Conversion of infix to postfix using stack operations
6. Postfix Expression Evaluation.
7. Addition of two polynomials using Arrays and Pointers.
8. Creation, insertion, and deletion in doubly linked list.
9. Binary tree traversals (in-order, pre-order, and post-order) using linked list.
10. Depth First Search and Breadth first Search for Graphs using Recursion.

Web Links

1. <https://www.youtube.com/watch?v=o1QaGUEi6ew>
2. https://www.youtube.com/watch?v=vpILz_sZvGU
3. https://www.youtube.com/watch?v=g1sNOOZC_u0

COURSE LEARNING OUTCOMES

After completion of the Data Structures Laboratory course, the student can be able to:

CLO1: Acquire knowledge about the working of linked list

CLO2: Understand the working of matrix manipulation

CLO3: Learn how to program Stack Tree, and Queue

CLO4: Know the working of quick sort algorithm



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - II YEAR (III SEMESTER)

COURSE TITLE : ENVIRONMENTAL STUDIES

COURSE CODE : CCE

COURSE CREDIT : 2

Unit 1:

The Multi-disciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness.

Unit 2:

Natural Resources - Renewable and non-renewable resources - Natural resources and associated problems.

- a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b. Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.
- c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity case studies.
- e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- g. Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

Unit 3 : Ecosystems:

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological Succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem:-

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4: Biodiversity and its conservation:

Biodiversity and its conservation - Introduction – Definition : genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega – diversity nation - Hot-spots of biodiversity - Threats to biodiversity : habitat loss, poaching of wildlife, man wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity : *In-situ* and *Ex-situ* conservation of biodiversity.

Unit 5: Environmental Pollution:

Environmental Pollution - Definition - Causes, effects and control measures of : Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards - Solid waste Management - Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment:

Social issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; it's problems and concerns. Case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies - Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness.

Unit 7: Human Population and the Environment:

Human Population and the Environment - Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV / AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case Studies.

Unit: 8 Field Work Visit:

Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

Suggested Readings:

1. Carson, R.2002.Silent Spring, Houghton Mifflin Harcourt.
2. Gadgil, M.,&Guha,R. 1993. This Fissured Land: An Ecological History of India, Univ. Of California Press.

3. Glesson, B. And Law, N.(eds.)1999, Global Ethics and Environment, London, Routledge.
4. Gliock,P.H.1993.Water Crisis, Pacific Institute for Studies in Dev. Environment & Security, Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K.Meffe, and Carl Ronald Carroll, Principles of Conservation Biology. Sunderland: Sinauer Associate, 2006.
6. Grumbine.R.Edward, and Pandit,M.k.2013.Threats from India's Himalayas dams.Science.,339:36-37
7. 7. McCully,P.1996.Rivers no more :the environmental effects of dams(pp.29.64).Zed books.
8. McNcill John R.2000.Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum,E.P..Odum, H.T.& Andrees.J.1971.Fundamenetal of Ecology, Philadelphia Saunders.
10. Pepper.J.J...Gerba.C.P. & Brusseau.M.L.2011.Environmental and Pollution Science. Academic Press.
11. Rao.M.N.& Datta,A.K 1987.Waste Water Treatment, Oxford and IBH Publishing Co.Pvt.Ltd.
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19. Wilson.E.O.2006. The Creation: An appeal to save life on earth.New York: Norton.
20. World Commission on Environment and Development.198.Our Common Future.Oxford University Press.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **Operating Systems**
COURSE CODE : **BCAS-41**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Operating Systems course, the student shall be able to:

- CO1: Describe the Fundamentals for Operating Systems
- CO2: Acquire Knowledge on Process Management
- CO3: Discuss the CPU Scheduling Algorithms.
- CO4: Point out the functions of Memory Management
- CO5: Summarize the File Management Systems.

BLOCK I: FUNDAMENTALS OF OPERATING SYSTEM

Introduction– Types of Operating System –Operating-System Operations–Resource Management –Security and Protection –Virtualization –Distributed Systems - Operating-System Services – User and Operating-System Interface –System Calls –System Services - Linkers and Loaders–Operating-System Structure –Building and Booting an Operating System.

BLOCK II: PROCESS MANAGEMENT

Process Management –Process Concept –Process Scheduling –Operations on Processes - Interprocess Communication –IPC in Shared-Memory Systems –IPC in Message-Passing Systems–Examples of IPC Systems –Communication in Client–Server Systems - Threads and Concurrency–Multicore Programming –Multithreading Models –Thread Libraries –Implicit Threading –Threading Issues.

BLOCK III: CPU SCHEDULING

CPU Scheduling–Basic Concepts –Scheduling Criteria –Scheduling Algorithms –Thread Scheduling –Multi-Processor Scheduling – Real-Time CPU Scheduling - Process Synchronization –The Critical-Section Problem –Peterson’s Solution –Hardware Support for Synchronization – Mutex Locks –Semaphores–Monitors–Deadlocks–System Model.- Deadlock

in Multithreaded Applications –Deadlock Characterization –Methods for Handling Deadlocks –
Deadlock Prevention–Deadlock Avoidance –Deadlock Detection –Recovery from Deadlock.

BLOCK IV: MEMORY MANAGEMENT

Memory Management – Contiguous Memory Allocation –Paging –Structure of the Page Table –
Swapping –Virtual Memory–Demand Paging –Copy-on-Write – Page Replacement –Allocation
of Frames –Thrashing –Memory Compression–Allocating Kernel Memory.

BLOCK V: FILE MANAGEMENT

File-System Implementation–File-System Structure –File-System Operations –Directory
Implementation - Allocation Methods –Free-Space Management –Efficiency and Performance–
Recovery – The WAFL File System–File-System Internals–File-System Mounting –Partitions
and Mounting–File Sharing –Virtual File Systems –Remote File Systems–Consistency
Semantics –Network File Systems.

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne “Operating System Concepts”, Tenth Edition, Wiley, 2018.

References:

1. Andrew S. Tanenbaum, and Herbert Bos, “Modern Operating Systems”, Fourth Edition, Pearson Education Limited, 2015.

Web Links

1. <https://www.youtube.com/watch?v=mXw9ruZaxzQ>
2. <https://www.youtube.com/watch?v=rFt1hwh-8zU>
3. <https://www.youtube.com/watch?v=392uyAUJqO4>
4. <https://www.youtube.com/watch?v=FpuIQrxBLsw>

COURSE LEARNING OUTCOMES

After completion of the Operating Systems course, the student can be able to:

CLO1: Explain the Fundamentals for Operating Systems

CLO2: Identify the Knowledge on Process Management

CLO3: Define the CPU Scheduling Algorithms.

CLO4: State the functions of Memory Management

CLO5: Paraphrase the File Management Systems.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **Data Base Management System**
COURSE CODE : **BCAS-42**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Data Base Management System course, the student shall be able to:

- CO1: Learn the basics of Database Management Systems.
- CO2: Describe the conceptual data model and Entity Relationship (ER) Model.
- CO3: Design the Relational Data Model and Relational Algebra.
- CO4: Categorize the normalization in Relational Database Design.
- CO5: Demonstrate the NOSQL Databases and Big Data.

BLOCK I: INTRODUCTION TO DATABASES

Introduction – Example – Characteristics of the Database Approach – Actors on the Scene – Workers behind the Scene – Advantages of Using the DBMS Approach - Database Applications – When Not to Use a DBMS – Data Models – Schemas – Instances – Three Schema Architecture - Data Independence – Database Languages and Interfaces – Database System Environment – Architectures for DBMSs – Classification of DBMSs.

BLOCK II: CONCEPTUAL DATA MODELING AND DATABASE DESIGN

Entity Relationship Model – Entity Types – Entity Sets – Attributes – Keys – Relationship Types – Relationship Sets – Roles - Structural Constraints – Strong Entity Types – Weak Entity Types – Enhanced Entity Relationship Model - Specialization and Generalization – Constraints and Characterization of Specialization and Generalization Hierarchies.

BLOCK III: RELATIONAL DATA MODEL, RELATIONAL ALGEBRA AND SQL

Relational Model Concepts – Super Key – Candidate Key – Primary Key – Alternate Key – Foreign Key - Relation Model Constraints and Relational Database Schemas – Update Operations – Transactions and Dealing with Constraint Violations - Unary and Binary Relational Operations in Relational Algebra – Queries in Relational Algebra – Basic SQL – SQL Data

Definition and Data Types – Specifying Constraints in SQL - Basic Retrieval Queries in SQL – Insert, Delete and Update Statements in SQL – Views in SQL.

BLOCK IV: RELATIONAL DATABASE DESIGN

Mapping Entity Relationship Model to Relations – Mapping Enhance Entity Relationship Model to Relations - Database Normalization – Functional Dependencies – First Normal Form – Second Normal Form and Third Normal Form.

BLOCK V: NOSQL DATABASES AND BIG DATA

Introduction – CAP Theorem – Document Based NOSQL Systems and MongoDB – NOSQL Key Value Stores – Column Based NOSQL Systems – NOSQL Graph Databases – Neo4j - Big Data – Characteristics of Big Data – Introduction to MapReduce and Hadoop – Hadoop Distributed File System.

Text Book:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017.

References:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2014.
2. C. J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

Web Links

1. https://www.w3schools.com/sql/sql_intro.asp
2. <https://www.geeksforgeeks.org/difference-between-dbms-and-sql/>
3. https://www.tutorialspoint.com/dbms/sql_overview.htm
4. <https://www.guru99.com/database-normalization.html>
5. <https://www.ibm.com/in-en/cloud/learn/cap-theorem>

COURSE LEARNING OUTCOMES

After completion of the Database Management Systems course, the student can be able to:

- CLO1: Teach the basics of Database Management Systems.
- CLO2: Relate the conceptual data model and Entity Relationship (ER) Model.
- CLO3: Differentiate the Relational Data Model and Relational Algebra.
- CLO4: Classify the normalization in Relational Database Design.
- CLO5: Compare the NOSQL Databases and Big Data.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **WEB Designing**
COURSE CODE : **BCAS-43**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Web Designing course, the student shall be able to:

- CO1: Describe about APPLET
- CO2: Teach about Networking and RMI
- CO3: Recognize the concepts Swing and AWT
- CO4: Explain about the database connectivity and Servlet
- CO5: Correlate the Java Beans concepts.

BLOCK - I: INTRODUCTION TO APPLETT

Introduction to applet –lifecycle of applet- servlet and its life cycle – HTML fundamentals - JSP fundamentals-variables-control structures, Applet to servlet communications. Servlets – deployment of simple servlets - web server (Java web server/Tomcat sever/Web logic)- HTTP GET and POST request-Session tracking-cookies - JDBC-Simple Web application-multi tier applications.

BLOCK - II: NETWORKING AND RMI

Connecting to a Server - Implementing Servers - Advanced Socket Programming: InetAddress - URL Connections. Remote Method Invocations: Setting Up Remote Method Invocation - Parameter Passing in Remote Methods.

BLOCK - III: ADVANCED SWING AND AWT

Lists – Trees – Tables - Styled Text Components - Component Organizers – Shapes - Images.

BLOCK - IV: DATABASE CONNECTIVITY AND SERVLET

The Design of JDBC - Basic Concepts - Executing Queries - Result Sets – Metadata - Transactions, Servlets.

BLOCK -V: JAVABEANS

The Bean-Writing Process - Using Beans to Build an Application - Bean Property Types - Customizers.

Reference books:

1. Cay S. Horstmann, Gary Cornell, *Core Java™ 2: Volume II–Advanced Features*, Prentice Hall, 2008.
2. Patrick Naughton & Herbert Schildt, *The Complete Reference: Java 2*, Tata McGraw Hill, 8 th Edition 2011.
3. Experiment the need for Database Management Systems
4. Solve conceptual models for any real world application
5. Describe Design databases for any real world application Understand the need for Database Normalization
6. Extend Understanding on NOSQL Databases and Big Data

Web Links

1. https://www.utc.fr/~dnace/dokuwiki/_media/fr/servletesjsp_translated.pdf
2. https://www.w3schools.com/html/html_basic.asp
3. <https://www.studytonight.com/servlet/storing-session-using-cookies.php>
4. <https://beginnersbook.com/2013/05/servlet-cookies/>
5. https://www.w3schools.com/tags/ref_httpmethods.asp
6. <https://slideplayer.com/slide/5228556/>

COURSE LEARNING OUTCOMES

CLO1: Identify about APPLET

CLO2: Learn about Networking and RMI

CLO3: Demonstrate the concepts Swing and AWT

CLO4: Modify about the database connectivity and Servlet

CLO5: Estimate the Java Beans concepts.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **Software Engineering**
COURSE CODE : **BCAS-44**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Software Engineering course, the student shall be able to:

- CO1: Examine the nature of software.
- CO2: Memorize Prescriptive Process Models.
- CO3: Defines the Modeling Principles.
- CO4: Select the Software Design aspects
- CO5: Indicate on Software Testing Strategies and Software Configuration Management.

BLOCK I: THE NATURE OF SOFTWARE

The Nature of Software – Defining Software – Software Application Domains – Legacy Software – The Changing Nature of Software – Web Apps – Mobile Applications – Cloud Computing – Product Line Software – Defining the Discipline – The Software Process – The Process Framework – Umbrella Activities – Process Adaptation – Software Engineering Practice – The Essence of Practice – General Principles – Software Development Myths – Software Process Structure – A Generic Process Model – Defining a Framework Activity – Identifying a Task Set – Process Patterns – Process Assessment and Improvement.

BLOCK II: PRESCRIPTIVE PROCESS MODELS

Prescriptive Process Models – The Waterfall Model – Incremental Process Models – Evolutionary Process Models – Concurrent Models – A Final Word on Evolutionary Processes – Specialized Process Models – Component-Based Development – The Formal Methods Model – Aspect-Oriented Software Development – The Unified Process – Phases of the Unified Process – Personal and Team Process Models – Personal Software Process – Team Software Process – Process Technology – Product and Process – Agility – Agility and the Cost of Change – Agile Process – Agility Principles – The Politics of Agile Development – Extreme Programming – The

XP Process – Industrial XP – Other Agile Process Models – Scrum – Dynamic Systems Development Method – Agile Modeling – Agile Unified Process.

BLOCK III: MODELING

Modeling – Principles That Guide Process, Practice and Each Framework Activity – Communication, Planning, Modeling, Construction and Deployment Principles – Requirements Engineering – Establishing the Groundwork – Identifying Stakeholders – Recognizing Multiple Viewpoints – Working toward Collaboration – Asking the First Questions – Nonfunctional Requirements – Traceability – Eliciting Requirements – Collaborative Requirements Gathering – Quality Function Deployment – Usage Scenarios – Elicitation Work Products – Agile Requirements Elicitation – Service-Oriented Methods – Developing Use Cases – Building the Analysis Model – Elements of the Analysis Model – Analysis Patterns – Agile Requirements Engineering – Requirements for Self-Adaptive Systems – Negotiating Requirements – Requirements Monitoring – Validating Requirements – Avoiding Common Mistakes – Requirements Analysis – Overall Objectives and Philosophy – Analysis Rules of Thumb – Domain Analysis – Requirements Modeling Approaches – Scenario-Based Modeling – Creating a Preliminary Use Case – Refining a Preliminary Use Case – Writing a Formal Use Case – UML Models That Supplement the Use Case – Developing an Activity Diagram – Swimlane Diagrams – Requirements Modeling: Class-Based Methods – Identifying Analysis Classes – Specifying Attributes – Defining Operations – Class-Responsibility-Collaborator Modeling – Associations and Dependencies – Analysis Packages.

BLOCK IV: SOFTWARE DESIGN

Software Design – Design within the Context of Software Engineering – The Design Process – Software Quality Guidelines and Attributes – The Evolution of Software Design – Design Concepts – Abstraction – Architecture – Patterns – Separation of Concerns – Modularity – Information Hiding – Functional Independence – Refinement – Aspects – Refactoring – Object-Oriented Design Concepts – Design Classes – Dependency Inversion – Design for Test – Design Model – Data Design Elements – Architectural Design Elements – Interface Design Elements – Component-Level Design Elements – Deployment-Level Design Elements – Designing Class-Based Components – Basic Design Principles – Component-Level Design Guidelines – Cohesion – Coupling.

BLOCK V: SOFTWARE TESTING STRATEGIES

Software Testing Strategies – A Strategic Approach to Software Testing – Verification and Validation – Organizing for Software Testing – Software Testing Strategy – Criteria for Completion of Testing – Strategic Issues – Test Strategies for Conventional Software – Unit Testing – Integration Testing – Test Strategies for Object-Oriented Software – Unit Testing in the OO Context – Integration Testing in the OO Context – Test Strategies for WebApps – Test Strategies for MobileApps – Validation Testing – Validation-Test Criteria – Configuration Review – Alpha and Beta Testing – System Testing – Recovery Testing – Security Testing – Stress Testing – Performance Testing – Deployment Testing – The Art of Debugging – The Debugging Process – Psychological Considerations – Debugging Strategies – Correcting the Error – White-Box Testing – Basis Path Testing – Flow Graph Notation – Independent Program Paths – Deriving Test Cases – Graph Matrices – Control Structure Testing – Black-Box Testing – Graph-Based Testing Methods – Equivalence Partitioning – Boundary Value Analysis – Orthogonal Array Testing – Model-Based Testing – Software Configuration Management – Elements of a Configuration Management System – Baselines – Software Configuration Items – Management of Dependencies and Changes.

Text Book:

1. Roger S. Pressman and Bruce R. Maxim, “Software Engineering”, A Practitioner’s Approach, Eighth Edition, McGraw-Hill Education, 2015.

References:

2. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson 2016.
3. Ian Sommerville, “Engineering Software Products”, Pearson 2019.

Web Links

1. <https://clearbridgemobile.com/cloud-apps-vs-web-apps/>
2. <https://searchcloudcomputing.techtarget.com/definition/cloud-application>
3. <http://users.csc.calpoly.edu/~jdalbey/308/Lectures/SoftwareProcessModels.html>
4. http://www.se.rit.edu/~se361/Slides/se361_Chapter_03.pdf
5. <https://www.tutorialride.com/software-engineering/agile-process-in-software-engineering.htm>
6. <https://smartbear.com/learn/automated-testing/software-testing-methodologies/>
7. https://www.tutorialspoint.com/software_engineering/software_testing_overview.htm

COURSE LEARNING OUTCOMES

After completion of the Software Engineering course, the student can be able to:

CLO1: Identify the nature of software.

CLO2: Memorize Prescriptive Process Models.

CLO3: Enumerate the Modeling Principles.

CLO4: Select the Software Design aspects

CLO5: Indicate on Software Testing Strategies and Software Configuration Management.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **Web Designing Laboratory (HTML/DHTML/CSS)**
COURSE CODE : **BCAS- P5**
COURSE CREDIT : **2**

COURSE OBJECTIVES

While studying the Web Technology Lab course, the student shall be able to:

CO1: Teach about the how to design web pages using various HTML tags

CO2: Show about the concepts of JavaScript

CO3: Create forms using JavaScript

List of Experiments

1. Create a form having number of elements (Textboxes, Radio buttons, Checkboxes, and so on). Write JavaScript code to count the number of elements in a form.
2. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.
3. Create a page with dynamic effects. Write the code to include layers and basic animation.
4. Write a JavaScript code to find the sum of N natural Numbers.
5. Create a form for Student information. Write JavaScript code to find Total, Average, Result and Grade.
6. Create a form for Employee information. Write JavaScript code to find DA, HRA, PF, TAX, Gross pay, Deduction and Net pay.
7. Create a Web services with RMI.
8. Implement RMI program to perform arithmetic functions.
9. Develop a simple application to insert and retrieve data from database.
10. Design a colour bean.

Web Links

1. <https://www.youtube.com/watch?v=TA5UKNGQGw>
2. <https://www.youtube.com/watch?v=itx0RYOnoBs>
3. https://www.youtube.com/watch?v=_zMpAWY0c6E

COURSE LEARNING OUTCOMES

After completion of the Web Technology Lab course, the student can be able to:

CLO1: Design web pages using various HTML tags

CLO2: Develop JavaScript to implement arrays.

CLO3: Write JavaScript to create forms.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - II YEAR (IV SEMESTER)

COURSE TITLE : **Data Base Management System Laboratory**
COURSE CODE : **BCAS-P6**
COURSE CREDIT : **2**

COURSE OBJECTIVES

While studying the Data Base Management System Lab course, the student shall be able to:

- CO1: Observe about the basic concepts of SQL Commands
- CO2: Prepare the concepts of nested and join queries
- CO3: Develop the concepts of functions, procedures and procedural extensions of databases.
- CO4: Design and implementation of typical database applications.
- CO5: Construct the concepts of a front end tool for GUI based application development

List of Experiments

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables and explore sub queries and simple join operations.
4. Query the database tables and explore natural, equi and outer joins.
5. Write user defined functions and stored procedures in SQL.
6. Execute complex transactions and realize DCL and TCL commands.
7. Write SQL Triggers for insert, delete, and update operations in database table.
8. Create View and index for database tables with large number of records.
9. Create a XML database and validate it using XML schema.
10. Create Document, column and graph based data using NOSQL database tools.

Web Links

1. <https://www.youtube.com/watch?v=P7-wKbKrAhk>
2. <https://www.youtube.com/watch?v=i6JGg1jFzyM>
3. <https://www.youtube.com/watch?v=1BK0LifIHFA>

COURSE LEARNING OUTCOMES

After completion of the Data Base Management System Lab course, the student can be able to:

- CLO1: Develop the basic concepts of SQL Commands
- CLO2: Organize the concepts of nested and join queries
- CLO3: Write the concepts of functions, procedures and procedural extensions of databases.
- CLO4: Design and implementation of typical database applications.
- CLO5: Create the concepts of a front end tool for GUI based application development.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (V SEMESTER)

COURSE TITLE : **Data Communication & Networking**
COURSE CODE : **BCAS-51**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Data Communication and Networking course, the student shall be able to:

- CO1: Describes the basics of network
- CO2: Enumerate Wireless Transmission with design issues.
- CO3: Summarize the concept of Data Link Layer and its protocols.
- CO4: Paraphrase routing algorithm and IP Protocols.
- CO5: Explain the concept of transport layer services and network security.

BLOCK I: INTRODUCTION TO NETWORKS

Introduction to Network Hardware and Software - Reference Models – OSI and TCP/IP Models - Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer - Theoretical Basis for Data Communication - Guided Transmission Media.

BLOCK II: WIRELESS TRANSMISSION

Wireless Transmission - Communication Satellites - Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching - Data Link Layer: Design Issues – Error Detection and Correction.

BLOCK III: DATA LINK LAYER

Elementary Data Link Protocols - Sliding Window Protocols - Data Link Layer in the Internet - Medium Access Layer - Channel Allocation Problem – Multiple Access Protocols – Bluetooth.

BLOCK IV: NETWORK LAYER

Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms - IP Protocol – IP Addresses – Internet Control Protocols.

BLOCK V: TRANSPORT LAYER

Transport Layer – Services - Connection Management - Addressing, Establishing and Releasing a Connection - Simple Transport Protocol – Internet Transport Protocols (ITP) -Network Security: Cryptography.

TEXT BOOK

1. A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.

REFERENCE BOOKS

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2007.
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008.
3. D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.
4. Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002.

Web Links

1. <https://www.youtube.com/watch?v=mYWslbszYQ>
2. <https://www.youtube.com/watch?v=yiLL32bX77s>
3. <https://www.youtube.com/watch?v=kAty4mKczEg>
4. <https://www.youtube.com/watch?v=nfpBQCOXr9Y>

COURSE LEARNING OUTCOMES

After completion of the Data Communication and Networking course, the student can be able to:

CLO1: Summarize the basics of network.

CLO2: Identify the Wireless Transmission and its design issues.

CLO3: Learn the concept of Data Link Layer and its protocols.

CLO4: Develop the routing algorithm and IP Protocols.

CLO5: Describe the concept of transport layer services and network security.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (V SEMESTER)

COURSE TITLE : **Programming in Java**
COURSE CODE : **BCAS-52**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Programming in Java course, the student shall be able to:

- CO1: Describe the Object Oriented features supported by Java.
- CO2: Demonstrate the looping and classes.
- CO3: Exploring the various arrays available in Java.
- CO4: Discriminate knowledge on creating, accessing and using a Package.
- CO5: Construct the Exception Handling in Java.

BLOCK I: JAVA FEATURES

Java Features – Comparison of C++ and Java – Java Virtual Machine – Constants – Variables – Data Types – Scope of Variables – Type Casting – Java Program Structure - Operators and Expressions – Arithmetic – Logical – Relational – Assignment – Increment and Decrement – Conditional – Bitwise – Special Operators - Arithmetic Expressions – Evaluation of Expressions – Type Conversion in Expressions – Operator Precedence and Associativity – Mathematical Functions.

BLOCK II: LOOPING, CLASSES AND OBJECTS

Decision Making, Branching and Looping – If Statement – If ... Else Statement – Nesting of If ... Else Statements – Else If Ladder – Switch Statement – The ?: Operator - While Statement – Do Statement – For Statement – Jumps in Loops – Return Statement – Labeled Loops - Classes, Objects and Methods – Defining a Class – Fields Declaration – Methods Declaration – Creating Objects – Accessing Class Members - Constructors – Method Overloading – Static Members – Nesting of Methods – Inheritance – Overriding Methods – Abstract Methods and Classes.

BLOCK III: ARRAYS

Arrays, Strings and Vectors – One Dimensional Arrays – Creating an Array – Two Dimensional Arrays - Strings – Vectors – Wrapper Classes – Enumerated Types – Annotations - Interfaces – Defining Interfaces – Implementing Interfaces – Accessing Interface Variables.

BLOCK IV: PACKAGES

Packages – Java API Packages – Using System Packages – Naming Conventions - Creating Packages – Accessing a Package – Using a Packages – Adding a Class to a Package – Hiding Classes – Static Import.

BLOCK V: EXCEPTIONS

Managing Errors and Exceptions – Types of Exceptions – Exceptions – Syntax of Exception Handling Code – Multiple Catch Statements - Using Finally Statement – Throwing Our Own Exception – Using Exceptions for Debugging.

Text Book:

1. E Balagurusamy, “Programming with Java”, Sixth Edition, McGraw Hill Education (India) Private Limited, 2019.

References:

1. Herbert Schildt, “Java: The Complete Reference”, Ninth Edition, McGraw Hill Professional, 2014.

Web Links

1. <https://www.javatpoint.com/features-of-java>
2. <https://www.youtube.com/watch?v=L677QCBCuWk>
3. <https://www.youtube.com/watch?v=hAk7abWHi3w>
4. https://www.youtube.com/watch?v=_nmm0nZqIYY

COURSE LEARNING OUTCOMES

After completion of the Programming in Java course, the student can be able to:

- CLO1: Explain the Object Oriented features supported by Java.
- CLO2: Illustrate the looping and classes.
- CLO3: Formulate the various arrays available in Java.
- CLO4: Discriminate knowledge on creating, accessing and using a Package.
- CLO5: Assess the Exception Handling in Java.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (V SEMESTER)

COURSE TITLE : **Programming in Python**
COURSE CODE : **BCAS-53**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Programming in Python course, the student shall be able to:

- CO1: Explain the basic concepts of Python language.
- CO2: Develop the functions and exception handling in Python
- CO3: Demonstrate the file handling and MySQL Database.
- CO4: Develop the concepts of graphics programming and Scientific Programming using NumPy / SciPy
- CO5: Create testing and version control systems.

BLOCK I: INTRODUCTION

Introduction to Python - Why Python - Installing in various Operating Systems - Executing Python Programs - Basic Programming concepts - Variables, expressions and statements - Input/Output – Operators.

BLOCK II: DATA FLOW

Conditions - Functions - Arguments - Return values - Iteration - Loops - Strings - Data Structures - Lists - Dictionaries - Tuples - Sequences - Exception Handling.

BLOCK III: FILE HANDLING AND DATABASE

File Handling - Modules - Regular Expressions - Text handling - Object Oriented Programming - Classes - Objects - Inheritance - Overloading Polymorphism - Interacting with Databases - Introduction to MySQL - interacting with MySQL - Building a address book with add/edit/delete/search features.

BLOCK IV: GRAPHICS PROGRAMMING

Introduction to Graphics programming - Introduction to GTK - PyGTK - Developing GUI applications using PyGTK - Scientific Programming using NumPy / SciPy - Image Processing - Processing multimedia files -Network Programming - Web services using SOAP, Introduction to Graphics programming - PyGame

BLOCK V: TESTING AND VERSION CONTROL SYSTEMS

Introduction to Version Control Systems – Subversion/Git - Writing Unit Tests- Creating Documentation - Contributing to Open Source Projects

Text Book

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 1st Edition 2012, O'Reilly.

Reference Books

1. Jeff McNeil, "Python 2.6 Text Processing: Beginners Guide", 2010, Packet Publications
2. Mark Pilgrim, "Dive Into Python", 2nd edition 2009, Apress.

Web Links

1. <https://www.youtube.com/watch?v=aequTxAvQq4>
2. <https://www.youtube.com/watch?v=3QpZ1Y4v824>
3. <https://www.youtube.com/watch?v=zEb9zn1RvpM>
4. https://www.youtube.com/watch?v=R39vTAj1u_8
5. <https://www.youtube.com/watch?v=HKTyOUx9Wf4>

COURSE LEARNING OUTCOMES

After completion of the Programming in Python course, the student can be able to:

CLO1: Assess the basic concepts of Python language.

CLO2: Demonstrate the functions and exception handling in Python.

CLO3: Develop the file handling system in Python and MySQL Database.

CLO4: Explain the concepts of graphics programming and Scientific Programming using NumPy / SciPy.

CLO5: Create testing and version control systems.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (V SEMESTER)

COURSE TITLE : **Programming in Java - Laboratory**
COURSE CODE : **BCAS-P7**
COURSE CREDIT : **4**

COURSE OBJECTIVES

While studying the Programming in Java Laboratory course, the student shall be able to:

- CO1: Describe the knowledge on Java Compiler and work with eclipse platform
- CO2: Learn how to use the control statements in Java
- CO3: Experiment the concepts of multi threading and exception handling
- CO4: Explain the concepts of graphics programming.

List of Experiments

1. Write a Java program for student Mark-List preparation.
2. Write a Java program to reverse and finding sum of individual digits of a given number
3. Develop an applet in Java that displays a simple message.
4. Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.
5. Write a Java program for finding volume of a sphere (Concept: Class and Object)
6. Write a Java program for preparing Employee salary Report (Concept : Array of Objects)
7. Write a Java program for checking whether a given number is palindrome or not (Concept : Abstract Class).
8. Write a Java Program for Electricity charge calculation (Concept : Implementing Multiple Inheritance).
9. Write a Java program to find area of Triangle and Rectangle (Concept : Package , Interface).
10. Write a Java program for queue implementation (Concept : Exception Handling; User defined Exception).

11. Write a Java program to implement Multi- Threading (Concept: Multi- Threading by extending Thread class).
12. Write a program for simple Railway Reservation System (Concept : IO Streams: DataInput Stream & DataOutputStream).
13. Write a Java program to display an image (Concept : Pixel Grabber Class : Getting pixels of an image)
14. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
15. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

Web Links

1. <https://www.youtube.com/watch?v=LxqOecFpHjo>
2. <https://www.youtube.com/watch?v=5u8rFbpdvds>
3. https://www.youtube.com/watch?v=Sny9Rta3k_Q

COURSE LEARNING OUTCOMES

After completion of the Programming in Java Laboratory course, the student can be able to:

CLO1: Describe the knowledge on Java Compiler and work with eclipse platform

CLO2: Develop the control statements in Java.

CLO3: Experiment the concepts of multi threading and exception handling

CLO4: Learn the concepts of graphics programming.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (DISTANCE MODE)

COURSE TITLE	:	Programming in Python - Laboratory
COURSE CODE	:	BCAS-P8
COURSE CREDIT	:	2

COURSE OBJECTIVES

While studying the Programming in Python Lab course, the student shall be able to:

CO1: Learn how to write program in Python basics.

CO2: Experiment the program in Python data structures.

CO3: Demonstrate how to handle files.

CO4: Learn how to connect with Database.

List of Experiments

1. Create a simple calculator to do all the arithmetic operations
2. Write a program to use control flow tools like if.
3. Write a program to use for loop
4. Data structures
 - i. use list as stack
 - ii. use list as queue
 - iii. tuple, sequence
5. Create new module for mathematical operations and use in your program
6. Write a program to read and write files, create and delete directories
7. Write a program with exception handling
8. Write a program using classes
9. Connect with MySQL and create address book
10. Write a program using string handling and regular expressions
11. Program to parse apache log file
12. Create a GUI program using pygtk.

Web Links

1. <https://www.youtube.com/watch?v=FP6qQgJI5f4>
2. https://www.youtube.com/watch?v=_uQrJ0TkZlc
3. <https://www.youtube.com/watch?v=AHkPH4VIWYA>

COURSE LEARNING OUTCOMES

After completion of the Programming in Python Lab course, the student can be able to:

CLO1: Demonstrate how to write program in Python basics.

CLO2: Experiment the program in Python data structures.

CLO3: Learn to handle files in python.

CLO4: Experiment how to connect with Database.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (VI SEMESTER)

COURSE TITLE : VISUAL PROGRAMMING
COURSE CODE : BCAS-61
COURSE CREDIT : 4

COURSE OBJECTIVES

While studying the Visual Programming course, the student shall be able to:

- CO1: Use a modern IDE to visually and programmatically create programs with GUI's
- CO2: Develop forms and events.
- CO3: Learn the VB data types and control structure
- CO4: Design and implement applications using Library Functions
- CO5: Create a Database in VB.

BLOCK I: INTRODUCTION TO WINDOWS PROGRAMMING

Introduction to Windows Programming and Visual Basic: Components of Windows Programming - Graphical User Interface – Window and its elements – Dialog Box – Drop-Down and Pop-Up menus – Visual Basic – Event-Driven Programming – Steps in Building a Project - User Interface Design – Writing Code – Visual Basic IDE – Creating and Running a simple project

BLOCK II: VISUAL BASIC FORMS AND CONTROLS:

Form – Tool Box controls – Property window – Design and Run-time properties – Events – Keyboard, Mouse, Code and System events - Visual Basic Object oriented programming – Creating buttons at run-time through object declaration - Screen, Printer, Error Objects.

BLOCK III: VISUAL BASIC PROGRAMMING:

Visual Basic Data Types - Constants: predefined constants – User-Defined constants – Variables - Scope Rules – Control Structures – If – Select Case – Loops – FOR , DO, WHILE loops – Goto – On Goto statements - Event procedures – User defined procedures.

BLOCK IV: LIBRARY FUNCTIONS

Library functions – Numeric, String, Boolean and miscellaneous functions – Sub Main() procedure - User-defined functions – Public, Private Scope rules – Creating EXE files – Arrays – User-defined data type – Type statement – Control Arrays - Graphics handling – Using multiple forms – Activating a form – Multiple Document Interface – A simple MDI application.

BLOCK V VISUAL BASIC ADVANCED FEATURES:

Creating a Database in VB – Accessing an external database with Data Control – Object Linking and Embedding (OLE) - Linking and embedding an excel worksheet with VB project – Using third-party controls in VB - Creating an Active X control project – Activating other applications from VB – Windows Application Program Interface functions (WINAPI)

Reference Books:

1. An Introduction to Programming using Visual Basic, David I. Schneider, Prentice Hall, 1995
2. Ready-to-Run Visual Basic Algorithms, Rod Stephens, J. Wiley Publication, 1998
3. “Visual Basic 6 from ground up” Garry Cornell, TMH, 1999.

Web Links

1. <https://www.youtube.com/watch?v=-HNNCem5MoQ>
2. https://www.tutorialspoint.com/vb.net/vb.net_basic_controls.htm
3. <https://www.youtube.com/watch?v=vTS0-BWHE0M>
4. <https://www.youtube.com/watch?v=XdSbp1A6eQc>
5. <https://www.youtube.com/watch?v=oWRxt48IRzo>

COURSE LEARNING OUTCOMES

After completion of the Visual Programming course, the student can be able to:

- CLO1: Demonstrate knowledge of programming terminology and how applied using Visual Basic
- CLO2: Develop a Graphical User Interface (GUI) based on problem description.
- CLO3: Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events.
- CLO4: Develop an Algorithm to verify processing is accurate
- CLO5: Develop and debug applications using Visual Basic 2010 (or version required for the course) that runs under Windows operating system.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (VI SEMESTER)

COURSE TITLE : **VISUAL PROGRAMMING LABORATORY**
COURSE CODE : **BCAS-P9**
COURSE CREDIT : **2**

COURSE OBJECTIVES

While studying the Visual Programming practical course, the student shall be able to:

- CO1: Demonstrate knowledge of programming terminology and how applied using Visual Basic
- CO2: Develop a Graphical User Interface (GUI) based on problem description
- CO3: Develop an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific events
- CO4: Develop an Algorithm to verify processing is accurate

List of Experiments

1. Write a program to design a simple calculator to perform addition, subtraction, multiplication and division cure function for the calculation)
2. Write a application with a derive list box, Dirlistbox, Filelist box and image control and using through load an image at runtime
3. Write a program to change the color the color of text using scrollbar
4. Write a application to move an image using a timer and command button
5. Write a application that change the font, size and color for a given text box.
6. Write a application that calculate the age from the given data of birth. (use DTP control)
7. Write a application for encryption and decryption of string using random number
8. Write a application to show the usage of shape and line control.
9. Write a application by using navigation and manipulation method.
10. Write a application to display item details using database

Web Links

1. <https://www.youtube.com/watch?v=Jfu2w7HS7Yw>
2. <https://www.youtube.com/watch?v=bk2TCojthDs>
3. <https://www.youtube.com/playlist?list=PLG4AvFYItCViiBOv6tJA6vXkc6UVIxA6>

COURSE LEARNING OUTCOMES

After completion of the Visual Programming practical course, the student can be able to:

CLO1: Design, create, build, and debug Visual Basic applications.

CLO2: Apply arithmetic operations for displaying numeric output.

CLO3: Apply decision structures for determining different operations.

CLO4: Write and apply loop structures to perform repetitive tasks.

CLO5: Write and apply procedures, sub-procedures, and functions to create manageable code



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (VI SEMESTER)

COURSE TITLE : Mini Project
COURSE CODE : BCAS-P10
COURSE CREDIT : 2

COURSE OBJECTIVES

While completing the project, the student shall be able to:

The objective of the Project Course is to help the students to study, analyze and design software or utility for research problems focused in the recent journals or application of such software related to problems in the area of Computer Application. The development of algorithms and derivation with respect to theoretical Computer Science in relevance to performance comparison, which will improve the skills of software development of the students, will be another objective of the mini project course.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS – III YEAR (ELECTIVE I)

COURSE TITLE : **Principles of Management**
COURSE CODE : **BCASE-01**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Principles of Management course, the student shall be able to:

- CO1: Learn the basic concepts of Management
- CO2: Explain how to do planning and decision making
- CO3: Gather information about how to organize in management
- CO4: Demonstrate the selection process.
- CO5: Aware about controlling and budgeting in management

BLOCK I: INTRODUCTION

Management – Features, Functions – Management as an art, Science, Profession – Evolution of management thoughts.

BLOCK II: PLANNING

Planning – Process, Importance, Nature and Scope, Types, Steps in Planning. Objectives, Policies, Procedures, Strategy - Decision making: Types of decisions, difficulties in decision making – Management by Objectives.

BLOCK III: ORGANIZING

Organizing – Features, Importance – Principles of organizations – Types - Organization structure – Delegation – Span of control - Line and staff relationship – Use of staff units and committees.

BLOCK IV: STAFFING

Staffing – Sources of recruitment – Selection process – Training - Directing – Nature and purpose – Communication process.

BLOCK V: CONTROLLING AND BUDGETARY

Need for Coordination – Controlling - Importance and functions of control – Control process - Budgetary and non- budgetary control.

Reference Books:

1. Rustom Davar Management Process
2. Management Process, Rustom Davar
3. Principles of Management, L.M. Prasad
4. Business Management, Dinkar & Pagare
5. Essentials of Management, Koontz & O Donnell
6. Principles of Management, Sherlekar.

Web Links

1. <https://www.youtube.com/watch?v=5RlnfakZ2I8>
2. <https://www.youtube.com/watch?v=dHM0AoNhiYk>
3. https://www.youtube.com/watch?v=HkFKfHcN_Cw
4. <https://www.youtube.com/watch?v=mg8F7vfC04M>
5. <https://www.youtube.com/watch?v=0OJ2PIGiwJE>

COURSE LEARNING OUTCOMES

After completion of the Principles of Management course, the student can be able to:

- CLO1: Develop the basic concepts of Management.
- CLO2: Demonstrate how to do planning and decision making
- CLO3: Gather information about how to organize in management
- CLO4: Demonstrate the selection process.
- CLO5: Explain about controlling and budgeting in management



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective I)

COURSE TITLE : **Management Information Systems**
COURSE CODE : **BCASE-02**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Management Information Systems course, the student shall be able to:

- CO1: Learn the basic concepts of Management Information Systems
- CO2: Identify the types of information systems.
- CO3: State the business information systems.
- CO4: Categorize the Financial Information System
- CO5: Learn about the various tools available for system development

BLOCK I: INTRODUCTION TO MIS

Concept, Definition, Role, Impact, Importance, - MIS and Uses. Approaches to management, Functions of Manager - Manager and the environment, Management as a control System.

BLOCK II: TYPES OF INFORMATION SYSTEMS

Decision Making, Concepts- Methods, Functions of DSS - Executive information System, MIS, TPS, ES.

BLOCK III: BUSINESS INFORMATION SYSTEM:

Functional Information Systems- Marketing Information - Manufacturing Information System- Quality Information System.

BLOCK-IV FINANCIAL INFORMATION SYSTEMS

Financial and Accounting Information System- Human Resource Information System.

BLOCK V: SYSTEM DEVELOPMENT LIFE CYCLE

System Development Life Cycle & Tools for IS Development - System Development- System Analysis, System Design, System Development Life Cycle - Preliminary Investigation- Tools for System Development - DFD- Data Dictionary- Decision Trees.

Text Books:

1. Management Information System, W. S. Jawadekar , Tata Mcgraw hill
- 2 .Management Information System A Managerial Perspective, Uma G. Gupta, Galgotia Publications Pvt. Ltd. 1998.

References Books:

1. Management Information System, W. S. Jawadekar , Tata Mcgraw hill
2. Management Information System A Managerial Perspective, Uma G. Gupta, Galgotia Publications Pvt. Ltd. 1998.

Web Links

1. <https://www.youtube.com/watch?v=-18Py3sX5sM>
2. <https://www.youtube.com/watch?v=HsbjxUYHyPM>
3. <https://www.youtube.com/watch?v=tOvNpNTyPPk>
4. <https://www.youtube.com/watch?v=Gz5LxhlYZ8o>
5. <https://www.youtube.com/watch?v=shNOYFlmBOU>

COURSE LEARNING OUTCOMES

After completion of the Management Information Systems course, the student can be able to:

CLO1: Explain the basic concepts of Management Information Systems

CLO2: Identify the types of information systems.

CLO3: State the business information systems.

CLO4: predict the Financial Information System

CLO5: Demonstrate the various tools available for system development.



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective I)

COURSE TITLE : Professional Ethics

COURSE CODE : BCASE-03

COURSE CREDIT : 3

COURSE OBJECTIVES

While studying the Professional Ethics course, the student shall be able to:

- CO1: Create awareness on Human Values.
- CO2: Develop the professional Ethics.
- CO3: Develop the Ethical Dilemma of an Professional.
- CO4: Explain the Global Issues
- CO5: Assess the safety and responsibilities

Block 1. HUMAN VALUES

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence –Character.

Block 2. ETHICS

Senses of 'Professional Ethics' - variety of moral issued - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment.

Block 3. ETHICAL DILEMMAS, SOURCES AND THEIR RESOLUTIONS:

What is an Ethical Dilemma, Sources of Ethical Behaviour, Code of Personal Ethics for Employees, How to Resolve an Ethical Problem, How to Resolve Ethical Dilemmas.

Block 4. SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island.

Block 5. GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics - weapons development – Professional as expert witnesses and advisors -moral leadership.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

Web Links

1. <https://www.youtube.com/watch?v=Y8eWo1qgDQQ>
2. <https://www.youtube.com/watch?v=PxVFvDh4tPg>
3. <https://www.youtube.com/watch?v=iJqQQAtxQUg>
4. <https://www.youtube.com/watch?v=K-2HgXtIZmo>
5. https://www.youtube.com/watch?v=Z_3VfpthmTs

COURSE LEARNING OUTCOMES

After completion of the Professional Ethics course, the student can be able to:

- CLO1: Build awareness on professional Ethics and Human Values.
- CLO2: Learn social responsibility of a Professional.
- CLO3: Demonstrate ethical dilemma while discharging duties in professional life.
- CLO4: Learn the Global Issues
- CLO5: Assess the safety and responsibilities



Tamil Nadu Open University

School of Computer Science

Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective II)

COURSE TITLE : **Constitution of India**

COURSE CODE : **BCASE-04**

COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Constitution of India course, the student shall be able to:

- CO1: Identify the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- CO2: Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
- CO3: Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- CO4: Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
- CO5: Describe about the election commission.

BLOCK I HISTORY OF MAKING OF THE INDIAN CONSTITUTION: History, Drafting Committee, (Composition & Working). Philosophy of the Indian Constitution: Preamble, Salient Features.

BLOCK II CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

BLOCK III ORGANS OF GOVERNANCE: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

BLOCK IV LOCAL ADMINISTRATION: District's Administration head: Role and Importance Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat:

Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

BLOCK V ELECTION COMMISSION: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7 th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Web Links

1. <https://www.youtube.com/watch?v=XrKEtEzqZ7g>
2. <https://www.youtube.com/watch?v=bI4XkJI2CHw>
3. <https://www.youtube.com/watch?v=MAWQS-1X7bw>
4. <https://www.youtube.com/watch?v=r-PUo0fuaT4>

COURSE LEARNING OUTCOMES

After completion of the Constitution of India course, the student can be able to:

CLO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CLO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CLO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CLO4: Discuss the passage of the Hindu Code Bill of 1956.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective II)

COURSE TITLE : **E- Learning**
COURSE CODE : **BCASE-05**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the e-Learning course, the student shall be able to:

- CO1: Learn about the basic concepts and history of e-Learning
- CO2: Design the role of tutor and learn the content development.
- CO3: Explain the philosophy of E-Learning
- CO4: Learn the visual communication techniques
- CO5: Explain the implementation strategy of E-Learning.

BLOCK I INTRODUCTION

E-Learning - E-Learning cycle - E-Learning types - challenges and support Blockies – cognitive presence – Approaches to design E-Learning - E-Learning framework – 6C framework - E-Learning Tools

BLOCK II E-LEARNING STRATEGY

Role of tutor - E-Learning strategy - Blended E-Learning – M-Learning- problem based learning- Enterprise learning- Corporate Learning- Web based Learning - Pod casting - Learning Management systems – Content development process – E-Learning standards- SCORM standard- managing e-learning quality - case studies.

BLOCK III PRINCIPLES OF E-LEARNING

Philosophy of E-Learning – theory of learning – Applying principles of multimedia - Applying principles of contiguity - Applying principles of modality - Applying principles of redundancy - Applying principles of coherency - Applying principles of personalization- web-based learning comm. Blockies - knowledge sharing and Knowledge management in e-learning- social networks and social media in e-learning

BLOCK IV DESIGN

On line E-Learning technologies – visual communication techniques- Computer-based technologies - Computer-mediated communication (CMC) – Assessment and evaluation- Organizing and designing learning sequences, Characteristics of Interactive Online Learning Media.

BLOCK V IMPLEMENTATION

Leverages example in E-Learning – collaborative E-Learning- Learner control in E-Learning- guidelines to solve issues in E-Learning – Implementation of an E-Learning Course Content for a complete online course, Research in content retrieval and generation for E-Learning, Role of cloud and semantic Grid in E-Learning

Reference book:

1. D.Randy Garrison “E-Learning in the 21st century a framework for research and practice”, 2nd edition, Taylor and Francis, 2011.
2. Robin Mason, “E-Learning : the key concepts”, Routledge, 2007.
3. William Horton, “E-Learning by Design”, Pfeiffer Wiley, 2006.
4. John Gardner, Bryn Holums, “E-Learning : Concepts and practice” SAGE Publications, 2006.
5. R.C.Clark and R.E.Mayer, “E-Learning and the science of instruction”, Pfeiffer Wiley, 2011.
6. Mark J Rosenberg, “E-Learning: strategies for delivering knowledge in the Digital Age”, McGraw- Hill, 2001.

Web links

1. <https://www.aupress.ca/books/120258-emergence-and-innovation-in-digital-learning/>
2. <https://opentextbc.ca/teachinginadigitalage/part/chapter-2-the-nature-of-knowledge-and-the-implications-for-teaching/>
3. <https://www.coursera.org/learn/elearning>

COURSE LEARNING OUTCOMES

After completion of the e-Learning course, the student can be able to:

- CLO1: Explain the basic concepts and history of e-Learning
- CLO2: Design the role of tutor and learn the content development.
- CLO3: Demonstrate the philosophy of E-Learning
- CLO4: Invent the visual communication techniques
- CLO5: Design the implementation strategy of E-Learning.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective II)

COURSE TITLE : **Big Data Analytics**
COURSE CODE : **BCASE-06**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Big Data Analytics course, the student shall be able to

- CO1: Familiarize with R Programming.
- CO2: Create data analysis using R and HADOOP Integrated Programming Environment.
- CO3: Describe the analytics for Big data ‘at Rest’ and Real-Time Analytical Processing for Big data ‘in Motion’.
- CO4: Explain the Pig Data model and Pig scripts.
- CO5: Create query for Big Data using Hive.

BLOCK I INTRODUCTION TO R PROGRAMMING

Introduction to R –Vectors –Filtering –Matrices –Creating Matrices –Applying Functions to Matrix Rows and Columns –Lists –Creating List –General List Operations - Data Frames – Creating Data Frames –Matrix like Operations in Frames –Applying Functions to Data Frames – Factors and Tables - Math and Simulations in R –Input/Output –Reading and Writing Files – Graphics –Creating Three-Dimensional Plots –Linear Models –Non-linear models –Clustering.

BLOCK II DATA ANALYSIS USING R AND HADOOP

Features of R Language -HADOOP Features –HDFS and MapReduce architecture –R and Hadoop Integrated Programming Environment-RHIPE - Introduction –Architecture of RHIPE – RHIPE function reference. RHADOOP Introduction –Architecture of RHADOOP –RHADOOP function reference, SQL on HADOOP.

BLOCK III ANALYTICS FOR BIG DATA STREAMS

IBM Pure Data Systems –Netezza’s Design Principles –The Netezza Appliance –Extending the Netezza Analytics –Real-Time Analytical Processing - InfoSphere Streams Basics – InfoSphereStreams Working –enterprise class –industry use cases –Indexing Data from Multiple Sources.

BLOCK IV PROGRAMMING WITH PIG

Introduction –installation and execution –PIG Data Model –PIG Latin –Input, Output-Relational Operators –User Defined Functions –Join Implementations - Integrating Pig with Legacy Code and Map Reduce –Developing and Testing Pig Latin Scripts –Embedding Pig Latin in Python – Evaluation Function in Java-Load Functions –Store Functions.

BLOCK V PROGRAMMING WITH HIVE

Introduction –Data Types and File Formats –Databases in Hive –HiveQL - Data Definition – Data Manipulation –Queries –Views –Indexes –Schema Design.

REFERENCES:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2011.
3. Zikopoulos, P., Parasarman, K., Deutsch, T., Giles, J., & Corrigan, D.V Harness the Power of Big Data The IBM Big Data Platform. McGraw Hill Professional, 2012.
4. Prajapati, V, “Big Data Analytics with R and Hadoop”, Packt Publishing Ltd, 2013.
5. Gates, A. Programming Pig.”O’Reilly Media, Inc.”, 2011.
6. Capriolo, E., Wampler, D., & Rutherglen, J., “Programming Hive”, O’ReillyMedia, Inc.”,2012
7. Norman Matloff , “The Art of R Programming: A Tour of Statistical Software Design”, NoStarch Press, 2011.
8. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data & Analytics Series, 2013.

Web Links

1. 2 IT - UNIT-1 Start Learning R.pdf (gvpcew.ac.in)
2. Chapter 10 Data Frames | Introduction to Programming with R (discdown.org)
3. Creating Graphs With ggplot2 | Data Analysis and Processing with R based on IBIS data (bookdown.org)
4. Chapter 13 Simulations | R Lecture Notes (ufl.edu)
5. Reading and Writing Data to and from R - MAKE ME ANALYST

COURSE LEARNING OUTCOMES

After completion of the Big Data Analytics course, the student can able to:

CLO1: Design applications using R

CLO2: Design applications using RHADOOP

CLO3: Develop analytic applications for data Streams.

CLO4: Develop Pig scripts for Big data applications.

CLO5: Design Big data applications schema and use HIVE QL.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective II)

COURSE TITLE : **Financial Accounting**
COURSE CODE : **BCASE-07**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Financial Accounting course, the student shall be able to:

- CO1: Learn the basic concepts of Accounting and its functions
- CO2: Describe knowledge about the various types of Accounting
- CO3: Learn about flow analysis
- CO4: Explain about the theory of costing.
- CO5: Formulate the importance of Budgeting.

BLOCK I: ACCOUNTING AND ITS FUNCTION

Fundamentals of Accounting: Principle of Accounting - Accounting and its Function: Double Entry Book Keeping - Ledger – Trial Balance – Rectification of Errors – Trading Profit and Loss Account – Balance Sheet - Journal – Rules of Journalising.

BLOCK II: TYPES

Financial concepts : Financial Statement – Nature of Financial Statements – Limitations of Financial Statements - Types of Analysis – Tools of Analysis – Trend Analysis – Comparative Statement.

BLOCK III: FLOW ANALYSIS

Ratio Analysis: Types of Ratio – Factors affecting efficiency of Ratio – Limitations of Ratio - Fund Flow Analysis - Cash Flow Analysis.

BLOCK IV: COSTING BUDGETING

Costing: Marginal Costing – Break even analysis – Application of Marginal Costing – Limitations

BLOCK V: BUDGETING

Budgeting: Importance of Budgeting – Budget factors.

Reference Books:

1. Advanced Accountancy, R.L.Gupta, and M.Radhasamy, Sultan Chand & Sons.
2. Principles of Management Accounting, Man Mohan and Goyal.
3. Studies in Cost Accounting, P. Das Gupta, Premier Book company.

Web Links

1. <https://www.youtube.com/watch?v=756D5Rx-p94>
2. <https://www.youtube.com/watch?v=jhtVVJxbPU0>
3. <https://www.youtube.com/watch?v=0OJ2PIGiwJE>
4. <https://www.youtube.com/watch?v=S3DGODVeSql>

COURSE LEARNING OUTCOMES

After completion of the Financial Accounting course, the student can be able to:

CLO1: Explain the basic concepts of Accounting and its functions

CLO2: Demonstrate knowledge about the various types of Accounting

CLO3: Learn about flow analysis

CLO4: Teach the theory of costing.

CLO5: Formulate the importance of Budgeting.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Elective II)

COURSE TITLE : **Data Mining**
COURSE CODE : **BCASE-08**
COURSE CREDIT : **3**

COURSE OBJECTIVES

While studying the Data Mining course, the student shall be able to

- CO1: Explain the major issues in Data mining
- CO2: Develop knowledge on Schemas of a Data Warehouse, OLAP and Cube Technology.
- CO3: Learn the Methods for Mining Frequent Patterns, Associations and Correlations.
- CO4: Learn the Basic Concepts and Methods for Classification.
- CO5: Use the basic concepts and Methods for Data Clustering.

Block I Introduction

Introduction – Kinds of Data and Patterns That Can Be Mined – Technologies Used – Kinds of Applications Targeted – Major Issues in Data Mining – Data Objects and Attribute Types – Basic Statistical Description of Data – Data Visualization – Measuring Data Similarity and Dissimilarity – Data Preprocessing – Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization.

Block II Data warehouse

Data warehouse – Basic Concepts – Operational Database Systems and Data Warehouses – Architecture of a Data Warehouse – Extract, Transform and Load – Metadata – Data Cube and OLAP – Multidimensional Data Model – Star Schema – Snowflake Schema – Starflake Schema – Fact Constellation Schema – Dimensions – Measures – OLAP Operations – Starnet Query Model for Querying Multidimensional Databases – Data Warehouse Design and Usage – Data Warehouse Implementation – ROLAP – MOLAP – HOLAP – Data Generalization by Attribute-Oriented Induction – Data Cube Technology – Data Cube Computation: Preliminary Concepts – Data Cube Computation Methods – Processing Queries by Exploring Cube Technology – Multidimensional Data Analysis in Cube Space.

Block III Mining Frequent Patterns

Mining Frequent Patterns, Associations, and Correlations – Basic Concepts – Market Basket Analysis – Frequent Itemsets, Closed Itemsets, and Association Rules – Frequent Itemset Mining Methods – Apriori Algorithm – Finding Frequent Itemsets by Confined Candidate Generation – Generating Association Rules from Frequent Itemsets – Improving the Efficiency of Apriori – Pattern-Growth Approach for Mining Frequent Itemsets – Mining Frequent Itemsets Using Vertical Data – Mining Closed and Max Patterns – Pattern Evaluation Methods – Association Analysis to Correlation Analysis – Comparison of Pattern Evaluation Measures – Pattern Mining in Multilevel, Multidimensional Space – Mining Multilevel Associations – Mining Multidimensional Associations – Mining Quantitative Association Rules – Mining Rare Patterns and Negative Patterns – Constraint-Based Frequent Pattern Mining – Metarule-Guided Mining of Association Rules – Constraint-Based Pattern Generation: Pruning Pattern Space and Pruning Data Space.

Block IV Classification

Classification – General Approach to Classification – Decision Tree Induction – Attribute Selection Measures – Tree Pruning – Scalability and Decision Tree Induction – Visual Mining for Decision Tree Induction – Bayes Classification Methods – Bayes' Theorem – Naïve Bayesian Classification – Rule-Based Classification – Using IF-THEN Rules for Classification – Rule Extraction from a Decision Tree – Rule Induction Using a Sequential Covering Algorithm – Model Evaluation and Selection – Metrics for Evaluating Classifier Performance – Holdout Method and Random Subsampling – Cross-Validation – Bootstrap – Model Selection Using Statistical Tests of Significance – Comparing Classifiers Based on Cost-Benefit and ROC Curves – Techniques to Improve Classification Accuracy – Ensemble Methods – Bagging – Boosting and AdaBoost – Random Forests – Improving Classification Accuracy of Class-Imbalanced Data – Classification by Backpropagation – Support Vector Machines.

Block V Cluster Analysis

Cluster Analysis – Requirements for Cluster Analysis – Overview of Basic Clustering Methods – Partitioning Methods – k -Means: A Centroid-Based Technique – k -Medoids: A Representative Object-Based Technique – Hierarchical Methods – Agglomerative versus Divisive Hierarchical Clustering – Distance Measures in Algorithmic Methods – BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees – Chameleon: Multiphase Hierarchical Clustering Using Dynamic Modeling – Probabilistic Hierarchical Clustering – Density-Based Methods –

DBSCAN: Density-Based Clustering Based on Connected Regions with High Density –
OPTICS: Ordering Points to Identify the Clustering Structure – DENCLUE: Clustering Based on
Density Distribution Functions – Grid-Based Methods – STING: STatistical INformation Grid –
CLIQUE: An Apriori-like Subspace Clustering Method – Evaluation of Clustering – Assessing
Clustering Tendency – Determining the Number of Clusters –Measuring Clustering Quality.

Text Books

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, July 6, 2011.
2. Ian H. Witten, Eibe Frank, Mark A. Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier; Third edition, 2014.

Text Book:

2. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann Publishers, 2011.

References:

5. Arun K Pujari, “Data Mining Techniques”, Fourth Edition, Orient BlackSwan, 2016.

Web Links

1. <https://www.youtube.com/watch?v=J326LIUrZM8>
2. https://www.youtube.com/watch?v=-WxbURm_YGA
3. https://www.youtube.com/watch?v=6bx_MGQqWBQ
4. <https://www.youtube.com/watch?v=CwjLMV52tzI>

COURSE LEARNING OUTCOMES

After completion of the Data Mining, the student can able to:

CLO1: Learn the major issues in Data mining.

CLO2: Demonstrate knowledge on Schemas of a Data Warehouse, OLAP and Cube
Technology.

CLO3: Explain the Methods for Mining Frequent Patterns, Associations and Correlations.

CLO4: Learn the Basic Concepts and Methods for Classification.

CLO5: Use the basic concepts and Methods for Data Clustering.



Tamil Nadu Open University
School of Computer Science
Chennai – 15

B. C. A. SYLLABUS - III YEAR (Non-Major Elective)

COURSE TITLE : Office Automation

COURSE CODE : BCAS-13

COURSE CREDIT : 2

COURSE OBJECTIVES

While studying the Office Automation course, the student shall be able to

CO1: Learn about the basics of computer.

CO2: Craft professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.

CO4: Familiarize the students in preparation of documents and presentations with office automation tools.

CO5: Discuss about the internet and e- mails.

BLOCK -1 BASICS OF COMPUTER

Unit -1 History & Generation of Computer, Applications of Computer, Advantages of Computer, Characteristics of Computer, Memory Units.

BLOCK – 2 MS-WORD

Unit -2 Introduction to word –working with documents

Unit -3 formatting page – formatting paragraph- shortcut keys.

BLOCK – 3 MS-EXCEL

Unit -4 MS-Excel: Basics – Menus – Tool Bars

Unit -5 Working with spreadsheets- shortcut keys.

BLOCK – 4 MS-POWERPOINT

Unit -6 Introduction to presentation – Templates – Layouts

Unit -7 Creating and Formatting presentation.

BLOCK – 5: INTRODUCTION TO INTERNET AND E-MAILS:

Unit- 8 World Wide Web (www) - History, Working-Web Browsers and its functions, Concept of Search Engines, Searching the Web. **E-Mail:** Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.

TEXT BOOK

1. Sanjay Saxena, —MS-Office 2000 for everyone!, Vikas Publishing House Pvt. Ltd, Reprint 2006.

REFERENCE BOOKS

1. Nellai Kannan, —MS-Office, Nels Publications, 3rd Edition, 2004.
2. John Walkenbach, Herb Tyson, Michael R.Groh, Faithe Wempen and Lisa A.Bucki , — Microsoft Office 2010 Bible —, Wiley India Pvt. Ltd , Reprint 2010.

Web Links

1. <https://psu.pb.unizin.org/ist110/chapter/5-2-human-computer-interaction/>
2. <http://www.igntu.ac.in/eContent/IGNTU-eContent-799042056712-MA-Linguistics-4-HarjitSingh-ComputationalLinguistics-1.pdf>
3. <https://www.geeksforgeeks.org/working-with-spreadsheets-in-ms-excel/>
4. http://www.bcpls.org/Docs/Computer_Handouts/Word101.pdf
5. <https://spreadsheeto.com/how-to-use-excel/>
6. http://www.bcpls.org/Docs/Computer_Handouts/PowerPoint10/1.pdf

COURSE LEARNING OUTCOMES

After completion of the Office Automation, the student can able to:

- CLO1: Memorize the computer basics
- CLO2: Perform documentation
- CLO3: Work in spread sheets
- CLO4: Perform presentation skills
- CLO5: Aware with internet and e-mails.

Programme Outcomes:

After successful completion of Bachelor of Computer Applications, a student shall be able to:

- PO1: Transform complex computing tasks into solvable parts of problem, investigate, develop solutions and propose integrated solutions using emerging technologies.
- PO2: Develop an effective helping relationship with people in order to ensure better results through combined knowledge, abilities and Communicate effectively with the society through effective oral documentations and presentations
- PO3: Identify, deep drive analyze, interpret and to formulate complex solutions using to various computing domains.
- PO4: Augment broad knowledge across various fields of computer in global technological development.
- PO5: Work as a member or leader in various teams and organize to excel for team progress in multidisciplinary situation.
- PO6: Improve technical and technological knowledge in diverse areas of computer and enhancing competencies, skills for high carrier orientation and entrepreneurship.

S.No		BCAS-11	BCAS-12	BCAS -21	BCAS-22	BCAS -23	BCAS -31	BCAS -32	BCAS -41	BCAS -42	BCAS -43	BCAS-44	BCAS - 51	BCAS - 52	BCAS - 53	BCAS - 61	BCAS-P10	BCASE-01	BCASE-02	BCASE-03	BCASE-04	BCASE-05	BCASE-06	BCASE-07	BCASE-08
1	Fundamental understanding of the field	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
2	Application of basic computing concepts	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								✓
3	Linkages with related disciplines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓					✓
4	Skills in related field of specialization	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
5	Ability to use in Real time problem	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								✓
6	Skills in Design / Solution modeling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓						✓
7	Skills in analysis and interpretation of data	✓		✓			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓								
8	Develop investigative Skills	✓		✓	✓		✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	✓		✓					✓

9	Skills in problem solving	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓								✓
10	Develop Technical Communication skills	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓							

Mapping of curriculum for Bachelor of Computer Applications